# Two Merged Retailers Integrate HPE NonStop SQL and Oracle RAC

**A Gravic, Inc. Case Study**

## Executive Summary

Company mergers always present a host of challenges, and prominent among them is integrating the disparate IT systems of the merged parties. Two major retailers that recently joined forces faced this exact predicament. Each retailer had thousands of stores, and they wanted to allow a shopper to return or to exchange goods at any of its stores regardless of the store where the original purchase took place. This challenge required transforming HPE NonStop SQL applications and Linux-based Oracle RAC applications so that the disparate databases could be integrated into a common framework.

The two retailers turned to HPE Shadowbase Streams from Gravic, Inc., to integrate the distinctly different applications by mirroring the HPE NonStop SQL and Oracle databases using bi-directional, active/active data replication. The goal was for each store to have local access to all sales, refund, and exchange activities so that any customer could easily be serviced at any store regardless of the retailer.

## The Retailers Evolve with HPE NonStop BASE24™ Systems

The two retailers in this case study have each been in operation for over a century, and each has significant brand recognition. Their wares have very little overlap, so the merger of the two chains made sense in terms of cross-selling between the brands and increased market competitiveness in an ever-changing retail world. Following the merger, they continued to operate their respective stores under their original brand names, which we will call Brand 1 and Brand 2 as shown in Figure 1.

Over the last several decades, the two retailers had independently evolved their IT operations to suit their own needs. When credit cards came into vogue, they each installed their own point-of-sale (POS) terminals in their stores. Over time, both retailers adopted ACI Worldwide, Inc.'s BASE24™ payment processing engine (www.aciworldwide.com) to route credit and debit card transactions from their POS terminals to issuing banks for authentication and authorization.

Both retailers used HPE NonStop systems to run their versions of BASE24. BASE24 controls all of the POS terminals in a retailer's stores, sends card transactions to the issuing banks for authorization, and records all sales.

One of the critical BASE24 facilities that each retailer used was the refund/exchange module. Since all of a retailer's stores had access to the retailer's BASE24 system, customers did not have to return items to the specific stores in which the products were purchased. Rather, customers could come into any of the retailer's existing stores with their purchase receipts, purchased products, and obtain a refund. Alternatively, customers could exchange the products for other ones.

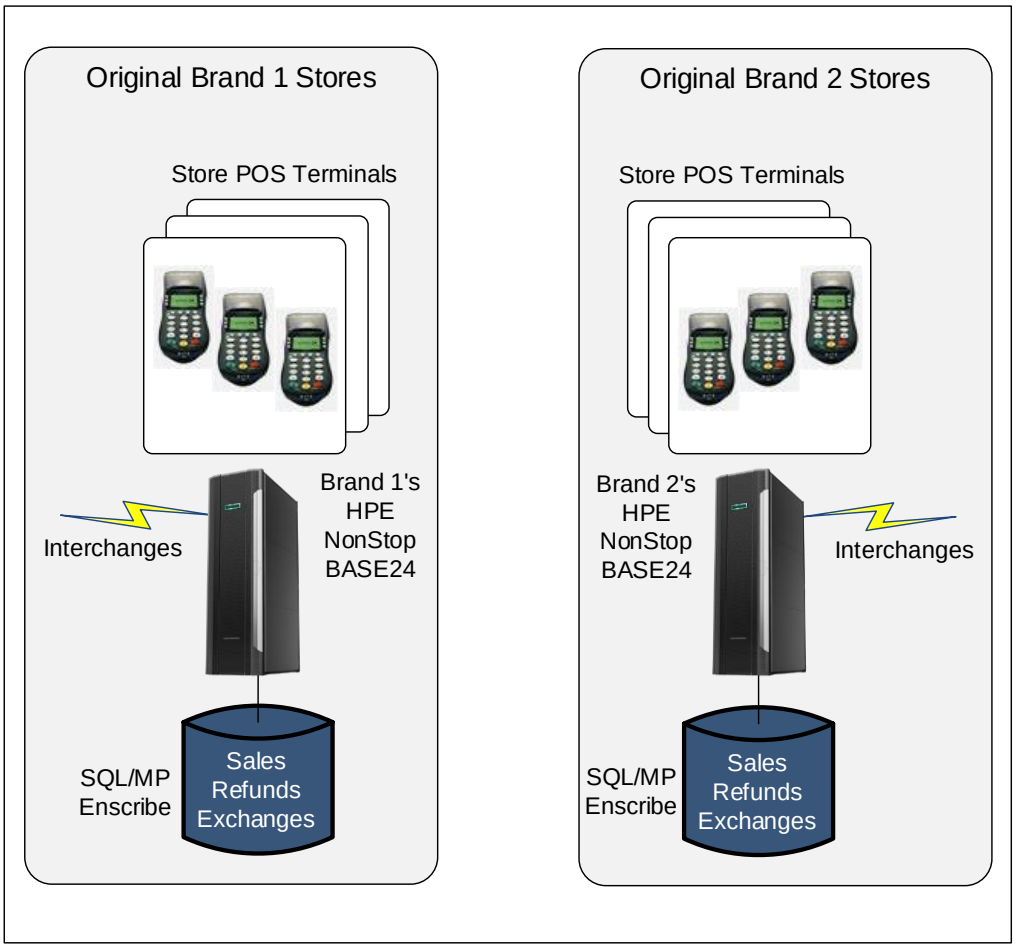


**Figure 1 – The Original Payment Processing Systems**

## New Stores Open with an Oracle RAC Database

Following the merger, the retailer wanted to integrate its systems and extend its refund/exchange policy so that a customer could return or exchange a product at a store of either Brand 1 or Brand 2, regardless of where the product had been purchased.

To complicate matters, the retailer implemented a new financial payment engine with additional functionality for the many new stores that it opened under the two brand names or for stores that it decided to refurbish/retrofit. It continued to use the NonStop BASE24 systems for its existing stores so its current POS systems did not need to be replaced. However, new stores used the POS systems provided by the new financial-payment system vendor.

The new vendor was AJB Software Design, Inc. (ajbsoftware.com). AJB's Retail Transaction Switch (RTS) performs real-time authorization for a variety of transaction types from numerous sources. RTS provides the authorization functions for POS transactions with the issuing banks. AJB's Flexible Integrated Payment System (FIPay) is a store-level communication gateway that interfaces a retailer's POS devices to RTS.

RTS runs on an Oracle Real Application Cluster (Oracle RAC) multi-server cluster. Oracle RAC provides the transparent deployment of a single database across a cluster of commodity servers. Applications can run simultaneously on all servers in the cluster, accessing the database via a common, distributed cache as shown in Figure 2. Should one server fail, the surviving servers assume the processing load. Thus, an Oracle RAC cluster provides application fault tolerance – the application will continue to function in the presence of any single (or perhaps multiple) server failures.

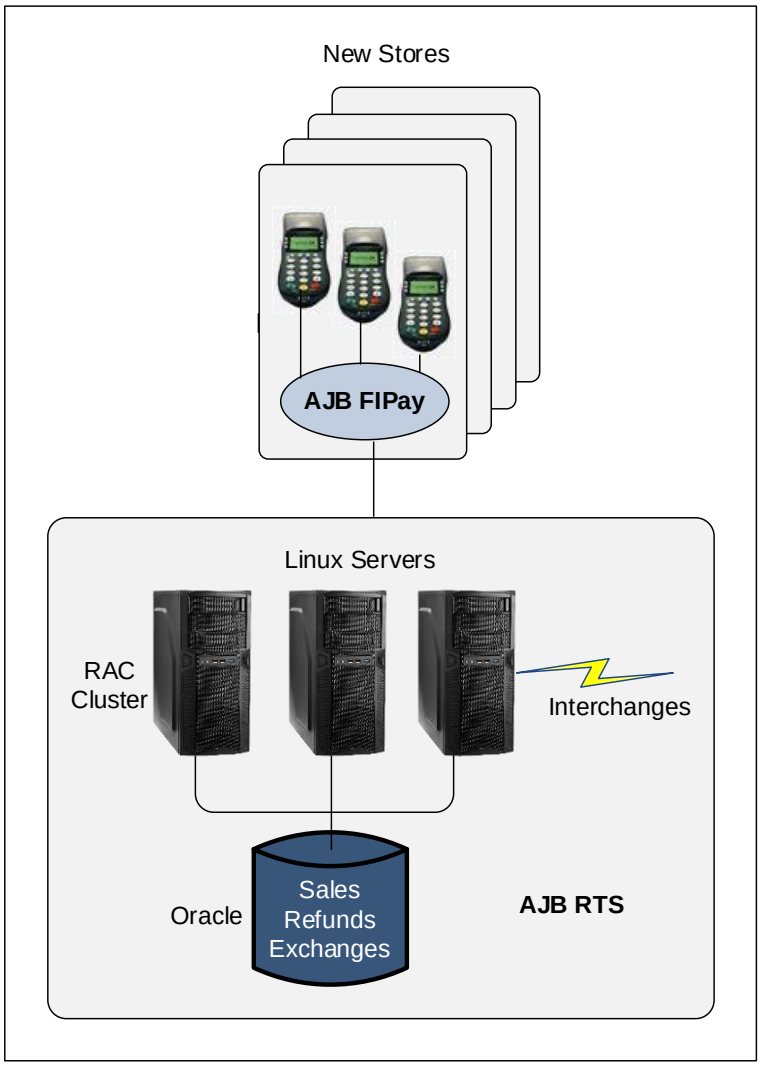


**Figure 2 – The New Payment Processing System**

Oracle RAC clusters are complex and typically much more difficult to set up and to manage than NonStop servers and failover to the surviving servers following a server failure can take minutes compared to the sub-second recovery time of NonStop systems. However, the retailer wanted to take advantage of additional functionality provided by the AJB system.

## Integrating the BASE24 HPE NonStop SQL and Oracle RAC Databases

### *The Retailer's Integration Strategy*

The retailer then faced the problem of having three different payment processing systems – a NonStop BASE24 system for each of the original retailers and an AJB Oracle RAC system for new stores being opened or for existing stores being retrofitted. Each system managed sales, returns, and exchanges for the subset of stores that it served. The retailer wanted to extend the return and exchange functions so that any store, existing or new, of either brand could accept product returns and exchanges from any of the other stores.

The retailer considered different options. One was to provide a new system that could act as a central repository of all sales transactions – in effect, an operational data store (ODS). Returns and exchanges would be managed by this new central system. However, the acquisition and management of yet another system, and the integration of existing systems with it via messaging adapters, was not a cost-effective move for the retailer.

Another option was to integrate the databases of the three systems so that they presented a single-system data view containing all sales, refund and exchange transactions across all stores. In this way, a customer could show up at any store with a purchased product for return or exchange and be properly serviced.

The retailer chose this second option. The strategy would use a bi-directional replication engine replicating all of the sales, refund, and exchange transactions to each of the databases. The replication engine would then transparently handle transforming the data from the source schema/data types to that of each target, including identifying and resolving any data collisions that might occur.

To simplify the transition, the retailer initially provided this capability primarily for its new stores. Any product purchased at a new store could be returned to or exchanged at any store, existing or new, of either brand. Likewise, a product purchased at any existing store could be returned to or exchanged at any existing store of

the same brand or at any new store of either brand. The only limitation was that products purchased at existing stores could not be returned to or exchanged at existing stores of the other brand. (As the existing stores are retrofitted with the new AJB POS terminals, this restriction will disappear.)

As this strategy was implemented, the AJB system replicated return or exchange transactions servicing the two pre-merger retailers in-store to the two NonStop BASE24 systems' NonStop SQL/MP databases. Likewise, existing stores' transactional updates processed by the BASE24 systems were replicated to the AJB system's Oracle database.

Return or exchange transactions were not replicated between the two BASE24 systems, leading to the restriction that product purchases at an existing store of one brand could not be returned to an existing store of the other brand. This limitation could have been avoided if the retailer had included bi-directional replication between the two original BASE24 databases, but it decided to defer this option to a later date.

***Data Replication by HPE Shadowbase Streams***

After exhaustive evaluations, the retailer chose HPE Shadowbase Streams[1] to keep the databases synchronized. Shadowbase Streams provides bi-directional data replication between heterogeneous databases.

As a heterogeneous replication engine, Shadowbase Streams uses Change Data Capture (CDC) technology to automatically map database updates from one schema to another, and to replicate between databases from different vendors. This capability includes field format conversion, aggregation, filtering, data cleansing, and schema translation. Whenever a sales, return, or exchange transaction is executed on an existing store's BASE24 system, its effect on the database is replicated to the AJB Oracle database serving the new stores. Likewise, a transaction executed at a new store is replicated from the AJB Oracle database to both BASE24 SQL/MP databases serving the existing stores.

The retailer faced a major problem dealing with the data-protection requirement imposed by the Payment Card Industry Data Security Standard (PCIDSS), because the BASE24 systems and the AJB system address this requirement differently.

According to the standard, sensitive data items such as credit card numbers (primary account numbers, or PANs) and social security numbers must be protected from unauthorized access. The BASE24 version used by the retailer did not employ encryption in its database (however, newer versions of BASE24 do support this capability). In contrast, the AJB RTS encrypted credit card numbers in-place and in-flight.

Shadowbase Streams user exits[2] integrated the two protection technologies as shown in Figure 3. Whenever a data item is sent from a BASE24 database to an AJB database, it is read in plain text from the BASE24 database and is sent over a secure, encrypted TCP/IP session to the AJB system (via proxy servers). There, using an API furnished by the AJB system, Shadowbase Streams encrypts the data before storing it in the AJB database.

Conversely, when replicating from AJB to BASE24, Shadowbase Streams reads the encrypted data item from the AJB database and uses an AJB API to decrypt the data item. The data item is then sent to each of the BASE24 systems over a secure, encrypted TCP/IP session (via proxy servers) and is written in plain text to the BASE24 databases.

[1]HPE Shadowbase Streams' white papers are available at *HPE Shadowbase Streams for Data Integration* and *HPE Shadowbase Streams for Application Integration.*

[2]User exits are points in the HPE Shadowbase Streams processing flow where customized functions may be incorporated.

## Data Protection

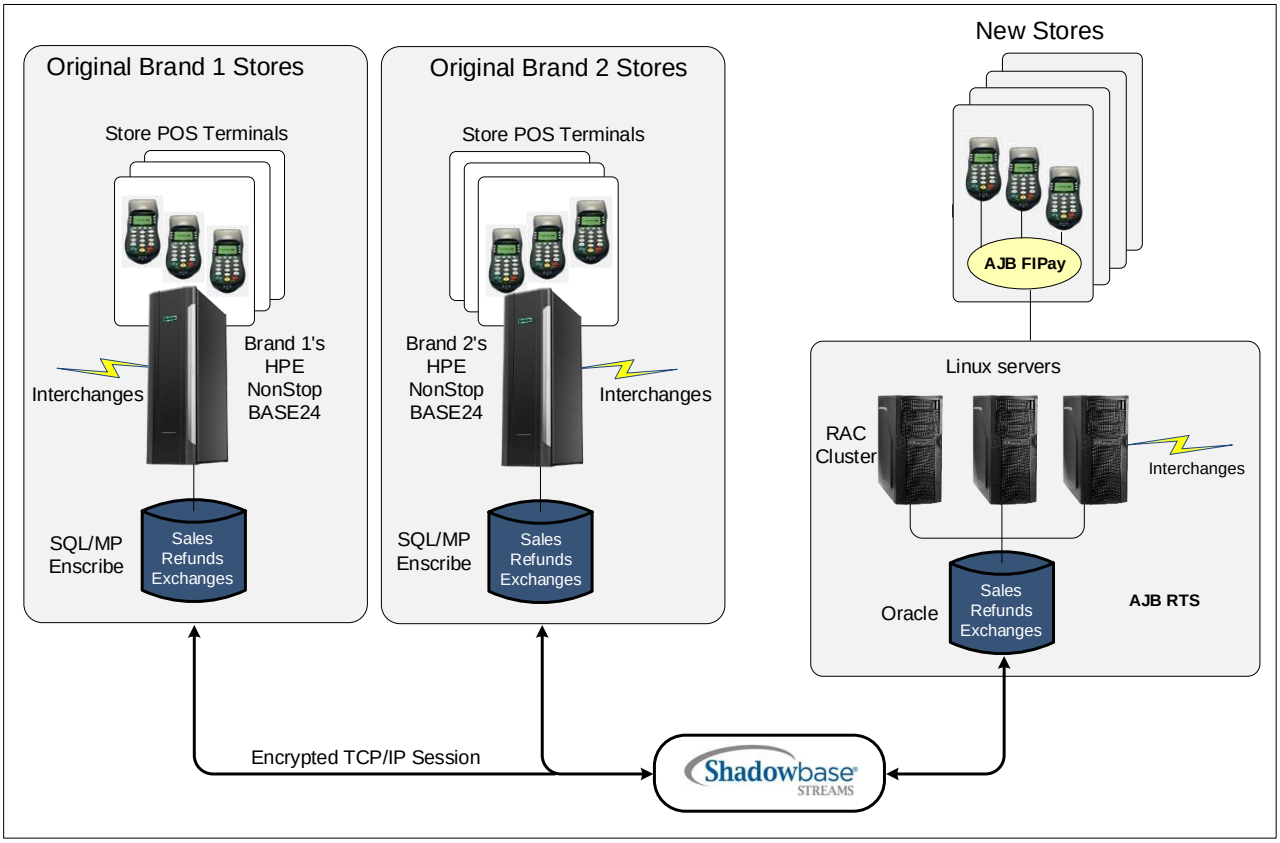


**Figure 3 – Integrated Refunds and Exchanges**

## Data Collisions

One important challenge facing bi-directional replication is that of data collisions. A data collision occurs if the same data item is updated on two different systems almost simultaneously – within the replication-latency interval during which the changes are propagating between the two systems. If this collision should happen and no provision is made to handle it, the change made at one system will overwrite the change made at the other system and vice versa. Now both systems will have different values for that data item, and both will be wrong.

In the return/exchange application of the retailer, collisions are highly unlikely since the customer is supposed to present the original sales receipt, and there is only one of them. However, during batch processing, it is possible that a batch update will make a change to a data item in one system at the same time that the returns/exchange application is doing so in another system.

Shadowbase Streams provides data collision detection and correction. In this case, Shadowbase Streams chooses a winning update based on rules established by the retailer. For instance, the rule may be that the more recent timestamp wins (such timing rules generally require that the clocks of the systems be synchronized). In the unlikely event of a data collision, Shadowbase Streams reports collisions for later manual review and reconciliation.

## Summary

Following a major merger, a combined company faced the problem of integrating the IT operations of the two original companies and adding new functionality. These companies used different applications running on different platforms to perform the same functional job. Disparate databases containing the same classes of data needed to be integrated into a common database in order to provide better customer service. This integration task was daunting, especially when the integration needed to occur with little or no application downtime.

In this case study, the IT integration problem was solved more easily than replacing multiple systems with a single integrated system. The merged retailer elected to keep the original payment systems of each of the original retailers, despite their differences. The merged retailer went even further and decided to upgrade to a new payment system for new stores that it was opening.

The databases of the three payment systems are kept synchronized via bi-directional data replication provided by HPE Shadowbase Streams. In this way, any system can properly process any transaction, regardless of where it originated. In particular, the retailer is able to extend its customer service by allowing a customer to return or exchange a product at any store regardless of the store brand at which it was purchased (with some restrictions).

Integrating applications and databases via data replication is a powerful technique for managing the differences between diverse IT infrastructures and for extending their functionalities. Shadowbase Streams successfully integrated the distinctly different applications of this retailer by mirroring the HPE NonStop SQL and Oracle databases using bi-directional, active/active data replication.

## International Partner Information

### Global

**Hewlett Packard Enterprise**
6280 America Center Drive
San Jose, CA 95002
USA
Tel: +1.800.607.3567
www.hpe.com

### Japan

**High Availability Systems Co. Ltd**
MS Shibaura Bldg.
4-13-23 Shibaura
Minato-ku, Tokyo 108-0023
Japan
Tel: +81 3 5730 8870
Fax: +81 3 5730 8629
www.ha-sys.co.jp

## Gravic, Inc. Contact Information

17 General Warren Blvd.
Malvern, PA 19355-1245
USA
Tel: +1.610.647.6250
Fax: +1.610.647.7958
www.shadowbasesoftware.com
Email Sales: shadowbase@gravic.com
Email Support: sbsupport@gravic.com

Hewlett Packard Enterprise Business Partner Information

Hewlett Packard Enterprise directly sells and supports Shadowbase Solutions under the name ***HPE Shadowbase***. For more information, please contact your local HPE account team or visit our website.