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Active/Active Payment Processing at Swedbank

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Based in Stockholm, Sweden, Swedbank (www.swedbank.com) is one of the largest retail banks in the Nordic region. It is the leading bank in Sweden, Estonia, Latvia, and Lithuania; and it also operates in Denmark, Finland, Norway, Western Russia, Luxembourg, Ukraine, the U.S., China, and Japan. It has more than 21,000 employees serving nine million private and a half million corporate clients.

Though its core market is not euro-based, Swedbank is planning to become SEPA-compliant. SEPA is the Single Euro Payments Area designed to make intercountry payments transparent. This compliance will give its customers the capability of paying and receiving electronic payments in euros as easily and reliably as is currently done in each EU (European Union) country.

Swedbank's Need to Go Active/Active

Among its other services, Swedbank processes electronic payment requests for a number of Swedish and overseas banks as well as ATM payments and payment requests from Swedbank's own customers. Processing over one billion transactions per year, it authorizes and authenticates large volumes of banking transactions.

Swedbank has been a long-time user of ACI's Base24 application to provide these functions. Its Base24 application has always run on HP NonStop servers to provide high levels of availability. In its initial configuration, Swedbank operated a hot backup site for testing and for failover in the event of a primary system failure. However, the time that it took to fail over to the backup system for planned or unplanned events precluded the system from achieving true 24x7 service to Swedbank's customers.

Because of the growing importance of the payment authorization and authentication functions, Swedbank decided that it had to offer true 24x7 service for these critical functions to its customers. When these functions are unavailable due to unplanned or planned downtime, the bank's customers cannot use their credit or debit cards for payment at point-of-sale devices or for withdrawals at ATM machines. Any outage can severely impact satisfaction and loyalty, which may ultimately affect the bank's revenue. Therefore, Swedbank recently moved its payment authorization and authentication functions to a NonStop active/active configuration.[1]

Swedbank's Active/Active System

The Swedbank active/active system runs on two NonStop server nodes separated geographically to provide disaster tolerance.[2] Both nodes are active and are processing different transactions

[1] What is Active/Active?, *Availability Digest*; October, 2006.
[2] Press release, Swedbank Uses GoldenGate's Active/Active Software Solution to Provide Continuous Availability for Payment Processing Application; October 29, 2007.

against their own copies of the application database. Transactions are split between the nodes to provide load balancing.

Should one node fail or be taken offline for planned hardware or software maintenance, upgrade, or migration, all transactions are simply routed to the surviving node for processing. Thus, planned downtime is eliminated; and recovery from a sudden failure occurs literally within seconds. True 24x7 operation is achieved.

Because each node must be able to handle the full load when the other node is down, there is ample excess capacity available when the system is running normally with both nodes in operation. This excess capacity becomes invaluable when the system must cope with sudden peaks in demand, such as during the holiday season or at the end of the month when most people do a lot of shopping or go online to pay bills.

Data Replication with GoldenGate

Because each of the nodes in the active/active system uses its own database copy, these database copies must be kept in synchronism. Only in this way can a transaction be processed arbitrarily at either node.

In Swedbank's active/active system, the database copies are kept synchronized via data replication. As a change is made to one database copy, that change is immediately replicated to the other database copy so that both database copies always reflect the same state of the application.

Swedbank chose the GoldenGate for Active-Active data replication engine from GoldenGate Software, Inc. (www.goldengate.com)[3] to provide the data replication services required to keep the database copies in synchronism. Headquartered in San Francisco, GoldenGate has more than 350 customers worldwide using GoldenGate products to capture, route, transform, deliver, and verify transactional data in real time across heterogeneous environments.

Swedbank decided to use the GoldenGate product because of its known out-of-the-box interoperability with Base24. In addition, GoldenGate products had already been used successfully by other Swedbank departments.

Swedbank's active/active configuration was also put to use to migrate the bank's earlier NonStop servers to HP's new Integrity platform. By taking down one server at a time, upgrading it, and then returning it to service, this major upgrade was made with no application downtime.

Data Collision Resolution

With asynchronous replication engines such as those provided by GoldenGate, there is a delay from the time that a change is made to the source database to the time that the change is applied to the target database. This is due not only to the processing time of the data replication engine but also to the channel propagation time required to send the change over the communication network. This delay is known as *replication latency*.

It is possible that each of the nodes might attempt to change the same object in the application database nearly simultaneously within the replication latency interval. In this case, each node will execute its own update to the data object and will then replicate that change to the other node. There, the node will overwrite its original change with the change replicated by the other node.

[3] Flexible Availability Options with GoldenGate's Transactional Data Management Platform (TDM), *Availability Digest*; February, 2007.

The value of both data objects is now different, and both are wrong. This is known as a *data collision*.

The GoldenGate replication engine provides several strategies for resolving data collisions. In Swedbank's case, business rules were defined to choose which change to accept and which to reject. These business rules were implemented as user exits provided by the replication engine. Rejected changes are logged for later manual review.

Summary

In order to provide true 24x7 availability of its ACI Base24 payment authorization and authentication services, Swedbank chose to move to an active/active system using HP NonStop server nodes and GoldenGate data replication to keep the nodal database copies synchronized. This configuration has proven that it can fulfill the 24x7 need. Swedbank has been operating its dual-node active/active system since 2006 with no outages or service issues.