CASE STUDY 3

MASTERING MASSIVE DATABASES AT MASTERCARD INTERNATIONAL

Many organizations are working hard to address the opportunities and storage challenges associated with "big data." Industry experts estimate that the total volume of data is doubling every 18 months and the vast majority of new data being generated is in business domains. MasterCard International (www.mastercard.com) is no stranger to wrestling with the issues associated with massive databases. MasterCard has amassed a data warehouse that is more than 100-terabytes in size and company insiders expect that it will growth to more than 1.8 petabytes. The growth of MasterCard's data warehouse is fueled by a client/server network that, on average, handles 140 million credit card transactions per hour on behalf of more than 25,000 financial institutions [WALL08]. In 2007, MasterCard's worldwide network processed 18.7 billion transactions totaling approximately $2.3 trillion.

MasterCard's computer facility authorizes, clears, and settles each credit card transaction in real time as a cardholder's credit card is swiped. MasterCard's bank and business clients expect the system to be fast and accessible. To meet these expectations, MasterCard expects its network to have a response time of 140 milliseconds per transaction (or less). It also has implemented sufficient redundancy and failover systems to be able to

promise its customers 99.999 percent network availability. Needless to say, MasterCard customers also expect the transaction processing and data storage systems to be secure.

For continued success, it is important for MasterCard to grow its volume of credit card transactions. To do this, the company works to expand its base of bank clients and business partners by offering them an attractive mix of products and services. Part of their efforts is directed toward helping its clients increase the number of customers who hold a MasterCard and use them to make purchases. To remain competitive against other credit card issuers such as American Express, Discover, and Visa, MasterCard must also continue to grow its volume of credit card transactions and it has learned that one of the best ways to do this is by being a good business partner for its clients.

In addition to credit cards, MasterCard offers debit cards, prepaid cards, smart cards with embedded chips, and contactless cards. It also has business card programs for commercial and public sector organizations of all sizes. MasterCard partners with its customers to create customized loyalty programs and reward solutions to provide incentives for cardholders to use MasterCard to make purchases. By helping its customers identify the benefits that services that are most appealing to their cardholders, MasterCard is able to help its partners increase customer satisfaction. MasterCard's global processing system enables customers to extend their loyalty programs worldwide. Hence, it is not surprising that MasterCard has been successful in partnering with airlines and hotel chains on loyalty programs.

MasterCard's Data Warehouse Strategy

MasterCard's data warehouse has emerged to play an important role in the company's competitive strategy. This global data repository has become a

business intelligence (BI) engine that helps the credit card giant and its clients make more effective business decisions.

Planning for the data warehouse began in the mid-1990s. Interestingly, MasterCard's executive team immediately grasped the data warehouse concept recommended by the IT division as a potential game changer. MasterCard executives typically required a detailed business case justifying IT investment recommendations, but in this case, the executives instantly recognized the proposed data warehouse as a strategic move to give MasterCard a competitive edge. Specifically, MasterCard wanted to improve market share. At the time, MasterCard accounted for only about 25% of charges for goods sold worldwide using credit cards, with Visa accounting for 50%. Since the creation of the data warehouse, MasterCard's market share increased to 31%. Although Visa continues to be the industry leader, MasterCard's role as a global leader in credit card processing has strengthened [BASE11].

Financial institutions that use MasterCard rely on the history of credit card transactions to provide information for targeted marketing and business planning. For example, a bank that issues credit cards might notice a large volume of charges for flights on a specific airline. The bank can use this information to negotiate a deal with the airline to provide special offers and incentives to cardholders. Similar promotional opportunities could be offered to a hotel chain that would provide additional incentives (such as "stay two nights and get a third night free") for using MasterCard to reserve and pay for a room.

MasterCard's BI and Reporting Tools

MasterCard runs a combination of homegrown and off-the-shelf analytic tools to identify buying trends, credit card fraud, and other useful information. The company can correlate and analyze transactions to

determine a consumer's interest or detect anomalies that suggest a card has been stolen. MasterCard offers bank clients access to these tools, as well as custom reports.

Among the signature applications provided by MasterCard is its Portfolio Analytics suite of BI and reporting tools. This suite includes a wide range of standard reports that let members analyze transactions every day, week, or month and compare the results to different parts of the country, other parts of the world, or predefined groups of similar banks.

Another popular tool is the MasterCard Marketing Center, which helps its customers monitor, analyze, and develop campaigns to increase use of their cards. For example, a card issuer in Los Angeles might use the data to see how many cardholders spent $25 or more in January and February on sporting goods at Wal-Mart stores. Then it might propose to Wal-Mart a mail marketing campaign before the opening of baseball season, tied to heavy spenders with an affinity to the Dodgers or Angels. A card issuer in New York City could use MasterCard's BI and reporting tools to identify patterns in restaurant charges for its most affluent cardholders. This information could be used to develop an "insider's guide" to NYC "hidden gems for food and wine" to share with select groups of other MasterCard holders.

The process used by MasterCard customers to make access the data warehouse to populate reports or perform BI queries is illustrated in general terms in Figure C3.1. Such transactions proceed in the following way:

1. Member bank connects to MasterCard facility, known as MasterCard Online. This could be by Internet, by means of a mobile access service, or by means of a private wide area network, such as a frame relay network. In the case of Internet access, all traffic must go through a firewall, which assures that unwanted traffic is blocked.

2. User authenticates to MasterCard Online. A dedicated group of servers is assigned the task of authenticating all incoming transaction requests to assure that the user has permission to use the facility and to specify the user's level of privilege.

3. MasterCard Online verifies user product licensing. This has to do with which business enterprise software tools the bank client is able to use.

4. User request is forwarded to a transaction server, which invokes the appropriate application software for this transaction. The application translates the request into the corresponding database requests and updates.

5. The transaction server forwards a transaction request to the data warehouse, which processes the request and returns a response to the member user.
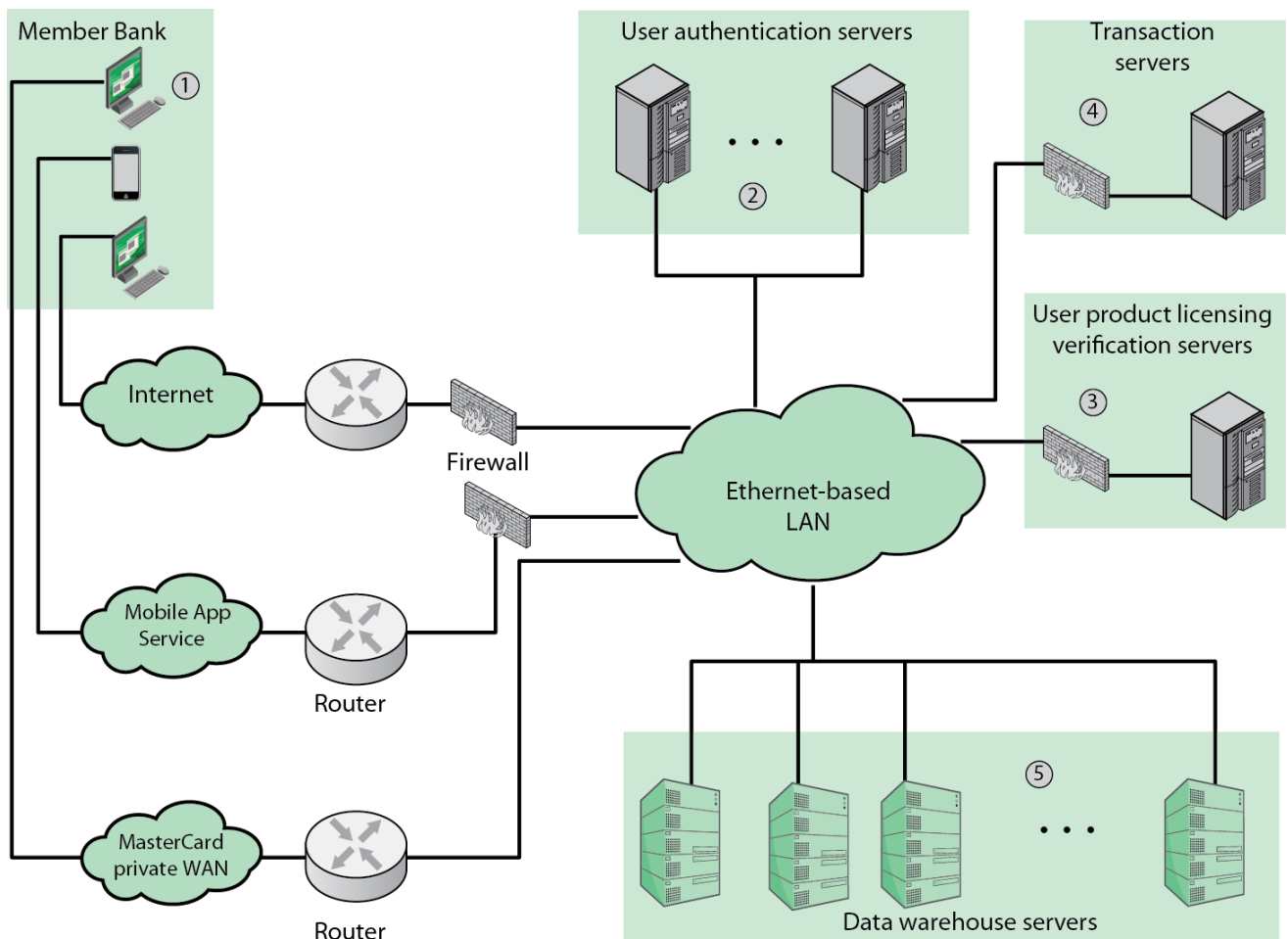

Figure C3.1 MasterCard's Client/Server Architecture

MasterCard continues to expand the size of the data repository and the tool set. The goal is to include every transaction handled by members over a three-year period, capturing the dollar amount, the card number, the location, and the merchant in each instance. But it is the set of applications provided to members that is crucial in gaining competitive edge. MasterCard aims to gain favor with portfolio managers and member banks, who decide whether to push Visa or MasterCard. If the online tools help those managers analyze the profitability of the cards in their portfolio better or gain more customers and transaction volume faster, then MasterCard benefits. To keep ahead of Visa, the MasterCard IT shop has dozens of full-time developers tasked to come up with new tools and reports to put in the hands of banks and other clients. The developers also work with MasterCard clients to create repeatable custom reports that can focus on any aspect of authorizing a card or transaction, including charge backs for disputed amounts and fraud.

MasterCard has approximately 1.7 billion cardholders worldwide and MasterCard can be used for purchases at more than 33 million locations. While this might seem like sufficient market penetration, MasterCard is always looking for new ways increase volume of purchase transactions. Several new payment systems have been implemented including "tag & go" PayPass cards that speed up purchasing by avoiding the need to swipe a card [LAWS12]. PayPass digital wallets have also been developed to speed up the payment process for online purchases.

MasterCard has embraced smartphone payment systems and are rolling out smartphone and tablet PC apps that enable banks and business clients use mobile devices to monitor credit usage patterns and use its data warehouse BI and reporting tools [TELE12]. As mobility become more pervasive, MasterCard's data repository will be modified to assimilate mobile transactions with traditional credit card transactions. This will almost certainly result in an enriched set of BI and reporting tools.

Discussion Points

1. MasterCard managers are motivated to increase (1) the number of individuals who have and use a MasterCard credit card, (2) the number of banks and other clients who issue MasterCards to customers and/or employees, and (3) the number of locations that accept MasterCard payments. Discuss how MasterCard could use its data warehouse to help it expand each of these customer bases.

2. MasterCard makes its analytics tools available to all of its member banks and other issuers. It knows that getting its clients to use these tools can be critical to keeping them as loyal customers. Discuss the steps that MasterCard can take to promote greater use of its BI and reporting tools by its clients. Who do you think larger or smaller clients will benefit most from MasterCard's analytics tools? Why?

3. Do some Internet research to identify examples of "tap & go" applications. What are some typical types of "tap & go" payment applications and what growth trends are expected? Do you think that there are limits to the types of applications that "tap & go" payments can be used for? Why or why not?

4. Do some research on the extent to which MasterCard's PayPass digital wallet is being embraced as a payment mechanism for online purchases. What are the advantages and disadvantages of digital wallets such as PayPass? What can MasterCard do to encourage online merchants to accept PayPass digital wallet payments?

5. Supporting mobility and smartphone apps is important to MasterCard. What challenges does MasterCard face in rolling out smartphone payment systems? Which of these do you think will be most difficult to address? Why?

Sources

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