Banking on Java

A new system built on Java EE brings stability and transparency to the complex world of trading financial credit assignments in Brazil.

BY PHILIP J. GILL

From left: Cláudio Silveira, Einar Saukas, and Fabiano Marques outside TIVIT headquarters in São Paulo, Brazil

PHOTOGRAPHY BY PAULO FRIDMAN

Marques, Saukas, and Silveira collaborate in the TIVIT offices.

SNAPSHOT

TIVIT
tivit.com.br

Headquarters:
São Paulo, Brazil

Industry:
IT services

Employees:
28,000

Revenue:
R$1.5 billion
(2012 estimate)

Java technology used:
Java EE 6

Brazil has one of the world's largest and most dynamic economies—but in 2010 the country's decade-long economic success story was threatened not by the global economic slowdown, but by a surprising discovery made by the country's central bank, the Banco Central do Brasil. Some Brazilian banks were reselling credit assignments—essentially loan contracts arising from consumer, financing, and leasing transactions—more than once. Such double-dealing, the central bank realized, had created a R$4.2 billion hole in the Brazilian banking system and the potential for a nationwide financial crisis.

"Apart from being obviously illegal, the actions of these banks created instability in the Brazilian financial system," says Einar Saukas, a principal architect at Java specialty firm Summa Technologies do Brasil and a consultant to TIVIT, an IT services company, both based in São Paulo. "The banks lost confidence in their ability to buy those credits, and to compensate for that, they raised interest rates to cover the increased risk," explains Saukas.

In turn, Saukas adds, "this decreased business turnover, slowed overall economic growth, and raised interest rates for millions of consumers and businesses."

To quell the uncertainty and return stability to the Brazilian economy, the central bank—which performs the same functions in Brazil as the US Federal Reserve—set out to ensure that such double-dealing could never again threaten the Brazilian banking system and economy.

Enter the Central de Cessão de Crédito (C3)—in English, Central Credit Assignment. C3 is a scalable, high-performance, distributed transaction system that now monitors the integrity of all credit assignment transactions. Written in Java, C3 was implemented in less than a year and quickly returned stability to the Brazilian banking system, says Saukas, who adds that it "reduced risk, restored confidence, lowered interest rates, and helped the economy to grow again." C3 also won one of the first Duke's Choice Awards Latin America—a special honor for Saukas, who has worked on two other Duke's Choice Award–winning projects.

For C3, the central bank contracted TIVIT, which chose to build the system on Java EE. "The Java EE platform was a natural choice for C3," explains Cláudio Silveira, TIVIT's operations director for applications. "In Brazil, Java has become a standard for banking applications."

CONSUMER CULTURE

Worldwide demand for Brazil's natural resources, agricultural products, manufactured goods, and business services has resulted in annual GDP growth exceeding 5 percent in most years since 1999 and has transformed South America's largest country into the world's sixth-largest economy as of 2011, surpassing the UK.

That growth also lifted 31 million Brazilians into the middle class, which now comprises nearly half the country's 193 million citizens. As in other thriving economies, growth of the middle class has been fueled by and has led to a boom in demand for consumer loans for cars, mortgages, and leases. Today about a third of all Brazilians have some kind of consumer debt.

To keep their coffers flush with cash for new loans, Brazilian banks—like banks in the US and elsewhere—resell

their loan contracts to other banks and financial institutions as long-term investments. "When a person goes to the bank to get a loan to buy a new car, for instance, they sign a contract to get the loan," explains Saukas, who consulted with TIVIT on the development of C3. "Since these institutions specialize in making loans, they need more money fast to make new loans to other people, so they resell these contracts to other banks."

In its first stage, C3—which operates under the supervision of the central bank—was designed to monitor all credit assignment operations between participating banks and to record whenever one bank sold a credit to another financial institution. "That negotiation has to be registered with C3, which detects instantly if someone is trying to sell the same credit to two different banks," says Saukas.

In the second stage, installed in 2012, additional functions were added that allow C3 to negotiate and control the actual sale through the central bank's payment system, known as CETIP. "Through C3, the buyer and seller negotiate the sale of those credits and the buyer is able to confirm all the information from the other side," says Saukas. "The system controls the ownership, and payment for the credits is actually controlled by CETIP and the central bank. C3 transfers the ownership from one bank to another, so the system is now fully automated."

MODERN ICON

Brazil's federal capital, Brasília, is considered an iconic masterpiece of modern architecture.

PIPELINE ARCHITECTURE

TIVIT's choice of Java EE, the Java platform for scalable, high-performance, transaction-oriented applications that are also highly secure and reliable, was a straightforward one. In addition to its widespread popularity in Brazilian banking circles, Java EE was the only platform that integrates the comprehensive set of APIs needed for a system as complex as C3; these include the Java Message Service (JMS) and Java Open Transaction Manager (JOTM).

In addition, Java EE has widespread support from the open source community; open source technologies and development tools used to develop C3 include XA distributed transaction protocol, the Spring Framework, JBoss Serialization, Apache Commons, dom4j, XStream, Hudson, Sonar, Nexus, JUnit, Mockito, Maven, and Eclipse.

The platform was also chosen because TIVIT had developed an earlier system with similar high-volume requirements using Java EE: the Débito Direto Autorizado (DDA), or Authorized Direct Debit, a real-time electronic billing and payment system. DDA, also written in Java, exchanges payment data between participating Brazilian banks and allows Brazilians to both receive and pay bills electronically. The system began operating in October 2009 and currently has more than 8.6 million registered bank customers and more than 729 million registered bills, processing 10 percent of the payment volume in Brazil.

The C3 system was developed and put into production in less than a year, because TIVIT was able to reuse DDA's

Marques readies a presentation while Saukas and Silveira discuss projects.

Java in Brazil

Besides being one of the world's largest economies, Brazil also boasts one of the world's largest Java communities—it's home to more than 142,000 Java developers, according to Java.net.

In fact, Brazil is home to the world's largest and second-largest Java user groups (JUGs), each with more than 40,000 members. The largest is SouJava, based in São Paulo, the country's largest city and an international business and financial center. The second largest is DFJUG, based in Brasília, the modernist federal capital district in the country's central highlands.

Einar Saukas, a principal architect at São Paulo–based Summa Technologies do Brasil, is a founder of SouJava and has worked on three Duke's Choice Award–winning projects, including the Central de Cessão de Crédito (C3) distributed transaction system. Saukas explains that Java's popularity is due in part to the Brazilian government's encouragement. "A few years back, the Brazilian government realized it had millions of documents in a proprietary format, Microsoft Word," Saukas says. "The government did not want to risk vendor lock-in, so officials encouraged the country's technology sector to embrace open standards such as Java."

Einar Saukas

In addition to C3, Saukas has helped develop two other major Java applications that have won Duke's Choice Awards—the Unified Health System for the Brazilian federal government in 2003 and the City of São Paulo Integrated Patient Scheduling System in 2005.

underlying software infrastructure. "Using the same software infrastructure lower layer as DDA reduced the development effort considerably," says Fabiano Marques, TIVIT's chief Java architect. "Because of this, the entire C3 project, from initial concept to production, could be done in the same year. Most of the development for the initial phase of C3 was executed in under two months."

That software infrastructure layer includes a unique "pipeline" architecture specifically designed to accommodate the high volume of transactions and large amounts of data; this architecture connects to a back-end DB2 database and a hierarchical storage management system.

BIG MONEY

Brazil was the world's sixth-largest economy in 2011, surpassing the United Kingdom.

"To allow the flexibility needed by the complex Brazilian banking system, the C3 system is structured as transactional Enterprise JavaBeans [EJBs] connected through JMS queues," explains Saukas. "Requests are processed by a sequence of EJBs working as a 'pipeline,' in which each bean reads from an internal JMS queue, performs a certain task or tasks, and forwards the results to the next bean. The EJBs use JOTM to guarantee transactional consistency and integrity between JMS and DB2 operations through XA."

"Integration through JMS queues," Saukas continues, "also ensures automated load balance and fault tolerance—since multiple bean instances, from different servers, process requests from each JMS queue as they become available, without the need for a centralized distribution logic."

To date, C3 has managed more than 700 million credit installments worth more than R$127 billion. More importantly, C3 has helped return stability and certainty to the Brazilian financial system. "The Brazilian National Banks Federation and the central bank both credit the system for decreasing operational risks in credit assignments and allowing financial institutions to lower interest rates on loans, financing, and leasing operations," says Saukas, noting that this has had a definite positive impact on ordinary Brazilians as well. "The lower rates directly benefit the 61 million Brazilian citizens who currently have consumer loans." `</article>`

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