

## Visa implements revolutionary smart card technology from IBM



### Overview

#### ■ **The Challenge**

Visa wanted to accelerate the transition from magnetic stripe, single-function payment cards to open standard, multi-application smart cards at Visa International and achieve market-leading technology at a price point under \$3

#### ■ **The Solution**

JC/OP, an operating system developed by IBM based on Java™ open standards and GlobalPlatform

#### ■ **The Benefits**

Accelerates the growth of this paradigm-changing technology, increases customer convenience by integrating banking with ticketing applications; payment card technology—from magnetic stripes to smart cards

“Debit or credit?” “Would you like cash back?” As more and more consumers continue to rely on payment cards as their primary source for retail transactions, new technology is being developed to improve the entire buying process. However, the magnetic stripe technology commonly found on payment cards is not capable of supporting the kinds of new applications that the industry is demanding. Seeking to replace the magnetic stripe with a smart chip, while keeping the price of cards low, Visa solicited card manufacturers and other industry players for a workable solution.

#### About Visa

With over one billion Visa, Visa Electron, Visa Cash, Visa Horizon, Interlink and PLUS cards in the market, Visa-branded cards ([www.visa.com](http://www.visa.com)) currently generate US \$2.4 trillion in annual sales volume and are accepted at over 30 million worldwide locations, including at more than 810,000 ATMs in the Visa Global ATM Network.

*“Cards will be much more affordable for issuers, which will help accelerate the global transition from simple magnetic stripe cards to dynamic multi-application smart cards”*

*Stephen Schapp  
Executive Vice President  
Global Product Platforms  
Visa International*

### **Proprietary versus open**

Initial proposals fell into two main categories: less-expensive proprietary solutions costing around \$3 per card and more expensive solutions using open standards at \$6 per card. With a billion cards in the global market, savings meant a lot to Visa and its member banks. They felt \$6 was too high for an open system, but didn't want to get locked into a proprietary offering.

### **IBM provides cost-effective solution**

Visa turned to the IBM BlueZ Secure Systems team at the IBM Zurich Research Laboratory, where various Java-based smart cards had already been developed. They discussed the feasibility of building a new card that would be both low cost and GlobalPlatform-based, running on an 8-bit smart card controller.

The discussions led to a workable solution, where Visa licenses a GlobalPlatform/Java-based solution from IBM, running on a chip controller from Philips Semiconductors. Visa then sub-licenses the IBM software —masked onto a Phillips chip— back to card manufacturers for production. This approach brought card prices to \$2 - \$3, a range Visa agreed upon.

### **IBM and JC/OP**

The IBM proposal was an implementation of the JavaCard™ and GlobalPlatform specifications, called JC/OP. The open solution delivered interoperability and performance at an affordable price. The IBM operating system consists of very dense, or compact software, further reducing manufacturing costs. Every card contains the Visa Smart Credit/Debit application or applet. In addition, a variety of card applets, such as loyalty and security solutions, have been added by Visa and third party providers.

“When IBM Zurich showed us a demonstration a few years ago, many card suppliers were still struggling with the smart card's software footprint and compatibility with evolving standards in their designs,” says Jim Lee, Senior Vice President

of Emerging Technologies at Visa International. “Since the projected manufacturing quantities were low, the price points were too high, around \$8 or \$9. The first open platform, IBM design was based on contactless Philips hardware, Java software, and a Cash application. IBM had really shoehorned a lot of functionality into a small piece of silicon! We were impressed by the way IBM was able to build a software platform that is very compact in size and performs very well,” says Lee. “Our measurements of basic functions, such as application-loading, assured us that the IBM design is considerably faster than others we had looked at.”

### **20 million and counting**

Visa's 21,000 banks have taken advantage of the savings by rolling out over 20 million copies of the smart card. Today the hardware technology in a Visa smart card is roughly equivalent to that of an early 1980's IBM PC.

The current dynamic, multi-application Visa smart cards are based on the Java 2.1.1 and GlobalPlatform 2.0.1 specifications. Cards typically include at least two applets, such as Visa Smart Credit/Debit and Visa Cash.



Additional applets, such as loyalty or secure Internet access, can be loaded into erasable memory (EEPROM), depending upon market needs. Applets can be securely added, replaced or removed after the card has been issued via software downloads.

More high-end cards can now also be manufactured at significantly reduced prices compared to today's standard versions. Applications such as public key encryption or contactless interface are added, and ROM memory is increased from 48 to 96 Kb and EEPROM from 16 to 32 Kb.

#### **The IBM contribution to smart card technology**

IBM started the research and development of a smart card operating system based on the JavaCard specifications in 1997 in its Zurich Research Laboratory. Starting with the publicly available specifications, IBM contributed proposals, implementation lessons, and scientific papers to aid the creation of an open standards specification.

This development effort included the creation of the world's first contactless JC/OP on a very low-powered and low-resource smart card chip.

#### **Visa sees bright future for the smart card**

Stephen Schapp, Executive Vice President of Global Product Platforms at Visa International, feels that the IBM efforts to reduce costs will get the Visa smart card off to a good start. "This price breakthrough has significantly changed the dynamics of the smart card marketplace," he says. "Cards are much more affordable for issuers, which will help accelerate the global transition from simple magnetic stripe cards to dynamic multi-application smart cards. This is a key part of Visa's goal to help build the infrastructure for u-Commerce—or universal commerce—the ability of consumers and businesses to conduct commerce virtually anywhere, anytime over any type of device."

#### **For more information**

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