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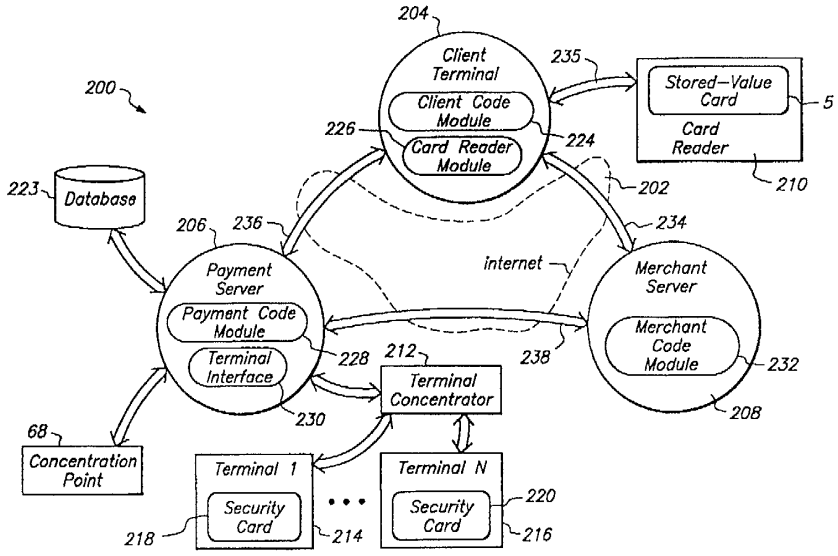
(54) Title: INTERNET PAYMENT AND LOADING SYSTEM USING SMART CARD

(57) Abstract



An architecture and system loads and uses a smart card (5) for payment of goods and/or services purchased on–line over the Internet (202). A client module on a client terminal (204) controls the interaction with a consumer and interfaces to a card reader (210) which accepts the consumer's smart card (5) and allows loading and debiting of the card. Debiting works in conjunction with a merchant server (208) and a payment server (206). Loading works in conjunction with a bank server (860) and a load server (862). The Internet provides the routing functionality between the client terminal and the various servers. A payment server (206) on the Internet includes a computer and a security module (or a security card (218) in a terminal (214)) to handle the transaction, data store and collection. A merchant server (208) advertises the goods and/or services offered by a merchant for sale on a web site. The merchant contracts with an acquirer to accept smart card payments for goods and/or services purchased over the Internet. A consumer uses his smart card (5) at the client terminal (204) in oder to purchase goods and/or services from the remote merchant server (208). The client terminal sends a draw request to the payment server. The payment server processes, confirms and replies to the merchant server (optionally by way of the client terminal). To load value, the client terminal (204) requests a load from a user account at the bank server (860). A load request is sent from the card (5) to the load server (862) which processes, confirms and replies to the bank server (optionally by way of the client terminal). The bank transfers loaded funds to the card issuer (108) for later settlement for a merchant from whom the user purchases goods with value on the card.

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INTERNET PAYMENT AND LOADING SYSTEM USING SMART CARD

FIELD OF THE INVENTION

The present invention relates generally to a payment system and a value loading system using a computer network. More specifically, the present invention relates to a payment system and a value loading system for a smart card using an open network such as the Internet.

BACKGROUND OF THE INVENTION

With the explosive growth in open networks (such as the Internet) over the past several years and the rapid increase in the number of consumers with access to the World Wide Web, there has been a great deal of interest in the development of electronic commerce on the Internet. Traditional financial transactions are being transformed.

A variety of service providers have introduced payment schemes to support the purchase of goods or services on-line in a virtual merchant environment. These approaches have used several models based on traditional payment methods existing in the face-to-face retail market, including credit/debit cards, checks and cash. However, for a variety of reasons, various of these numerous schemes have particular drawbacks.

Currently, a consumer may use his or her traditional credit or debit card to make a purchase over the Internet. A consumer simply supplies his card account number which is then transmitted across the Internet to a merchant and the payment transaction is completed in the traditional manner for a credit card. Often, these account numbers are transmitted over the Internet with extremely limited or no security. Security can be improved through use of the "Secure Electronic Transaction" protocol published by Visa International and Mastercard in 1996. These transactions still require some form of card validation and performance of a balance check. These checks are performed on-line between the merchant, an acquirer and an issuing bank, a process which can become time consuming and inefficient when the value of the transaction is low, or when a number of small value transactions will be taking place in a short time span.

The electronic check is modeled on the paper check, but is initiated electronically using digital signature and public cryptography. Deposits are gathered by banks via electronic mail and cleared through existing channels such as the Automated Clearing House (ACH). However, use of such an electronic check by a consumer has various

drawbacks. For one, digital signatures and public encryption necessitate use of a certifying authority adding additional entities and "net" trips to the transaction. Also, cardholder registration is needed.

Other Internet payment alternatives are modeled on cash transactions and include a variety of schemes. With CyberCash, the consumer appends his credit card number to an electronic invoice received from the merchant, returns the credit card number to the merchant which is then processed and forwarded on to CyberCash where it is then treated like a normal credit card transaction. However, this technique suffers from some of the disadvantages discussed above with respect to traditional credit card transaction on the Internet and requires additional work by the merchant in processing the credit card number. Debit transactions may also be completed but require a consumer to open a CyberCash account in advance.

A digital, token-based system for Internet transactions has been implemented by DigiCash. With DigiCash, so-called "digital coins" are purchased from DigiCash from a prefunded deposit account and stored on the consumer's hard drive. These digital coins are then used for an Internet transaction with a merchant. This scheme has disadvantages in that the consumer must first set up a relationship with DigiCash and use a credit card or similar instrument to purchase these digital coins, which then must be downloaded to the consumer's computer. This transaction can be time consuming for the consumer and is subject to fraud. In addition, a merchant must be set up to not only accept these digital coins, but also to verify their authenticity, to confirm the transaction, and then finally to forward these numbers on to his bank in order to finally get paid. One drawback from the merchant's point of view is that much of the transaction work must be performed by the merchant.

Another scheme for completing an Internet transaction is offered by First Virtual Holding, Inc. First Virtual offers a software solution based upon a unique identification number and electronic mail confirmation. To use this scheme, a consumer opens a special account with First Virtual and then receives a confidential identification number. When the consumer wishes to purchase a product or service over the Internet, he or she sends an electronic mail message containing the confidential identification number to the merchant. The merchant then sends the number to First Virtual by electronic mail for verification and identification of the customer. First Virtual then confirms with the consumer by electronic mail that the consumer did indeed initiate the transaction and wishes to make the purchase. There are drawbacks to this scheme in that the consumer must first open a special account with First Virtual. Also, the merchant must communicate with First Virtual to identify the customer and to identify the customer's credit card account number that is identified by the confidential identification number.

Aside from payment schemes over the Internet, a technique in use for performing a financial transaction at a stand-alone terminal uses a smart card. A smart card is typically a credit card-sized plastic card that includes a semiconductor chip for holding the digital equivalent of cash directly, instead of pointing to an account or providing credits. When a card of this kind is used to make a purchase, the digital equivalent of cash is transferred to the merchant's "cash register" and then to a financial institution. Stored-value cards are either replenishable (value can be reloaded onto the card using a terminal) or non-replenishable (the card is decremented in value for each transaction and thrown away when all its value is gone).

Physically, a smart card often resembles a traditional "credit" card having one or more semiconductor devices attached to a module embedded in the card, providing contacts to the outside world. The card can interface with a point-of-sale terminal, an ATM, or a card reader integrated into a telephone, a computer, a vending machine, or any other appliance. A microcontroller semiconductor device embedded in "processor" smart card allows the card to undertake a range of computational operations, protected storage, encryption and decision making. Such a microcontroller typically includes a microprocessor, memory, and other functional hardware elements. Various types of cards are described in "The Advanced Card Report: Smart Card Primer", Kenneth R. Ayer and Joseph F. Schuler, The Schuler Consultancy, 1993, which is hereby incorporated by reference.

One example of a smart card implemented as a processor card is illustrated in FIG. 1. Of course, a smart card may be implemented in many ways, and need not necessarily include a microprocessor or other features. The smart card may be programmed with various types of functionality, such as a stored-value application; credit/debit; loyalty programs, etc. For the purpose of this disclosure, card 5 is programmed at least with a stored-value application, and will be referred to as "stored-value" card 5.

Stored-value card 5 has an embedded microcontroller 10 that includes a microprocessor 12, random access memory (RAM) 14, read-only memory (ROM) 16, non-volatile memory 18, an encryption module 22, and a card reader interface 24. Other features of the microcontroller may be present but are not shown, such as a clock, a random number generator, interrupt control, control logic, a charge pump, power connections, and interface contacts that allow the card to communicate with the outside world.

Microprocessor 12 is any suitable central processing unit for executing commands and controlling the device. RAM 14 serves as storage for calculated results and as stack memory. ROM 16 stores the operating system, fixed data, standard routines, and look up

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