

E-Micropayments Sweat the Small Stuff

David Geer

E-commerce is certainly nothing new. Many people buy books, CDs, clothes, travel, and other products and services over the Internet every day. However, after years of online purchasing, one long-promised aspect of e-commerce has remained largely unfulfilled: electronic micropayments for items that cost \$5 or less.

Now, though, there appears to be a growing demand for e-micropayment technologies that would enable the purchase of items and services such as MP3 music files, magazine and newspaper articles, Web-based comics, pay-per-view videos, database access, and driving directions.

Highlighting the demand for micropayments, Apple Computer says its iTunes Music Store sold about 70 million songs, at 99 cents each, during its first year of operation, ending April 2004, and 95 million songs as of July 2004.

In addition, personal publishing has become pervasive during the past few years, with many Web sites specializing in comics, music, and art. Content creators would like to make money from this type of material and thus are interested in e-micropayment technology, said Professor Andrew Odlyzko, director of the University of Minnesota's Digital Technology Center. Without such a technology, these providers generally give their content away.



Also, said Nitesh Patel, senior wireless analyst for Strategy Analytics, a market research and consulting firm, the boom in mobile phone use among young people has increased the demand for ways to buy low-cost ring tones, icons, and games.

The ability to buy inexpensive items conveniently would eliminate the need for buyers to pay large subscription fees for entire sets of material when they only want selected pieces of content. It could also reduce the incentive to share files illegally.

Providers of inexpensive content see micropayment technology as a way to generate revenue, said Kurt Huang, founder, chief product officer, and president of e-micropayment-technology vendor BitPass.

Using credit cards for each purchase, as is usually done with e-commerce, is impractical for inexpensive items because the credit card fees and associated costs eat up sellers' profits. In addition, online merchants must spend time and money checking a credit card

holder's identity and available credit before approving a purchase, which is also impractical for small transactions.

Because of this, several companies are developing e-micropayment products, including BitPass's Core BitPass System and BitPass Studios; Firstgate's Click & Buy; Payloadz's PayLoadz.com system; Paystone's personal, merchant, and group-pay accounts (for handling high-volume payments such as commissions, rebates, or paychecks); and Peppercoin's Peppercoin 2.0.

Despite the promise, not all industry observers say the approach has a bright future. In addition, the technology faces several obstacles, including the need to convince sellers and users to trust and work with e-micropayments.

THE TECHNOLOGY IN DETAIL

Most credit card processors charge merchants a minimum fee of between 15 and 35 cents per transaction, said Dave McClure, director of the developer network for PayPal, a service typically used for larger online purchases. This would be impractical for providers of inexpensive content because it represents all or much of the profit on many sales.

Strategy Analytics' Patel said that in the late 1990s, micropayment providers like Beenz, DigiCash, and Flooz didn't succeed because the vast majority of online vendors were not interested in selling inexpensive items. In addition, at that time, consumers expected most online content to be free.

A challenging development task

Typically, buyers acquire low-cost digital content in one of two ways: by either giving a single content provider large prepayments that would cover multiple purchases or receiving a bill from a vendor after making numerous small purchases.

However, this requires individual content providers to track each customer's purchases, which may not be worthwhile for small transactions. Also, these relationships lock a buyer in to an individual provider.

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Other key challenges for e-micropayment technology include security, ease of use, the ability to handle high transaction volumes, and record keeping related to banking regulations.

General approaches

In meeting these challenges, micropayment vendors have taken a number of general approaches.

Usually, the payment-service vendors' Web sites enable buyers to access, via a link or button that opens a second browser window, e-micropayment applications that can combine purchases from multiple online sellers.

In many cases, users of a single e-micropayment technology can make prepayments to an account, which they can then use for purchases from multiple content providers.

Some e-micropayment technologies don't process a user's small purchases until they total perhaps \$20, noted Rob Carney, Peppercoin's vice president of marketing. The multiple purchases then incur only a single credit card processing fee, which is relatively low on a per-purchase basis.

With some e-micropayment systems, the money goes first from the buyer to the payment-service vendor, which then pays the merchants. With other systems, buyers pay sellers directly, via the e-micropayment application. E-micropayment providers get their revenue from charging fees to content sellers.

In general, vendors use passwords and encryption to provide security for e-micropayments. Also, e-micropayment applications no longer require that users install plug-ins or other software downloads, which used to be sources of security holes.

Payment-service vendors sometimes have Web-hosting companies operate their systems to provide a stable, reliable platform. Other reliability approaches include uninterruptible power supplies, backup power generators, secondary sources of Internet access in case the primary connection crashes, and other types of redundancy.

Micropayment systems also work with error-checking technology to reduce the chances of transaction-handling mistakes, noted Ossip Kaehr, Firstgate's chief technology officer.

Most vendors offer ease of use by making their e-micropayment interfaces look like the credit card interfaces that customers are used to.

There appears to be a growing demand for e-micropayment technologies.

MAJOR E-MICROPAYMENT VENDORS

The various commercial e-micropayment technologies are similar in many respects but differ in others.

BitPass

BitPass deducts the cost of small purchases from a buyer's account that has been prepaid via a credit card or some other payment system such as PayPal.

The approximately 1,000 providers that work with BitPass register their content and services with the company and install gateways on their Web servers to the e-micropayment technology.

When buyers click on BitPass-enabled content on a seller's site, the e-micropayment system prompts them to enter their password in a new browser window. Once the system confirms that buyers have enough funds in their account, they can access the content.

BitPass pays merchants via PayPal or by using the Automated Clearing House electronic-funds-transfer system to deposit money directly to their bank accounts.

Firstgate Internet

Firstgate works with about 3,000 providers of articles, information, games, and other content and has 2.5 million customers, mostly in Europe.

For security, Firstgate uses passwords and secure sockets layer (SSL)

encryption and also records the IP addresses of buyers' machines for reference in case problems occur.

The company charges content providers an up-front fee—which varies based on the complexity of the project—for set-up, integration, and consulting. Firstgate then tailors its systems with business rules for each participating merchant.

The company bills buyers' credit cards, debit cards, or phone accounts, once they have accrued a few dollars in charges. North American customers can buy material via a charge to their bank accounts.

Firstgate aggregates consumer micropurchases across merchants to enable a single processing of multiple transactions, explained Chief Operating Officer Ed Burrell. "This reduces processing costs, per-purchase credit card fees, and administration," he explained. Firstgate then remits money to merchants via checks or bank transfers.

PayLoadz

PayLoadz works with about 1,000 merchants and generates about \$3 million per year in revenue, explained founder and lead developer Shannon Sofield.

Rather than having prepaid accounts with PayLoadz, users pay sellers directly through PayPal, which also verifies that the buyers have enough money in their accounts to make the purchase. Merchants pay PayLoadz a flat monthly fee based on their sales levels, rather than a percentage of each transaction.

PayLoadz delivers files via a secure server to the customer using PayPal's Instant Payment Notification system, which lets vendors integrate PayPal with their back-end operations. Buyers never see a PayLoadz interface.

The PayLoadz system consists of an application server that hosts the Web site and handles transaction processing, a file storage and delivery server, and a database server. Separating the components into servers tuned for specific roles improves performance and

reliability, Sofield said.

For security, PayLoadz uses SSL with 128-bit RC4 encryption.

Paystone Technologies

Customers in North America, Australia, New Zealand, and parts of Europe can access Web content after setting up prepaid Paystone accounts by mailing funds directly to the company using their bank's bill payment service or by depositing cash at any Bank of America branch.

Merchants that sell content via Paystone create links to the e-micropayment system. Customers follow the links, enter their Paystone password, and are redirected back to the content they want to purchase.

For security, Paystone uses 128-bit SSL encryption.

Peppercoin

Massachusetts Institute of Technology cryptography expert Ron Rivest and fellow MIT computer scientist Silvio Micali founded Peppercoin.

Buyers at participating Web sites who want to use Peppercoin see the e-micropayment technology's interface, which looks like a common credit card interface, noted Bob Nix, the company's vice president of engineering.

The application's new version, Peppercoin 2.0, doesn't require pre-enrollment or predeposit of funds. Consumers just enter their credit or debit card information with the merchant online as usual, and Peppercoin processes the transaction.

As Figure 1 shows, the application uses a *universal aggregation* technique to efficiently process many small interactions between multiple consumers and merchants as a few large transactions.

The company uses RSA BSAFE software to provide encryption and digital signing capabilities for the security of a buyer's information and the transaction's integrity. Digital signatures can authenticate a message's sender's identity and verify that no one has altered the original content.

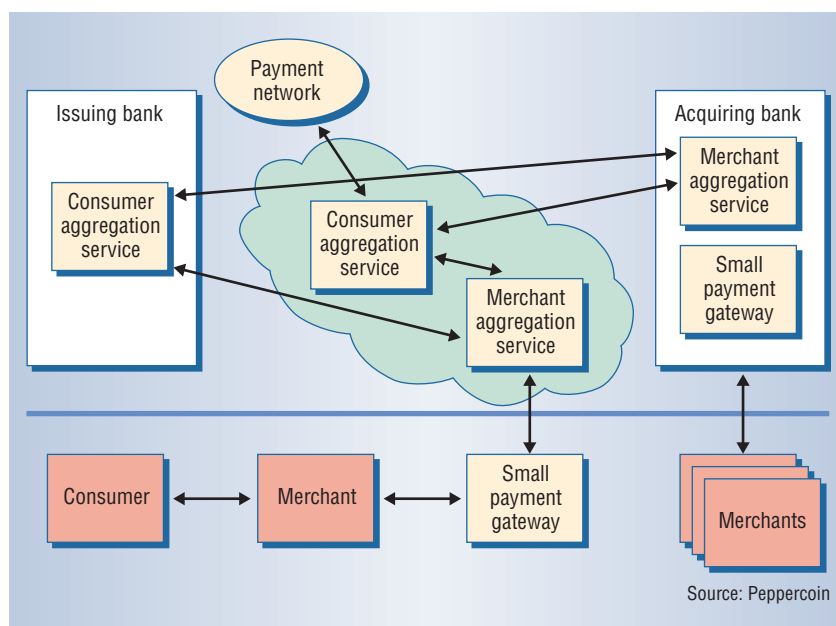


Figure 1. Peppercoin e-micropayment technology. When a consumer buys an item from a merchant, the transaction passes through a small-payment gateway to the payment service's system. Among other functions, the gateway feeds payment information into the system's service for aggregating multiple payments by consumers to merchants. The consumer aggregation service authorizes consumer spending, integrates with credit cards or other payment instruments, and presents a summary aggregated bill. The merchant service handles the sellers' end of the transaction. The banks that handle the money transfer have their own aggregation services.

To reduce overhead on small transactions, Peppercoin uses an online self-service customer-service module.

MACROCHALLENGES FOR E-MICROPAYMENTS

E-micropayment technology faces a number of obstacles to success. For example, said the University of Minnesota's Odlyzko, although e-micropayment technologies may be reliable, they run on the Internet, PCs, and browsers, which are not always dependable.

Economic factors

E-micropayment products deal in very small transactions and thus potentially yield low profit margins, noted PayLoadz's Sofield. Therefore, it may not prove to be economical for many companies to invest in and distribute the expensive e-commerce systems only to get thin profits dependent on high transaction volumes that might

not materialize.

Also, Odlyzko said, content providers eventually may find that they can economically and successfully sell small items bundled into larger packages on their own, thereby eliminating the need for third-party e-micropayment technology.

Insufficient demand

Perhaps the key marketplace challenge for e-micropayment vendors is making content providers aware of their applications and selling them on the idea that their services are effective and worth paying for.

Currently, said Strategy Analytics' Patel, many merchants are not interested in using e-micropayment technology until they see one or two products prove themselves over time as being reliable and attractive to buyers.

Also, digital content is scattered all over the Internet. There are relatively

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few sites where potential buyers can see large amounts of digital content grouped together. This makes it less convenient to buy the material, thereby reducing the number of online micropurchases and thus the demand for e-micropayment software.

Micropayment use is beginning to grow in Japan and with European news and publishing companies. If the technology becomes widely used, e-micropayment vendors may have to deal more effectively with such potentially thorny issues as refunds and customer support, explained BitPass's Huang.

In the future, said Odlyzko, "There will be progress in usability and, in particular, in incorporating micropay-

ments into devices like cell phones and PDAs." However, researchers must figure out how to run e-micropayment applications on handheld devices, which have performance, memory, and battery-life limitations.

For example, Odlyzko noted, the cryptography required for e-micropayment security uses considerable processing power, which can run down mobile devices' batteries. Researchers are working to solve this problem.

Technical improvements notwithstanding, Odlyzko said, micropayments are likely to make slow progress in the marketplace during the next five years simply because of low demand. "It is a technology with grand ambitions and limited prospects," he said.

Not all industry observers agree. "Micropayment technology will

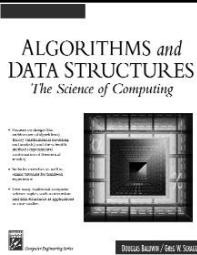
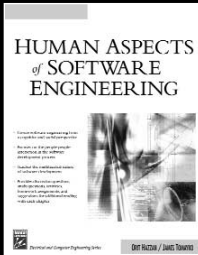
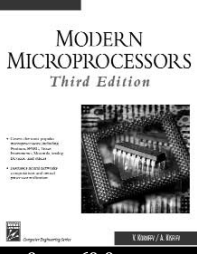

become more pervasive as more consumers pay for personalized content and services," said BitPass's Huang. Over time, said PayLoadz's Sofield, this will cause the use of micropayments to grow "at an incredible rate."


As this occurs, said Erik Michielsen, an analyst with ABI Research, the sale of low-cost content will increase, competition will grow, and the price of the material will decrease, which will encourage more use of micropayment technology. ■

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