

# **The e-Payment Systems**

# Electronic Commerce (E-Commerce)

- **Commerce** refers to all the activities the **purchase and sales of goods or services.**
  - Marketing, sales, payment, fulfillment, customer service
- **Electronic commerce is doing commerce with the use of computers, networks and commerce-enabled software** (more than just online shopping)

# Advantages of Electronic Commerce

- **Increased sales**
  - Reach narrow market segments in geographically dispersed locations
  - Create virtual communities
- **Decreased costs**
  - Handling of sales inquiries
  - Providing price quotes
  - Determining product availability
- **Being in the space**

# Disadvantages of Electronic Commerce

- Loss of ability to inspect products from remote locations
- Rapid developing pace of underlying technologies
- Difficult to calculate return on investment

# Infrastructure for E-commerce

- The Internet
  - system of interconnected networks that spans the globe
  - routers, TCP/IP, firewalls, network infrastructure, network protocols
- The World Wide Web (WWW)
  - part of the Internet and allows users to share information with an easy-to-use interface
  - Web browsers, web servers, HTTP, HTML
- Web architecture
  - Client/server model
  - N-tier architecture; e.g., web servers, application servers, database servers, scalability

# Distinct Categories of e-Commerce

- *Business to Consumer (B2C)*
- *Business to business (B2B)*
- *Consumer to Consumer (C2C)*
- *Consumer to Business (C2B)*

# Four Categories of e-Commerce

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|                      |           | Business originating from . . . |           |
|----------------------|-----------|---------------------------------|-----------|
|                      |           | Business                        | Consumers |
| And selling to . . . | Business  | B2B                             | C2B       |
|                      | Consumers | B2C                             | C2C       |

# Electronic Payment Systems



# E-payment systems

- To transfer money over the Internet
- Methods of traditional payment
  - Check, credit card, or cash
- Methods of electronic payment
  - Electronic cash, software wallets, smart cards, and credit/debit cards

# Requirements for e-payments

- **Atomicity**
  - Money is not lost or created during a transfer
- **Good atomicity**
  - Money and good are exchanged atomically
- **Non-repudiation**
  - No party can deny its role in the transaction

# Desirable Properties of Digital Money

- Universally accepted
- Transferable electronically
- Divisible
- Private (no one except parties know the amount)
- Anonymous (no one can identify the payer)

No known system satisfies all.

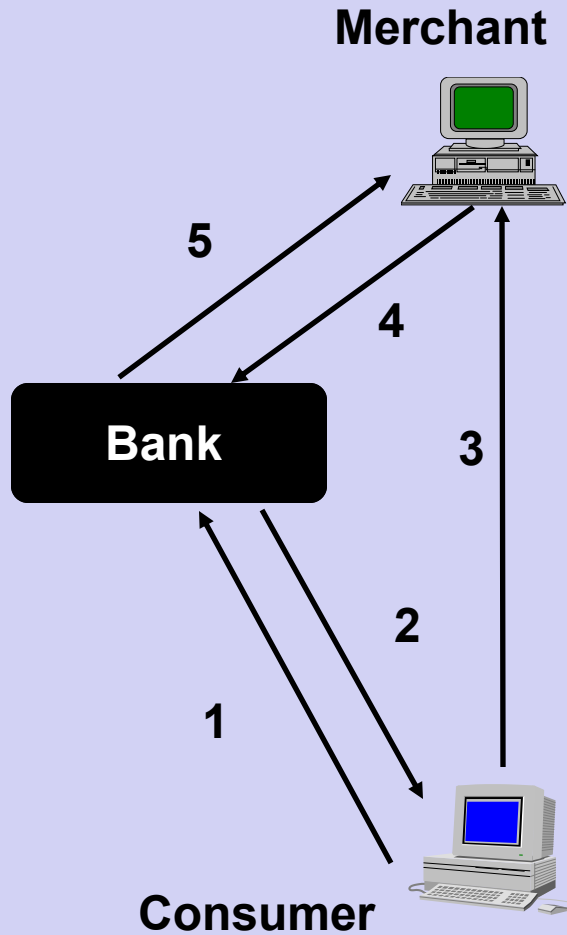
# Types of E-payments

- E-cash
- Electronic wallets
- Smart card
- Credit card

# Electronic Cash

- Primary advantage is with purchase of items less than \$10
  - Credit card transaction fees make small purchases unprofitable
  - Micropayments
    - o Payments for items costing less than \$1

# E-cash Concept



1. Consumer buys e-cash from Bank
2. Bank sends e-cash bits to consumer (after charging that amount plus fee)
3. Consumer sends e-cash to merchant
4. Merchant checks with Bank that e-cash is valid (check for forgery or fraud)
5. Bank verifies that e-cash is valid
6. Parties complete transaction: e.g., merchant present e-cash to issuing bank for deposit once goods or services are delivered

# Advantages and Disadvantages of Electronic Cash

- **Advantages**

- More efficient, eventually meaning lower prices
- Lower transaction costs
- Anybody can use it, unlike credit cards, and does not require special authorization

- **Disadvantages**

- Susceptible to forgery

# Past and Present E-cash Systems

- **E-cash not popular in U.S., but successful in Europe and Japan**
  - Reasons for lack of U.S. success not clear
    - o Manner of implementation too complicated
    - o **Lack of standards and interoperable software** that will run easily on a variety of hardware and software systems



# Past and Present E-cash Systems

- **CyberCash**
- **CyberCoins**
- **DigiCash**
- **Coin.Net**

# Electronic Wallets

- **Stores credit card, electronic cash, owner identification and address**
  - Makes shopping easier and more efficient
    - o Eliminates need to repeatedly enter identifying information into forms to purchase
    - o Works in many different stores to speed checkout
  - Amazon.com one of the first online merchants to eliminate repeat form-filling for purchases

# An Electronic Checkout Counter Form

Please fill in the information below. Items in red are required for us to process your order. You can submit this form online, or if you are concerned about online security, you can call our Customer Service department at 1-800-468-5846 (or 408-325-7000 for orders originating outside the US) and place your order over the phone. Our Customer Service hours are 6:00AM until 5:00PM, Monday through Friday, Pacific Standard Time.

**We are currently experiencing shipping delays of up to 84 hours. For faster delivery, please place your order with our Customer Service Department at 1(800)468-5846. We apologize for any inconvenience this may cause.**

### Step 3: Email Address

Enter your email address. Note that all order confirmations, order tracking, etc is emailed to this address. Please double check your e-mail address; this is our only means of communicating with you regarding your order.

Email

### Step 4: Billing Address

Please give us your billing address and contact information.

First Name

Last Name

Company

Address1

Address2

City

State  State or Province  Zip/Postal Code   
(US only) (Non-US Only)

Country

Phone  Fax

**FIGURE 7-9** *A typical electronic checkout counter form*

# Electronic Wallets

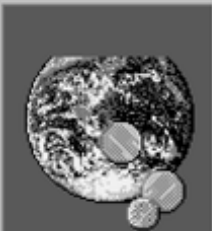
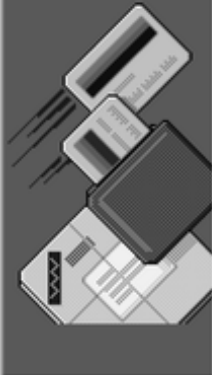
- Agile Wallet
  - Developed by CyberCash
  - Allows customers to enter credit card and identifying information once, **stored on a central server**
  - Information pops up in supported merchants' payment pages, allowing one-click payment
  - Does not support smart cards or CyberCash, but company expects to soon
- eWallet
  - Developed by Launchpad Technologies
  - Free wallet software that stores credit card and **personal information on users' computer**, not on a central server; info is dragged into payment form from eWallet
  - Information is encrypted and password protected
  - Works with Netscape and Internet Explorer

# Electronic Wallets

- **Microsoft Wallet**
  - Comes pre-installed in Internet Explorer 4.0, but not in Netscape
  - All information is encrypted and password protected
  - Microsoft Wallet Merchant directory shows merchants setup to accept Microsoft Wallet

# Entering Information Into Microsoft Wallet

**Credit Card Information**

**VISA** Otis' Visa

Enter your credit card information and accept or change the display

Credit card information

Name on the card:  Expiration date:

Number:

-    -    -

Some older cards have only 13 digits. If your card has only 13 digits, check the box below.

Only display 13 digits

Display name

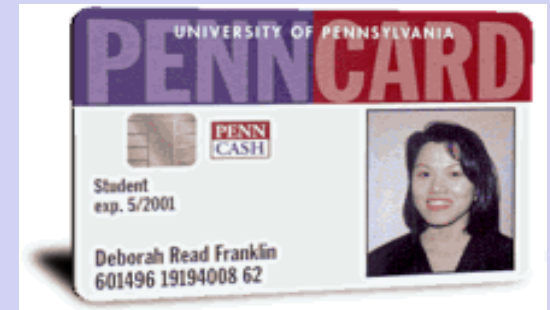
The display name represents this credit card (i.e., Dad's Personal Visa, Dad's Work Visa).

< Back    Next >    Cancel

FIGURE 7-10

*Entering credit card information into Microsoft Wallet*

# Smart Cards



- Plastic card containing an embedded microchip
- Available for over 10 years
- So far not successful in U.S., but popular in Europe, Australia, and Japan
- Smart cards gradually reappearing in U.S.; success depends on:
  - Critical mass of smart cards that support applications
  - Compatibility between smart cards, card-reader devices, and applications

# Smart Cards



- Magnetic stripe
  - 140 bytes, cost \$0.20-0.75
- Memory cards
  - 1-4 KB memory, no processor, cost \$1.00-2.50
- Optical memory cards
  - 4 megabytes read-only (CD-like), cost \$7.00-12.00
- Microprocessor cards
  - Embedded microprocessor
    - o (OLD) 8-bit processor, 16 KB ROM, 512 bytes RAM
    - o Equivalent power to IBM XT PC, cost \$7.00-15.00
    - o 32-bit processors now available



# Smart Card Applications

- Ticketless travel
  - Seoul bus system: 4M cards, 1B transactions since 1996
  - Planned the SF Bay Area system
- Authentication, ID
- Medical records
- Ecash
- Personal profiles
- Government
  - Licenses
- Mall parking

...

# Advantages and Disadvantages of Smart Cards

- **Advantages:**

1. Atomic, debt-free transactions
2. Feasible for very small transactions (information commerce)
3. (Potentially) anonymous
4. Security of physical storage
5. (Potentially) currency-neutral

- **Disadvantages:**

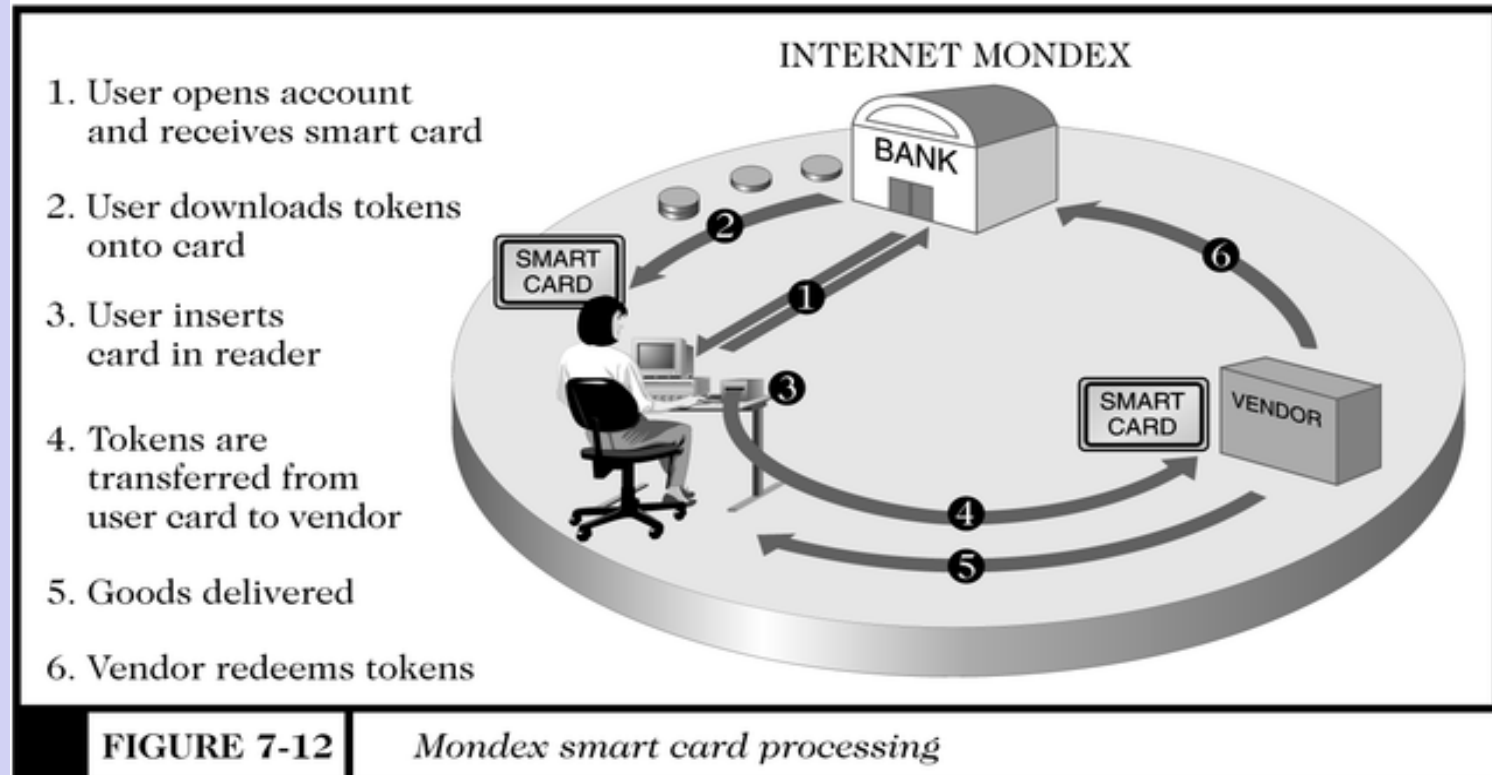
1. Low maximum transaction limit (not suitable for B2B or most B2C)
2. High Infrastructure costs (not suitable for C2C)
3. Not (yet) widely used

# Mondex Smart Card



- Holds and dispenses electronic cash (Smart-card based, stored-value card)
- Developed by MasterCard International
- **Requires specific card reader, called Mondex terminal**, for merchant or customer to use card over Internet
- Supports micro-payments and works both online and off-line at stores or over the telephone
- Secret chip-to-chip transfer protocol

# Mondex Smart Card Processing



**FIGURE 7-12**

*Mondex smart card processing*

# Credit Cards



- Credit card
  - Used for the majority of Internet purchases
  - Has a preset spending limit
  - Currently most convenient method
  - Most expensive e-payment mechanism
    - o MasterCard: \$0.29 + 2% of transaction value
  - Disadvantages
    - o Does not work for small amount (too expensive)

# Processing a Payment Card Order

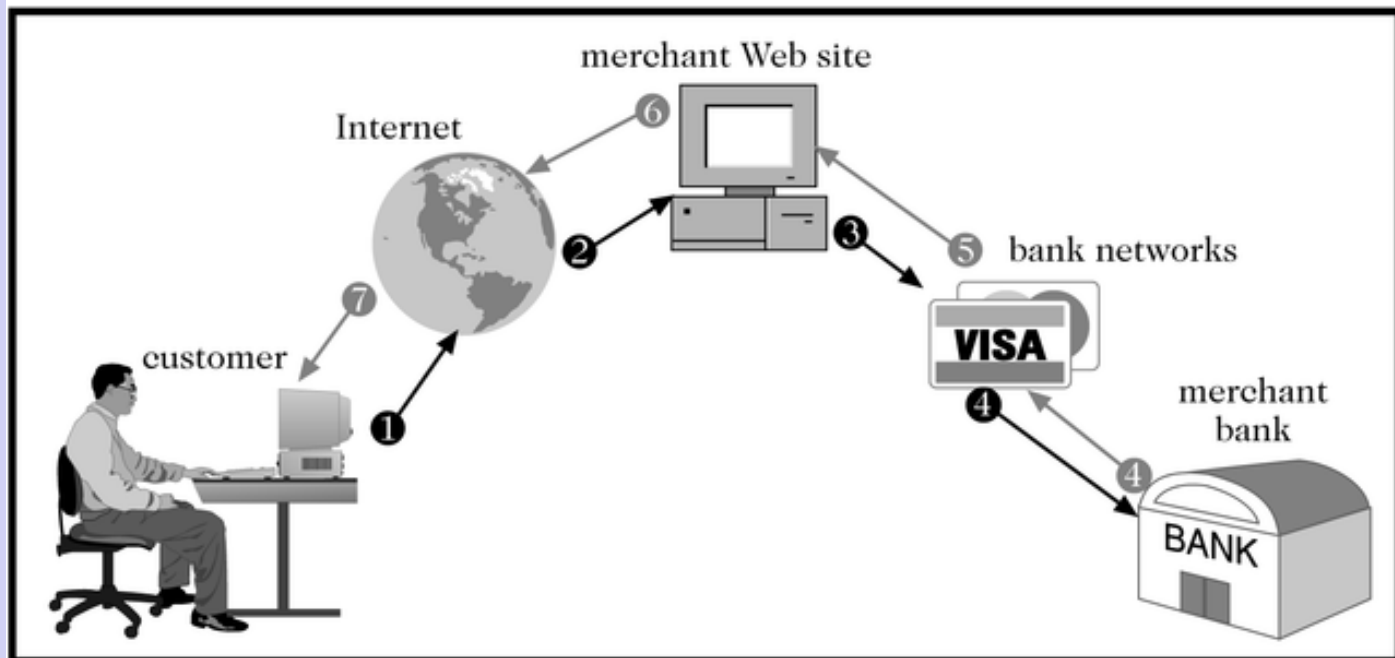


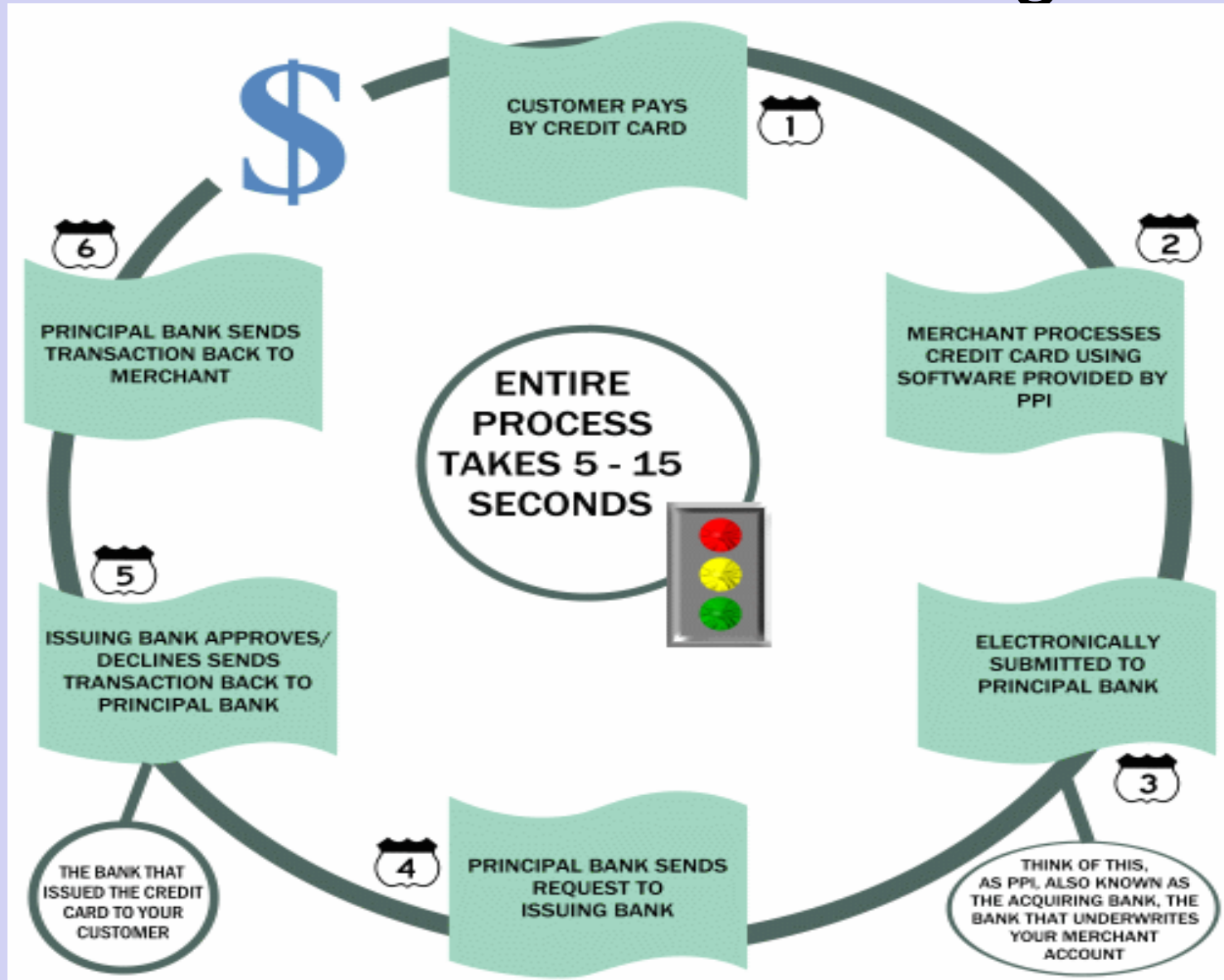
FIGURE 7-13

*Processing a payment card order*

# Setting Up Merchant Account

- Merchant bank
  - Also called acquiring bank
  - Does business with merchants that want to accept payment cards
  - Merchant receives account where they deposit card sales totals
  - Value of sales slips is credited to merchant's account

# Credit Card Processing





# Debit Card



- A **debit card** is a plastic card which provides an alternative payment method to cash when making purchases. Physically the card is an ISO 7810 card like a credit card;
- Depending on the store or merchant, the customer may swipe or insert their card into the terminal, or they may hand it to the merchant who will do so. The transaction is authorized and processed and the customer verifies the transaction either by entering a PIN or, occasionally, by signing a sales receipt.

# Credit card VS Debit card

- You can obtain credit in credit card but not in debit card.
- Credit card charges interest for using the bank's money. (debit card is free from this problem)