NETWORK AND E-COMMERCE SECURITY

Basir University, 2020-2021

By: Prof. Dr. Mohammad Hajarian

- Session 6

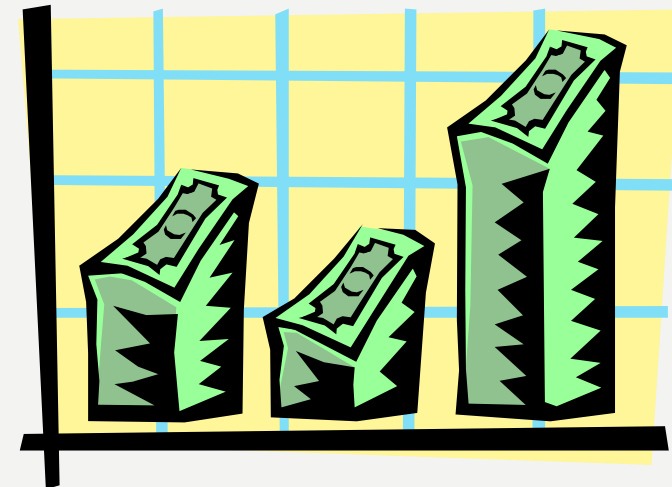# SECURITY IN ELECTRONIC PAYMENTS

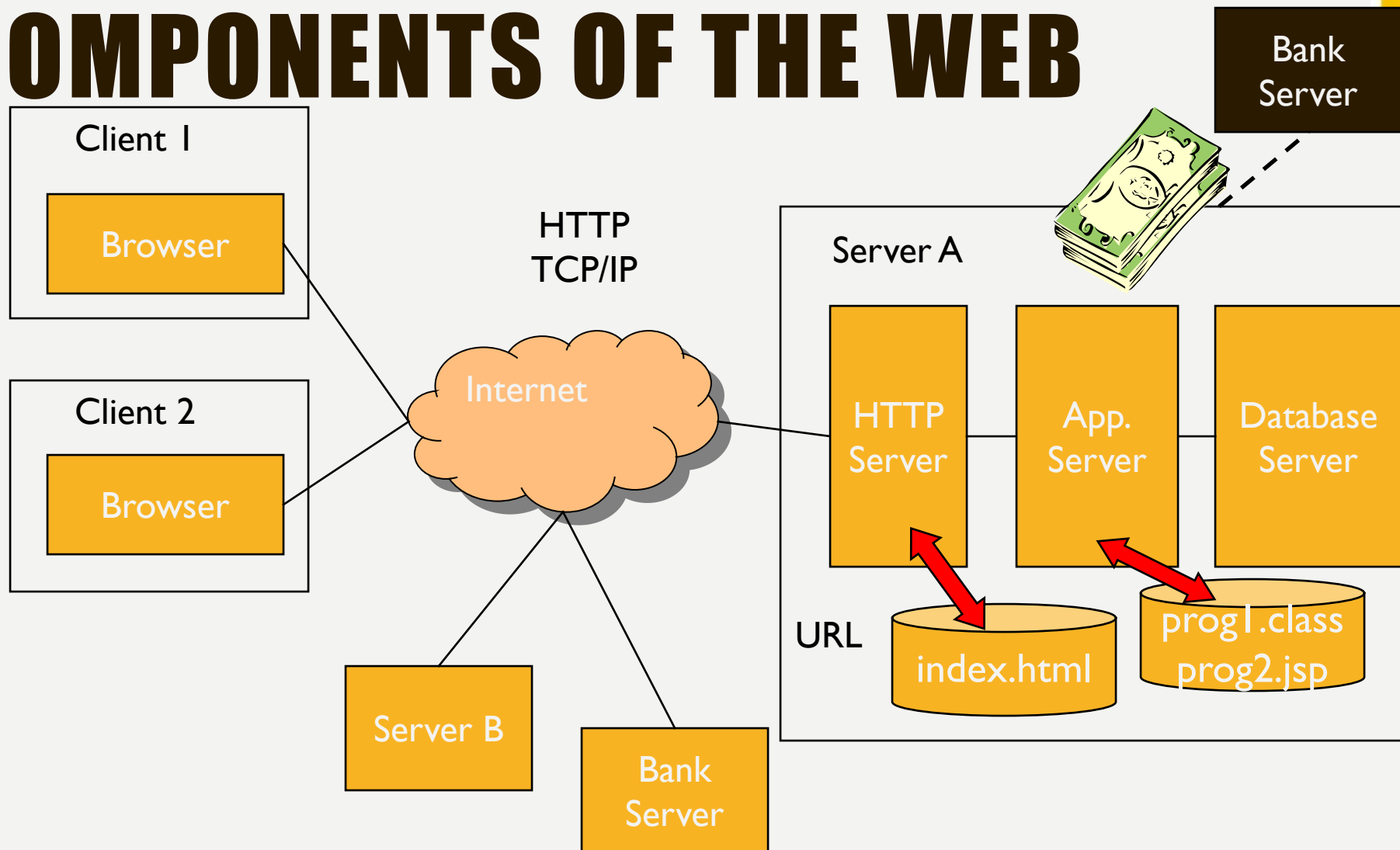# E-PAYMENT METHODS

TRADITIONAL PAYMENT METHODS

Payment: *The transfer of money from one individual or legal entity to another*

- Cash

- Personal Cheques

- Money orders (Bank note)

- Credit cards

- Debit cards

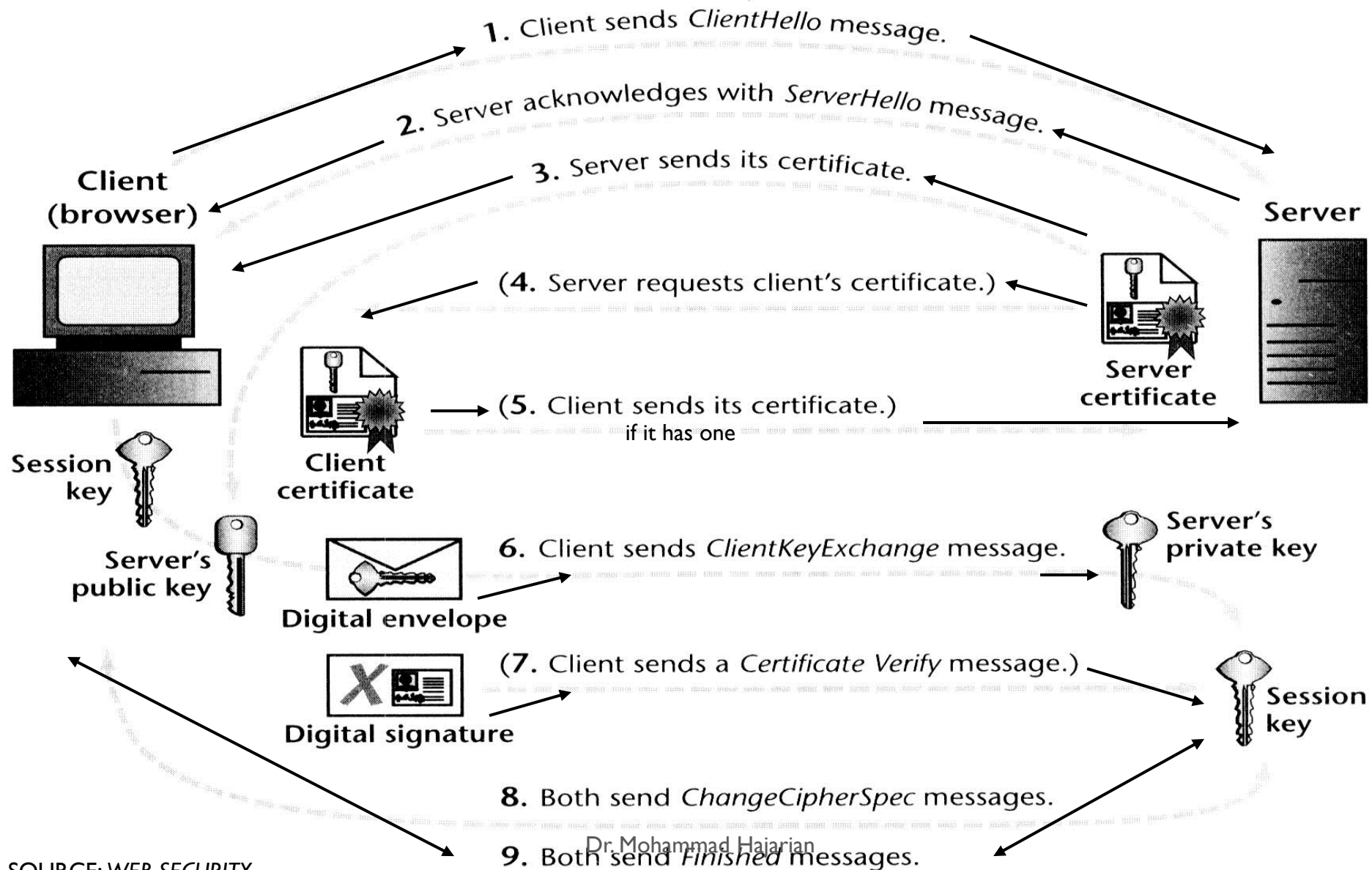Dr. Mohammad Hajarian

MAJOR ARCHITECTURAL COMPONENTS OF THE WEB

Client 1

Browser

Client 2

Browser

HTTP
TCP/IP

Internet

Server B

Bank
Server

Bank
Server

Server A

HTTP
Server

App.
Server

Database
Server

URL

index.html

prog1.class
prog2.jsp

1. Client sends *ClientHello* message.

2. Server acknowledges with *ServerHello* message.

3. Server sends its certificate.

(4. Server requests client's certificate.)

(5. Client sends its certificate.)
if it has one

6. Client sends *ClientKeyExchange* message.

(7. Client sends a *Certificate Verify* message.)

8. Both send *ChangeCipherSpec* messages.

9. Both send *Finished* messages.

Client (browser)

Server

Session key

Client certificate

Server certificate

Server's public key

Digital envelope

Server's private key

Digital signature

Session key

Session key

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SOURCE: *WEB SECURITY*

6

ELECTRONIC PAYMENT SYSTEMS

VARIOUS E-PAYMENT METHODS

- Credit and Debit card

- Digital Currency

- E-Wallets

- Peer-to-Peer Methods

- Smart card

- Micro-payments

- B2B

- **Credit card**
  - SSL, SET protocols
- **Payment orders, direct transfers, checks**
  - Automated Clearing House (ACH)
- **Online Banking**
  - Wingspan
- **Intermediaries**
  - PayPal
- **Stored-Value Cards, Smart Cards, Wallets**
  - Mondex
  - Octopus

ECOMMERCE PAYMENT RANGES

	Minimum Transaction Value	Typical Transaction Value	Maximum Transaction Value
Macro	$5.00	$50.00	☐
Mini	$0.10	$1.00	$10.00
Micro	$0.001	$0.01	$1.00

SOURCE: COMPAQ CORP.

E-MICROPAYMENTS

e-micropayments

Small online payments, typically under US $10

- Companies with e-micropayment products:
    - BitPass (*bitpass.com*)
    - Paystone (*paystone.com*)
    - PayLoadz (*payloadz.com*)
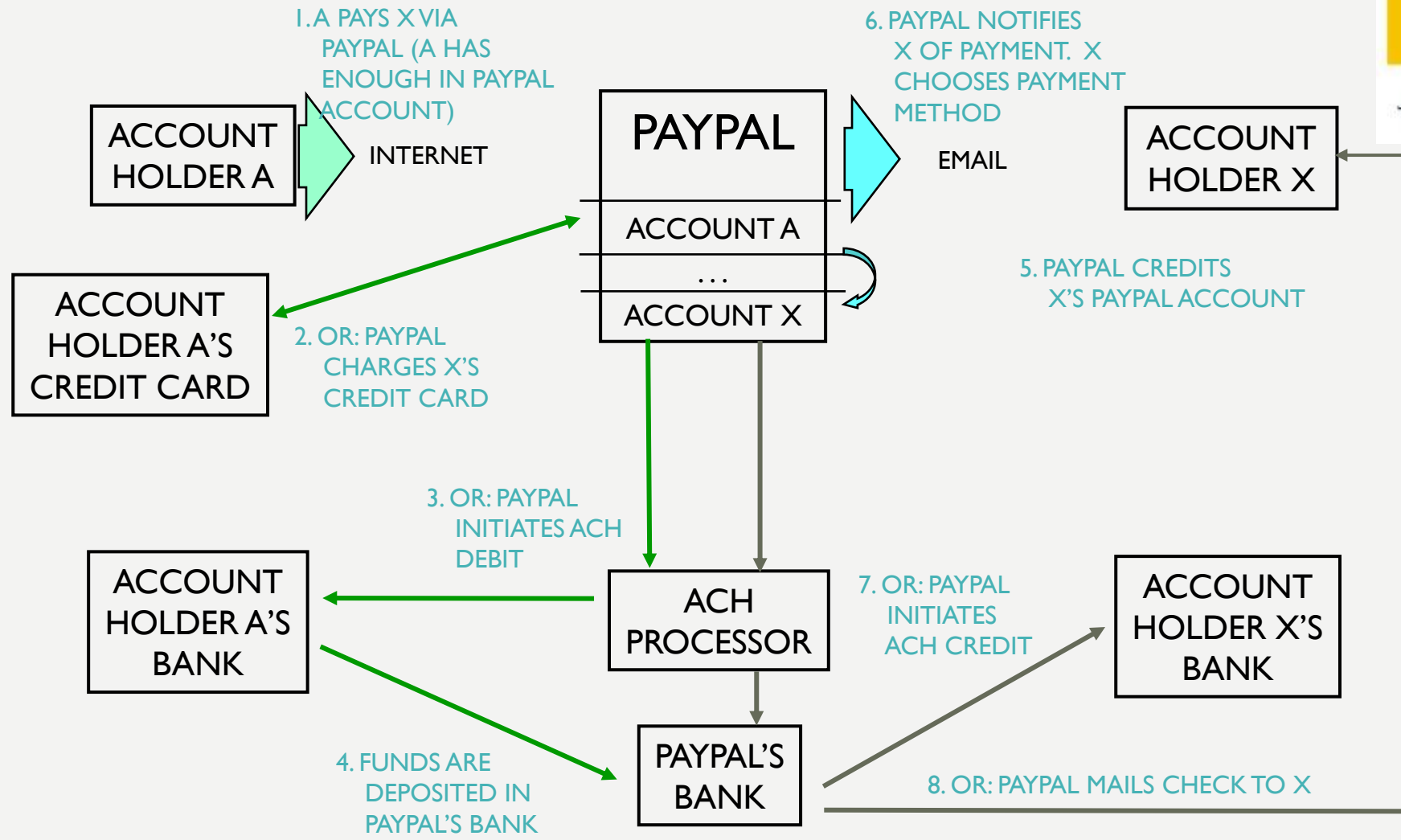   - Peppercoin (*peppercoin.com*)

PAYPAL

PAYPAL

- Pay anyone, anywhere via email
- Draws funds from user's bank account, places credit hold on credit card for guarantee
- 286 million users
  – Bank of America has 3.3. million
- Accounts insured up to $100,000
- Based on automated clearinghouse
- Withdraw funds anytime, or send to someone else
- Mobile payments (WAP)

PAYPAL

1. A PAYS X VIA PAYPAL (A HAS ENOUGH IN PAYPAL ACCOUNT)

6. PAYPAL NOTIFIES X OF PAYMENT. X CHOOSES PAYMENT METHOD

ACCOUNT HOLDER A

INTERNET

PAYPAL

ACCOUNT A

. . .

ACCOUNT X

EMAIL

ACCOUNT HOLDER X

2. OR: PAYPAL CHARGES X'S CREDIT CARD

5. PAYPAL CREDITS X'S PAYPAL ACCOUNT

ACCOUNT HOLDER A'S CREDIT CARD

3. OR: PAYPAL INITIATES ACH DEBIT

ACCOUNT HOLDER A'S BANK

ACH PROCESSOR

7. OR: PAYPAL INITIATES ACH CREDIT

ACCOUNT HOLDER X'S BANK

4. FUNDS ARE DEPOSITED IN PAYPAL'S BANK

PAYPAL'S BANK

8. OR: PAYPAL MAILS CHECK TO X

PAYMENTS CARDS

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USING PAYMENTS CARDS ONLINE

payment card

Electronic card that contains information that can be used for payment purposes

- Three forms of payment cards:
  - Credit cards
  - Charge cards
  - Debit cards

USING PAYMENTS CARDS ONLINE

- Processing Credit Cards Online

    authorization

    Determines whether a buyer's card is active and whether the customer has sufficient funds

    settlement

    Transferring money from the buyer's to the merchant's account

USING PAYMENTS CARDS ONLINE

- Processing Credit Cards Online

payment service provider (PSP)

A third-party service connecting a merchant's EC systems to the appropriate acquirers. PSPs must be registered with the various card associations they support

USING PAYMENTS CARDS ONLINE

– Key participants in processing credit card payments online include the following:

- Acquiring bank

- Credit card association

- Customer

- Issuing bank

- Merchant

- Payment processing service

- Processor

USING PAYMENTS CARDS ONLINE

- Fraudulent Credit Card Transactions

    Address Verification System (AVS)

    Detects fraud by comparing the address entered on a Web page with the address information on file with cardholder's issuing bank

USING PAYMENTS CARDS ONLINE

card verification Value (CVV)

Detects fraud by comparing the verification number printed on the signature strip on the back of the card with the information on file with the cardholder's issuing bank

USING PAYMENTS CARDS ONLINE

- Fraudulent Credit Card Transactions

  - Additional tools used to combat fraud include:

    - Manual review

    - Fraud screens and decision models

    - Negative files

    - Card association payer authentication services (3-D Secure)

USING PAYMENTS CARDS ONLINE

virtual credit card

An e-payment system in which a credit card issuer gives a special transaction number that can be used online in place of regular credit card numbers

SMART CARDS

SMART CARDS

smart card

An electronic card containing an embedded microchip that enables predefined operations or the addition, deletion, or manipulation of information on the card

EXHIBIT 12.2 SMART CARD

Embedded Chip

SMART CARDS

- Types of Smart Cards

  contact card

  A smart card containing a small gold plate on the face that when inserted in a smart card reader makes contact and passes data to and from the embedded microchip

SMART CARDS

- Types of Smart Cards

    contactless (proximity) card

    A smart card with an embedded antenna, by means of which data and applications are passed to and from a card reader unit or other device without contact between the card and the card reader

SMART CARDS

smart card reader

Activates and reads the contents of the chip on a smart card, usually passing the information on to a host system

smart card operating system

Special system that handles file management, security, input/output (I/O), and command execution and provides an application programming interface (API) for a smart card

SMART CARDS

- Applications of Smart Cards
  – Retail Purchases

    e-purse

    Smart card application that loads money from a card holder's bank account onto the smart card's chip

    Common Electronic Purse Specification (CEPS)

    Standards governing the operation and interoperability of e-purse offerings

  – Transit Fares
  – E-Identification

SMART CARDS

- Applications of Smart Cards

  - Transit Fares

    To eliminate the inconvenience of multiple types of tickets used in public transportation, most major transit operators in the United States are implementing smart card fare-ticketing systems

  - E-Identification

    Because they have the capability to store personal information, including pictures, biometric identifiers, digital signatures, and private security keys, smart cards are being used in a variety of identification, access control, and authentication applications

SMART CARDS

- Applications of Smart Cards in Health Care

  – Storing vital medical information in case of emergencies

  – Preventing patients from obtaining multiple prescriptions from different physicians

  – Verifying a patient's identity and insurance coverage

  – Speeding up the hospital or emergency room admissions process

SMART CARDS

- Applications of Smart Cards in Health Care

    – Storing vital medical information in case of emergencies

    – Providing medical practitioners with secure access to a patient's complete medical history

    – Speeding up the payment and claims process

    – Enabling patients to access their medical records over the Internet

SMART CARDS

- Securing Smart Cards
    - Smart cards store or provide access to either valuable assets or to sensitive information
    - Because of this, they must be secured against theft, fraud, or misuse
    - The possibility of hacking into a smart card is classified as a "class 3" attack, which means that the cost of compromising the card far exceeds the benefits

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
  - Imbedded microprocessor
    - (OLD) 8-bit processor, 16 KB ROM, 512 bytes RAM
    - Equivalent power to IBM XT PC, cost $7.00-15.00
    - 32-bit processors now available
  - Intelligent, active devices with defenses

SMART CARD APPLICATIONS

- Ticketless travel: Seoul bus system
  - 4M cards, 1B transactions since 1996
- Authentication, ID
- Medical records
- Ecash
- Store loyalty programs
- Personal profiles
- Government
  - Licenses
- Mall parking

. . .

SMART CARD STRUCTURE

Contacts:

Power—(Vcc)	(GND)—Ground
Reset—(RST)	(Vpp)—Optional
Clock—(CLK)	(I/O)—Input/Output
Reserved for future use—(RFU)	(RFU)—Reserved for future use

Microprocessor

Contacts

Card
(Upside-down)

Plastic

Epoxy

Contacts (8)
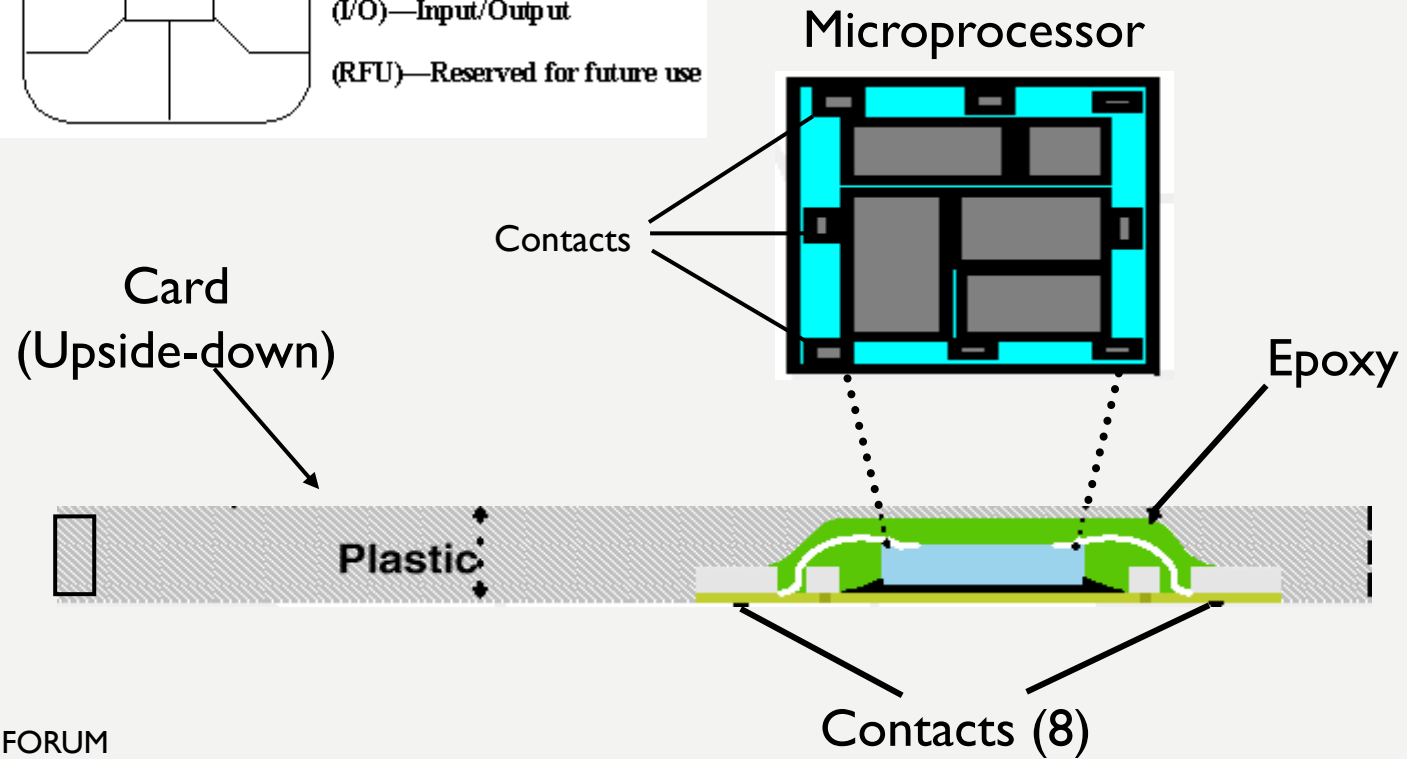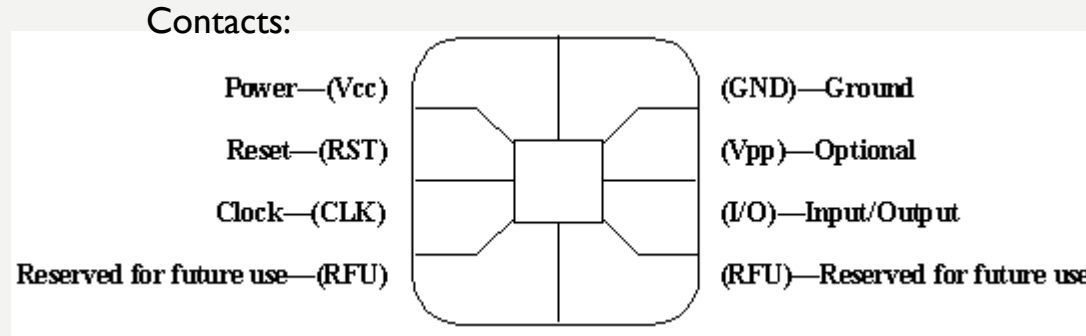
SOURCE: SMART CARD FORUM

STORED-VALUE CARDS

stored-value card

A card that has monetary value loaded onto it and that is usually rechargeable

E-CHECK

E-CHECKING

e-check

A legally valid electronic version or representation of a paper check

Automated Clearing House (ACH) Network

A nationwide batch-oriented electronic funds transfer system that provides for the interbank clearing of electronic payments for participating financial institutions

E-CHECKING

- Benefits of e-check processing:
  - It reduces the merchant's administrative costs by providing faster and less paper-intensive collection of funds
  - It improves the efficiency of the deposit process for merchants and financial institutions

E-CHECKING

- Benefits of e-check processing:
  - It speeds the checkout process for consumers
  - It provides consumers with more information about their purchases on their account statements
  - It reduces the float period and the number of checks that bounce because of insufficient funds (NSFs)

EXHIBIT 12.3 PROCESSING E-CHECKS WITH AUTHORIZE.NET
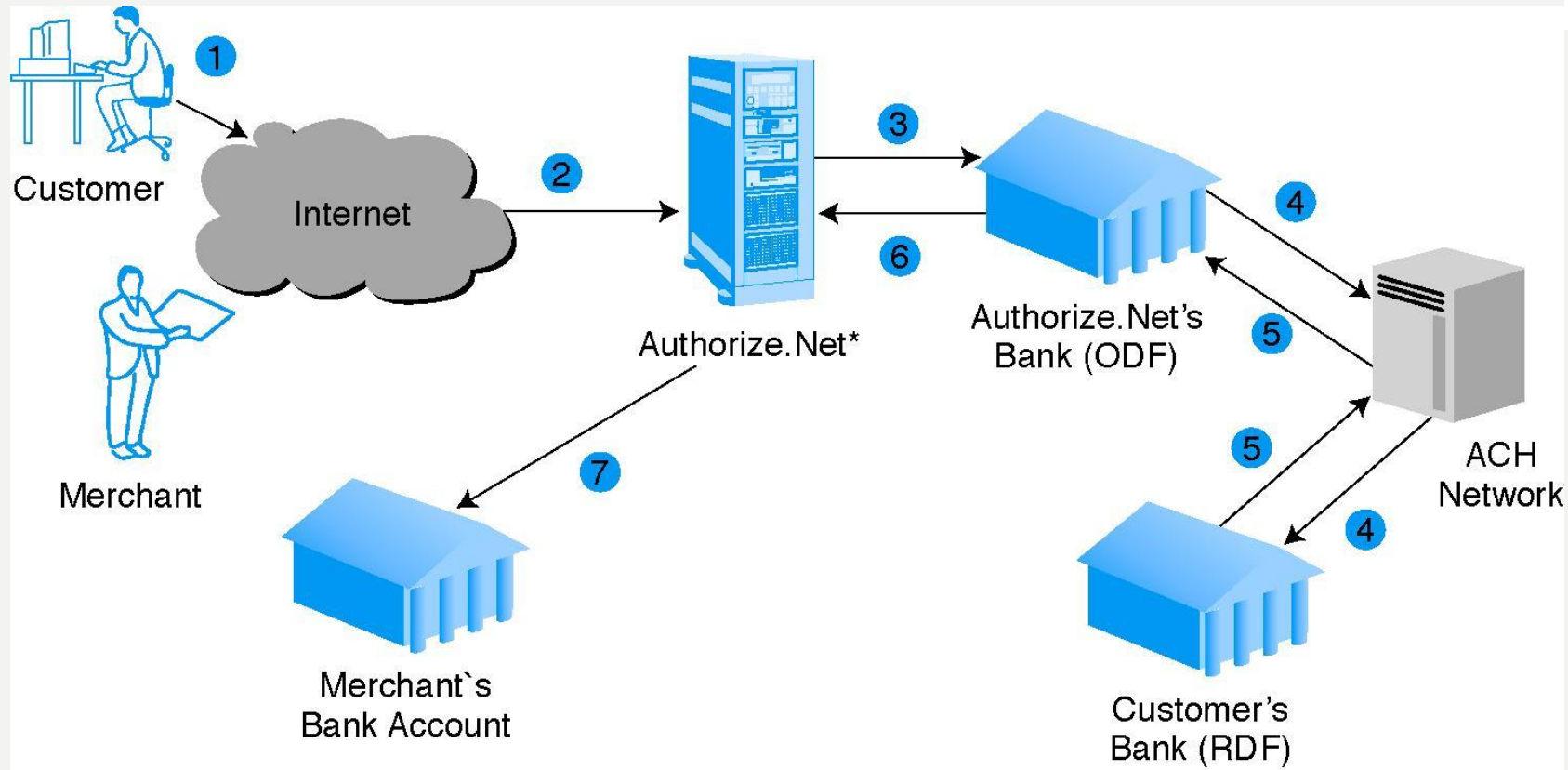
electronic bill presentment and payment (EBPP)

Presenting and enabling payment of a bill online. Usually refers to a B2C transaction

EXHIBIT 12.4 E-BILL PRESENTMENT

ELECTRONIC BILL PRESENTMENT AND PAYMENT

- Types of E-Billing
  - Online banking
  - Biller direct
  - Bill consolidator

ELECTRONIC BILL PRESENTMENT AND PAYMENT

- Advantages of E-Billing

  – Reduction in expenses related to billing and processing payments

  – Electronic advertising inserts can be customized to the individual customer

  – Reduces customer's expenses

EXHIBIT 12.5 E-BILLING PROCESS FOR SINGLE BILLER
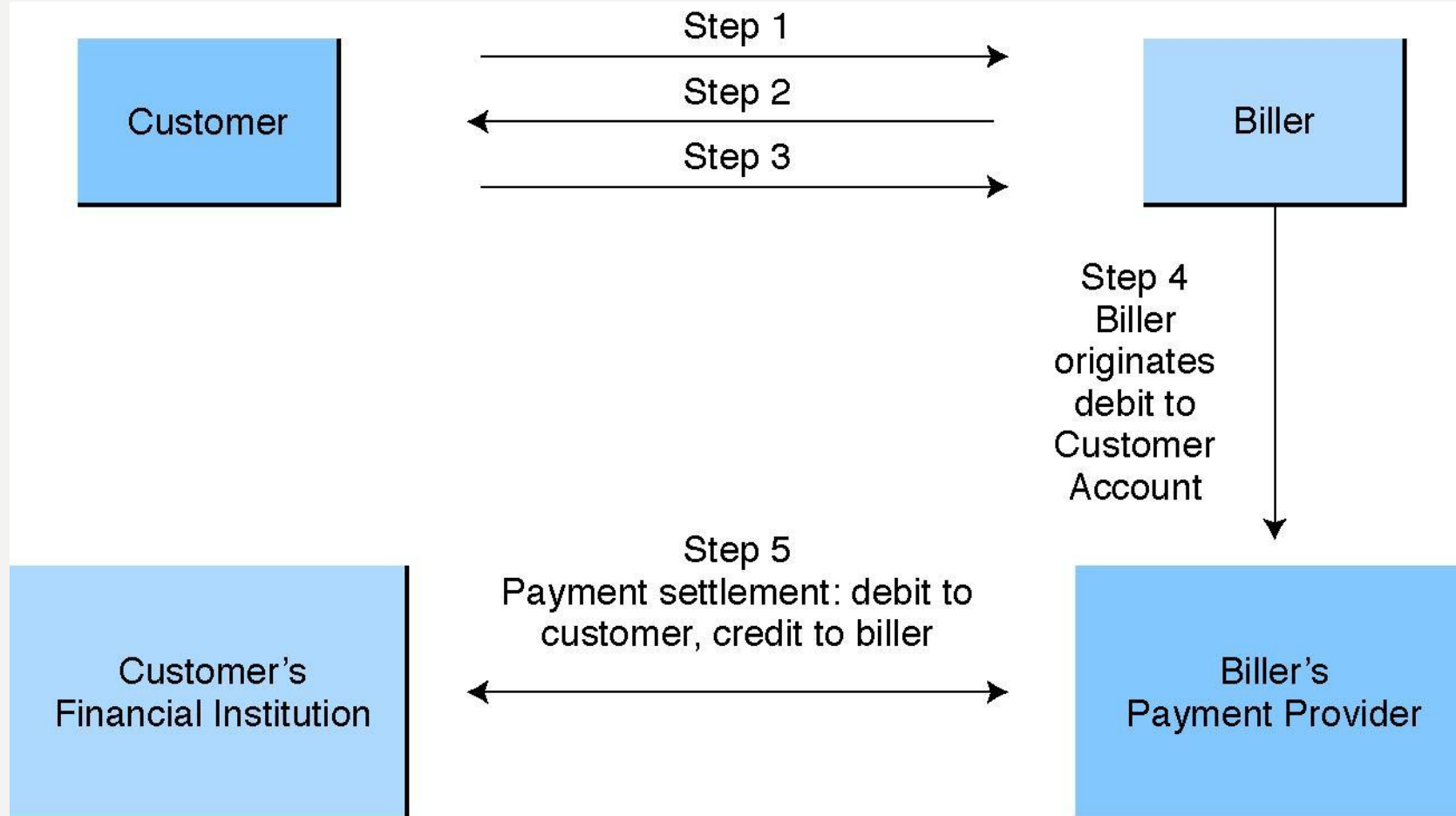
EXHIBIT 12.6 E-BILLING PROCESSES FOR BILL CONSOLIDATOR
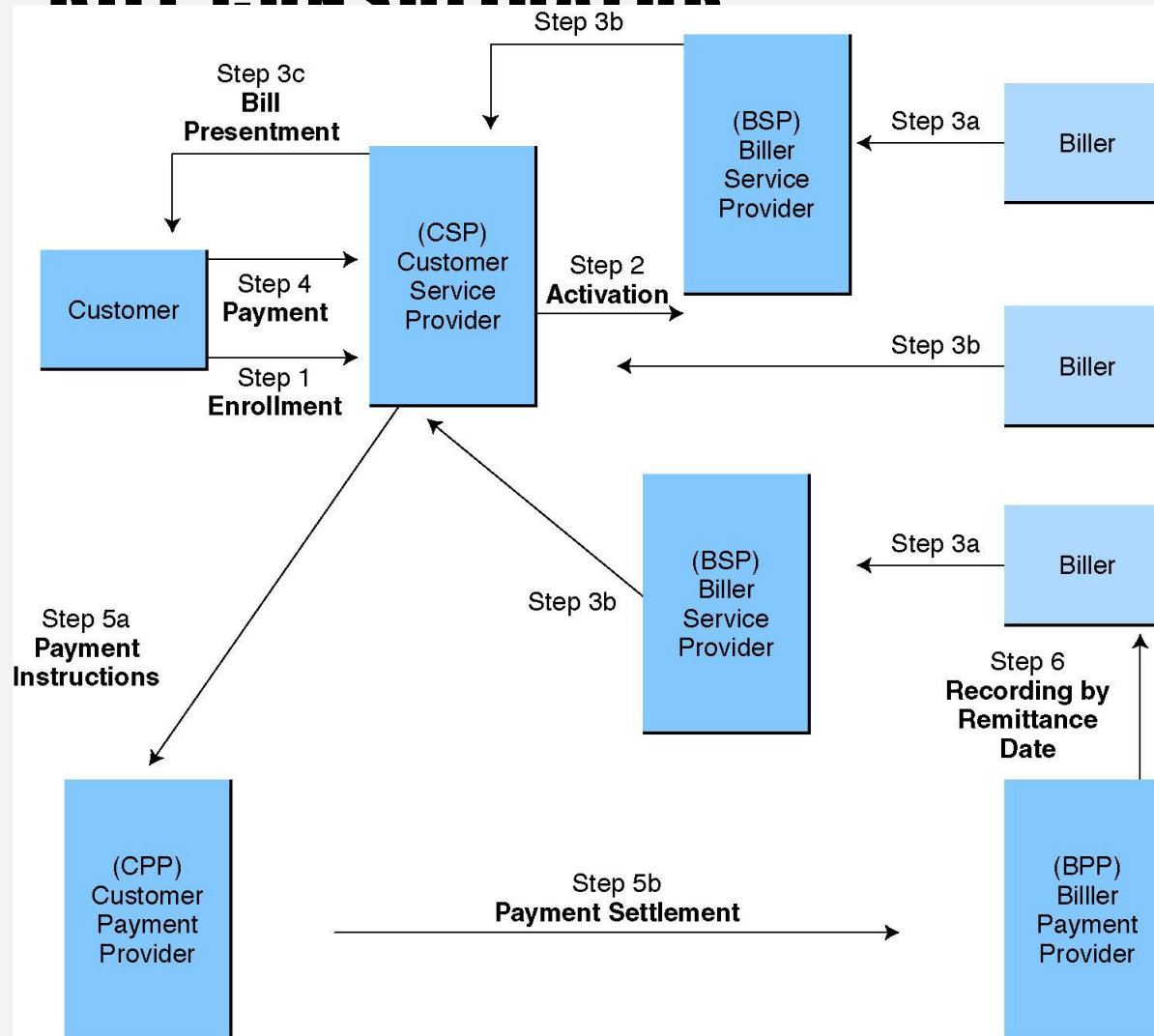
CREDIT CARDS

CREDIT CARDS

- A very common method of payment

- Cards are issued by a bank

- Unique 16-digit number (including check digits) and an expiration date

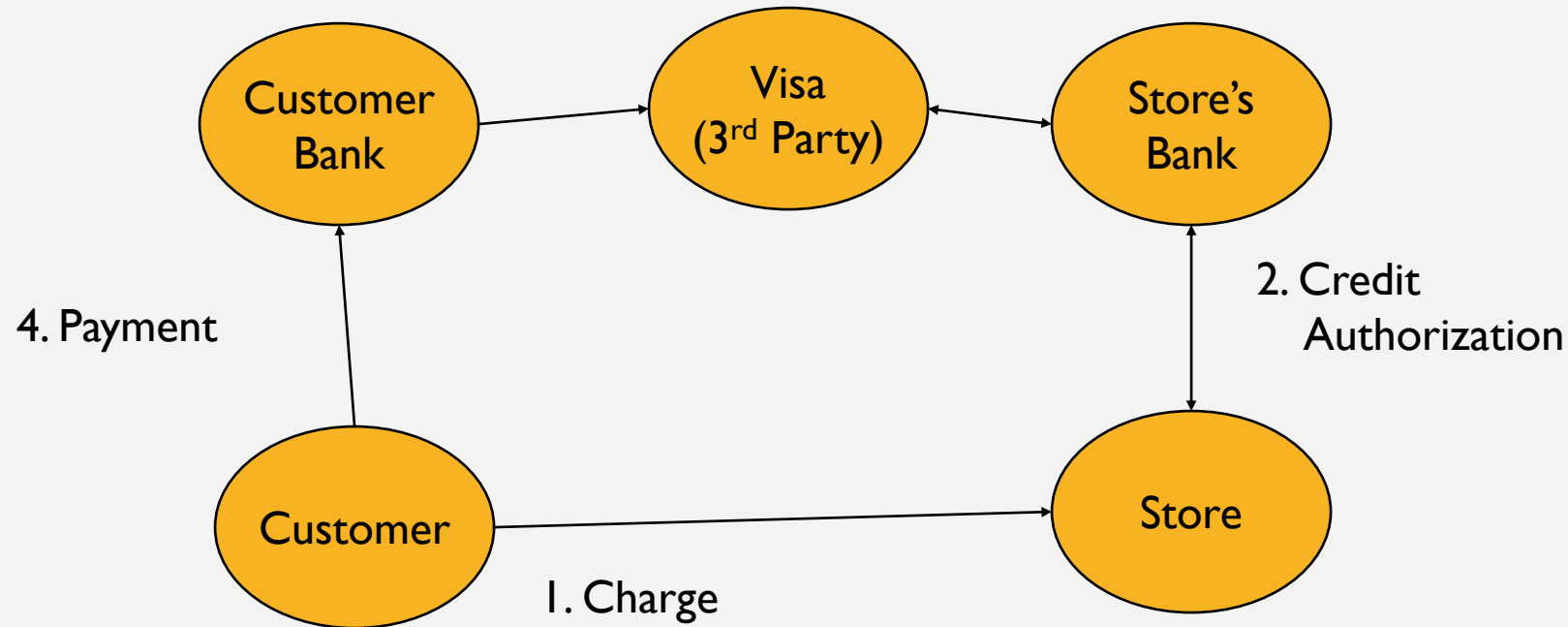- Third party authorization companies verify purchases
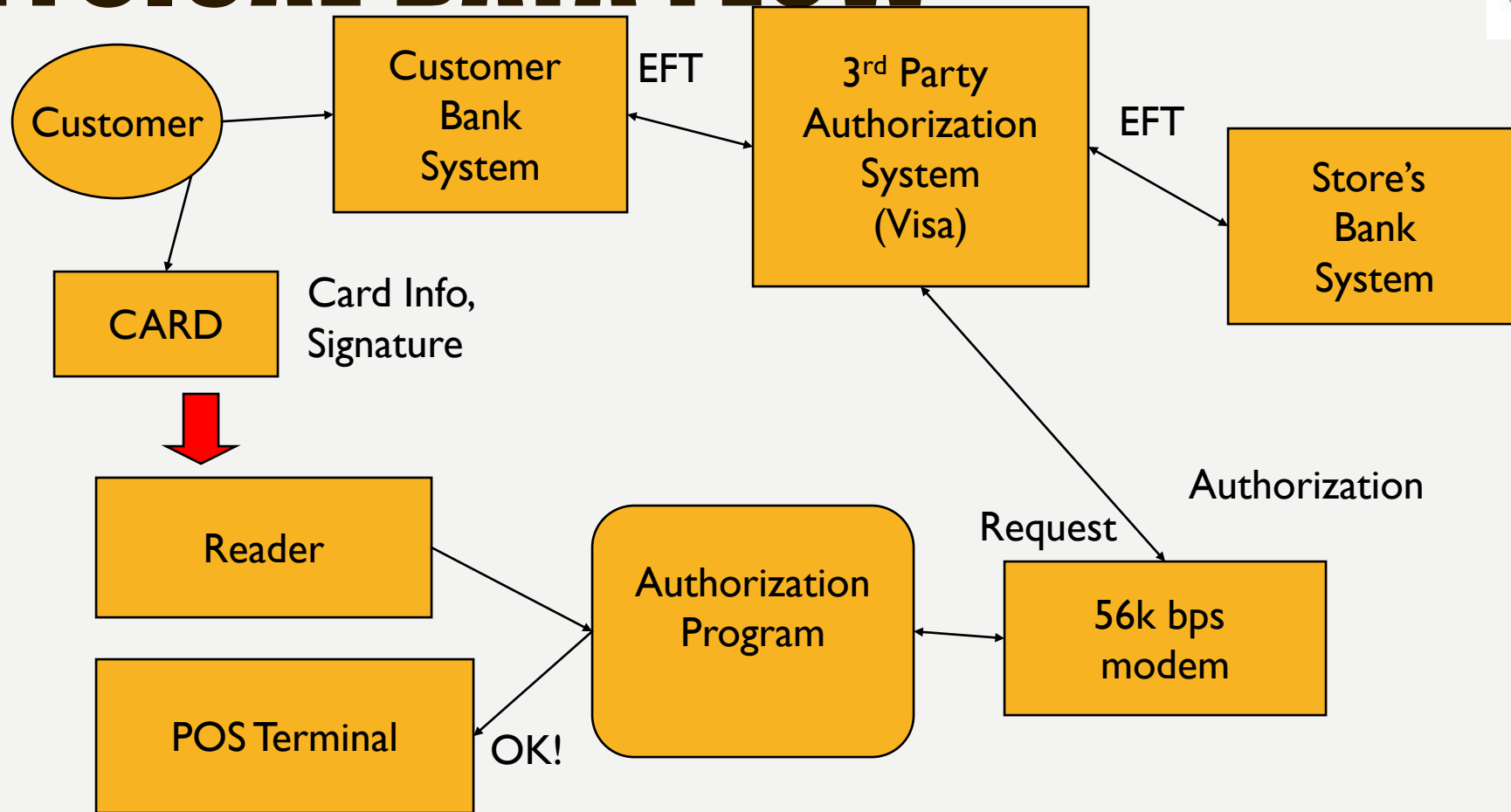
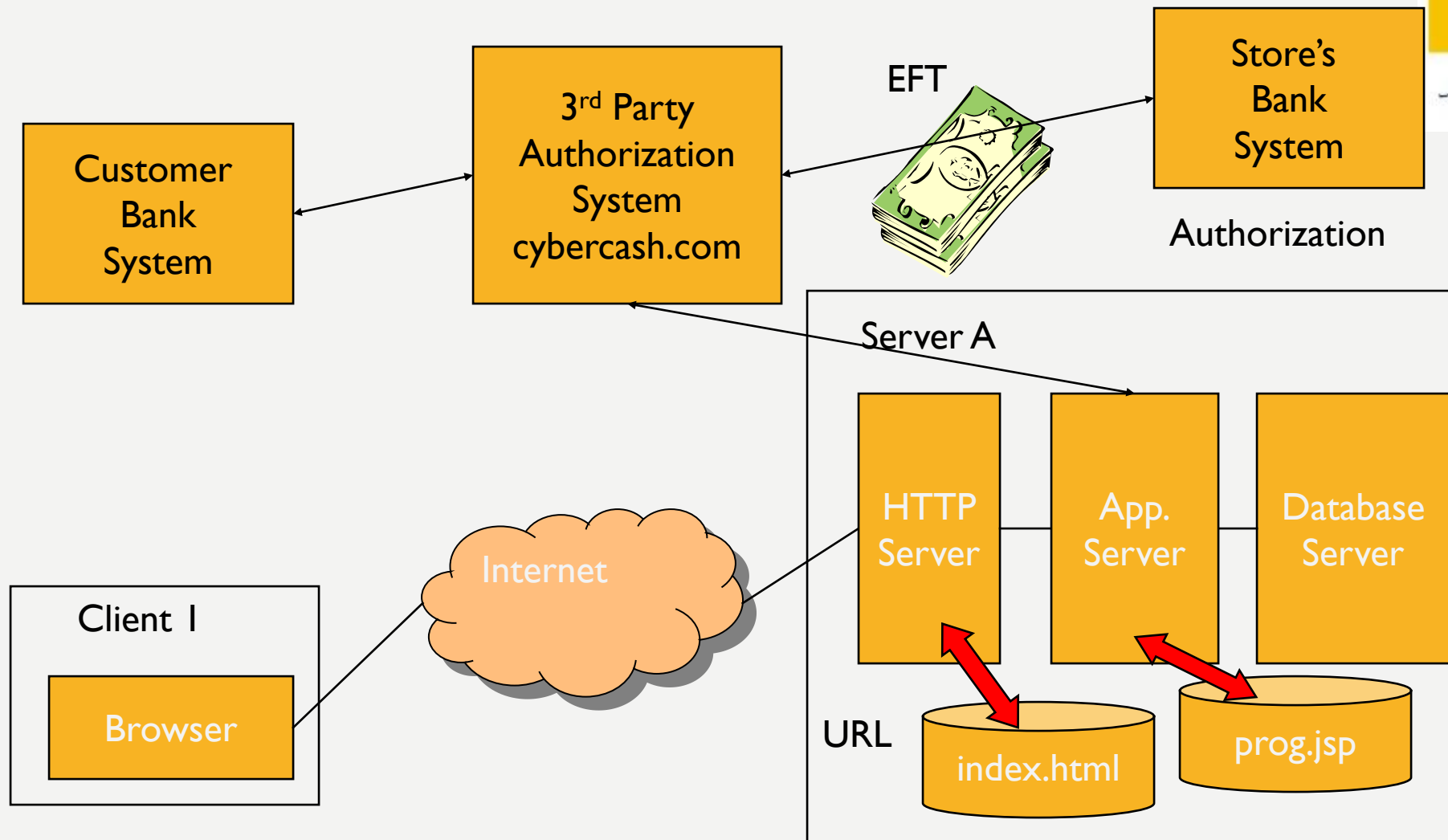# CREDIT CARD – BUSINESS MODEL LOGICAL MONEY FLOW

3. Clearance/Settlement

Customer Bank → Visa (3rd Party) ← Store's Bank

4. Payment

2. Credit Authorization

Customer → Store

1. Charge

What can you do if your statement shows a fraudulent purchase?

CREDIT CARD - IT PHYSICAL DATA FLOW

USE OF CREDIT CARD ON THE WEB

CREDIT CARD FRAUD

- A major problem for E-commerce
- The merchant has no legal proof of purchase unless the buyer uses authentication certificate
- Companys such as Visa, nochargeback.com and CyberCash (now VeriSign) are working to limit fraud:
  - Visa has established high risk business models and best practices info for merchants
  - Nochargeback.com has lists of fraudlent cards, e-mail addresses and postal addresses
 - VeriSign/CyberCash has employed AI to catch frauders

CREDIT CARDS

- The most expensive ePayment mechanism
- MasterCard: $0.29 + 2% of transaction value
- A $100 charge costs the merchant $2.29
- <u>Currently</u> the most convenient method
- Advantage: allows credit
- People can buy more than they can afford
- Disadvantages:
  - doesn't work for small amounts (too expensive)
  - doesn't work for large amounts (too expensive)

PARTIES TO A CREDIT CARD TRANSACTION
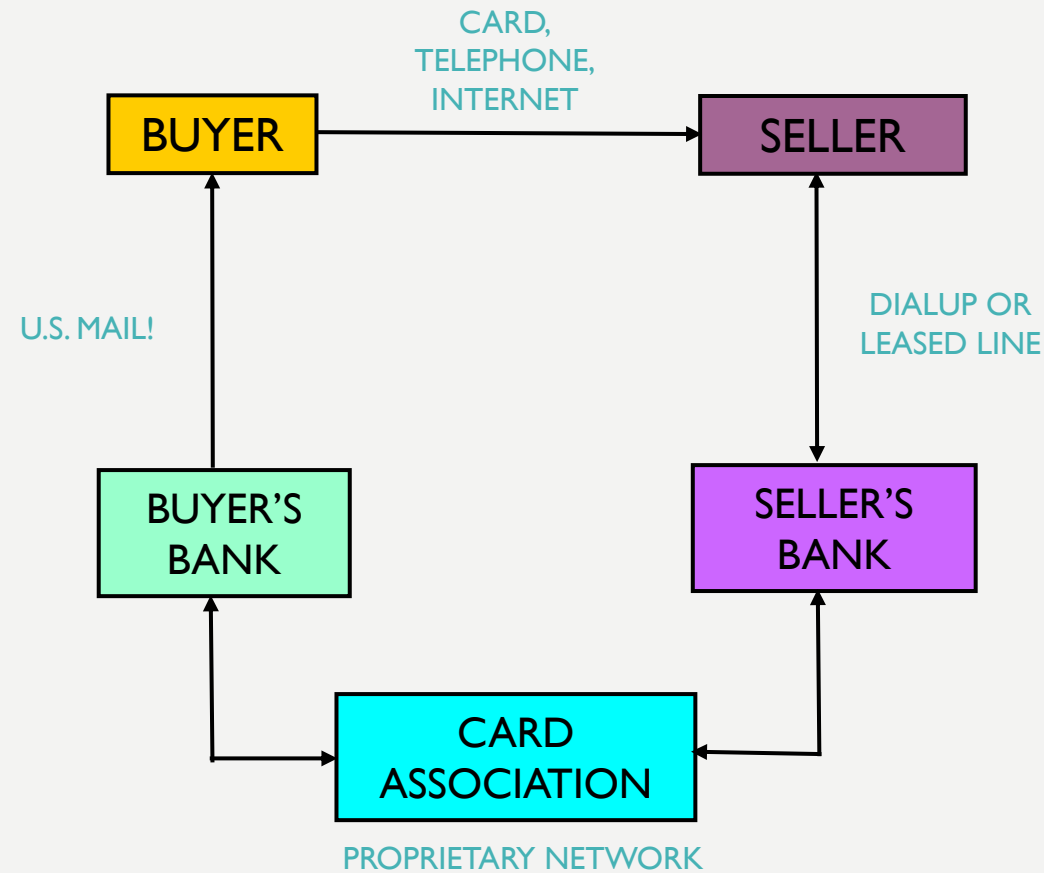
B2B

- B2B transactions are the fastest area of $ growth on the web
- B2B transactions are substantially larger than B2C
- Paymantech is major provider:
  - 24/7 availability, all manner of EFT supported
  - many management tools and reporting methods
- Ecredit.com offers real-time automated credit approval and financing
- TradeCard offers comprehensive B2B E-commerce facilities on an international scale

Q/A

- End of Session 6

THANK YOU!