SSL, SET and Electronic Payment Systems

Lecture Outline

- Secure E-Commerce Transactions
- S-HTTP
- Secure Socket Layer (SSL)
- Secure Electronic Transaction (SET)
- Electronic Payment Systems

Support for Electronic Commerce Services

- Most e-commerce services involve financial transactions and system of payment, and a lot of it takes place through the web.
- Security is major consideration, since most transactions are confidential.

Early Web Merchant Services

- Early web services for commerce involved:
  - HTML versions of order forms, viewed through the browser, then printed, filled and returned by ordinary mail.
  - Catalogs in HTML for on-line viewing.
- The next step
  - Submit orders on-line – front-end HTML forms, back-end CGI.
- Then came
  - *Shopping cart applications*
    - user browse multiple on-line catalogues, put items in a shopping cart, and purchase all the items at the end .

Secure HTTP (S-HTTP)

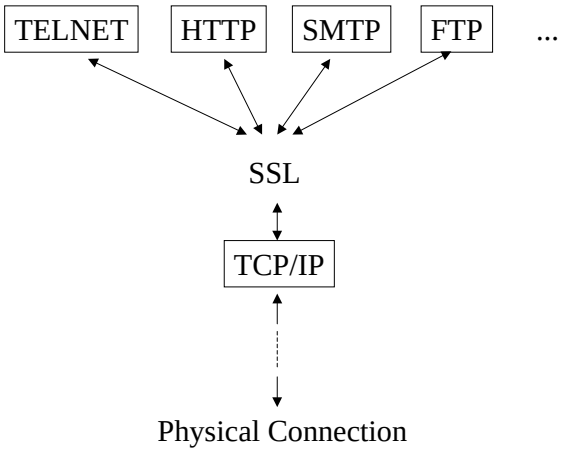
- Using normal HTTP is very insecure as HTTP transfers data unencrypted
  - not appropriate for billing information and credit card transactions.
- S-HTTP produced by Enterprise Integration Technology (EIT) extends HTTP by
  - Allowing clients and servers to sign, authenticate, and encrypt HTTP packets.
  - Uses extra HTTP headers to indicate required processing for signing, authentication and encryption/decryption.
  - Adds additional data to the HTTP packet to store certificate and encryption key information.

Secure Socket Layer (SSL)

- SSL is the most dominant web cryptographic protocol for general browser/server communication today.
- Originally introduced by Netscape in Navigator 1.0, and later adopted by Microsoft for Internet Explorer.
  - All major browsers supports SSL.
- Overtook S-HTTP as the cryptographic system of choice.

SSL Characteristics

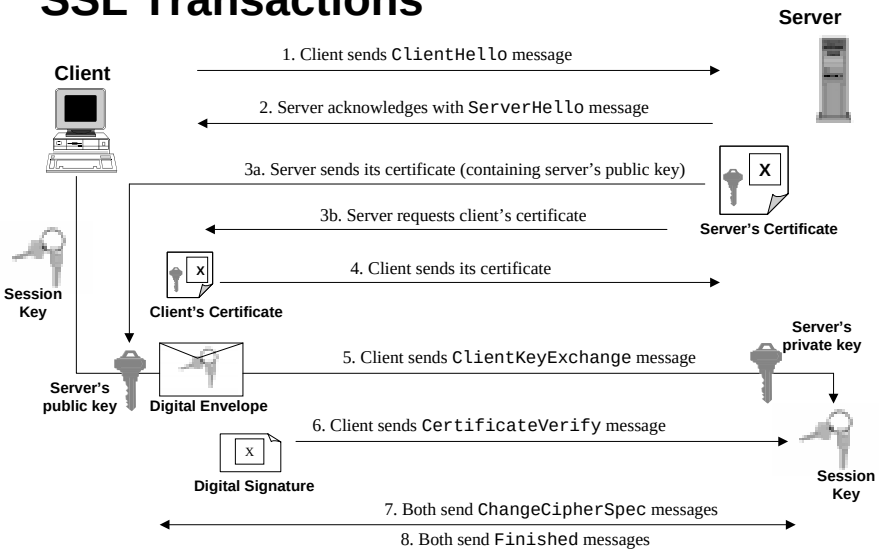
- Operates on the transport layer of TCP/IP
  - as oppose to S-HTTP which operates only on HTTP at the application layer
  - This means it will be able to secure messages from all possible protocols beside HTTP
  - see next diagram



SSL Characteristics (cont'd)

- An SSL connection offers a choice of cipher suite
  - When an SSL client first contacts a server, they negotiate which *cipher suite* (encryption algorithms, digest functions and authentication methods) to use
  - they pick the strongest set both client and server can support.
- During an SSL session, all communication are encrypted.

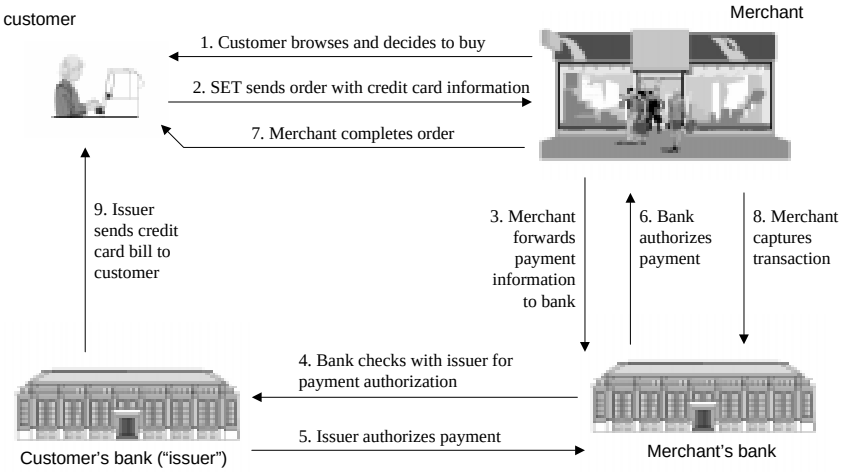
SSL Transactions



Secure Electronic Transaction (SET)

- SET is a protocol for electronic credit card payment.
  - It only works within the credit card system.
- Developed by a consortium of companies led by MasterCard, Visa, Netscape and Microsoft.
- Provides a lot of high-level services specific to card transactions, eg.
  - Cardholder registration
  - Merchant registration
  - Purchase request
  - Payment Authorisation
  - Funds Transfer
  - Refunds to customers
  - Credits

SET in a Credit Card Transaction



Electronic Payment Systems

- SET is tied completely to the credit card system. There are other new forms of payment systems which are electronically based, but not tied to the credit-card system.
- Digital money systems involves using encrypted packets to represent money, which can be transferred to cover payments
  - In the end, institutions such as banks still need to provide the monetary value for these electronic payments.

Electronic Payment Systems (cont'd)

- Egs.
  - CyberCash (http://www.cybercash.com)
  - eCash (http://www.ecash.net/)
  - Millicent (http://www.millicent.com)
- Such payments system still suffer from the lack of uniform standards, resulting in users having to store their electronic money in multiple systems to use them.

On-line Frauds

- Mechanisms such as SSL and SET have made on-line financial transactions as safe (and in certain cases more safe) than off-line ones.
  - Major credit cards companies such as Visa and Mastercard estimates the percentage of on-line fraudulent transactions at 0.08-0.09%, about the same as "face-to-face" transactions.
  - Research by ActivMedia estimates the amount of losses in on-line retail due to credit-card frauds at about 1.22%, compared to 1.49% for conventional retail.
  - If interested, read http://www.noie.gov.au/creditcard
- Of course, how secure the on-line transaction depends on the individual servers set-ups.

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