Web-Based Vulnerabilities

CSH6 Chapter 21

"Web-Based Vulnerabilities"

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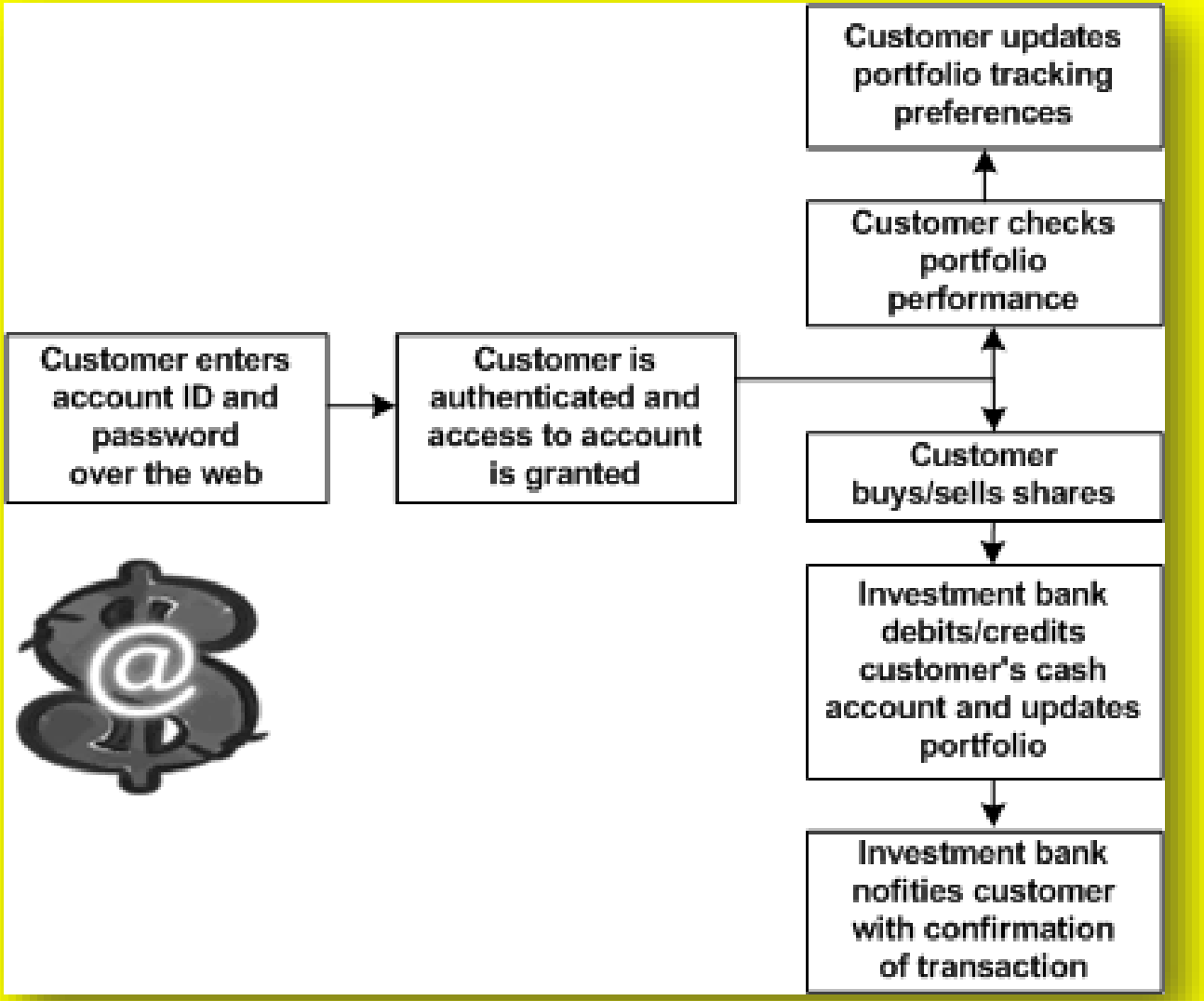
Topics

- Breaking E-Commerce Systems
- Case Study of Breaking an E-Business
- Web Application System Security
- Protecting Web Applications
- Components & Vulnerabilities in E-Commerce Systems

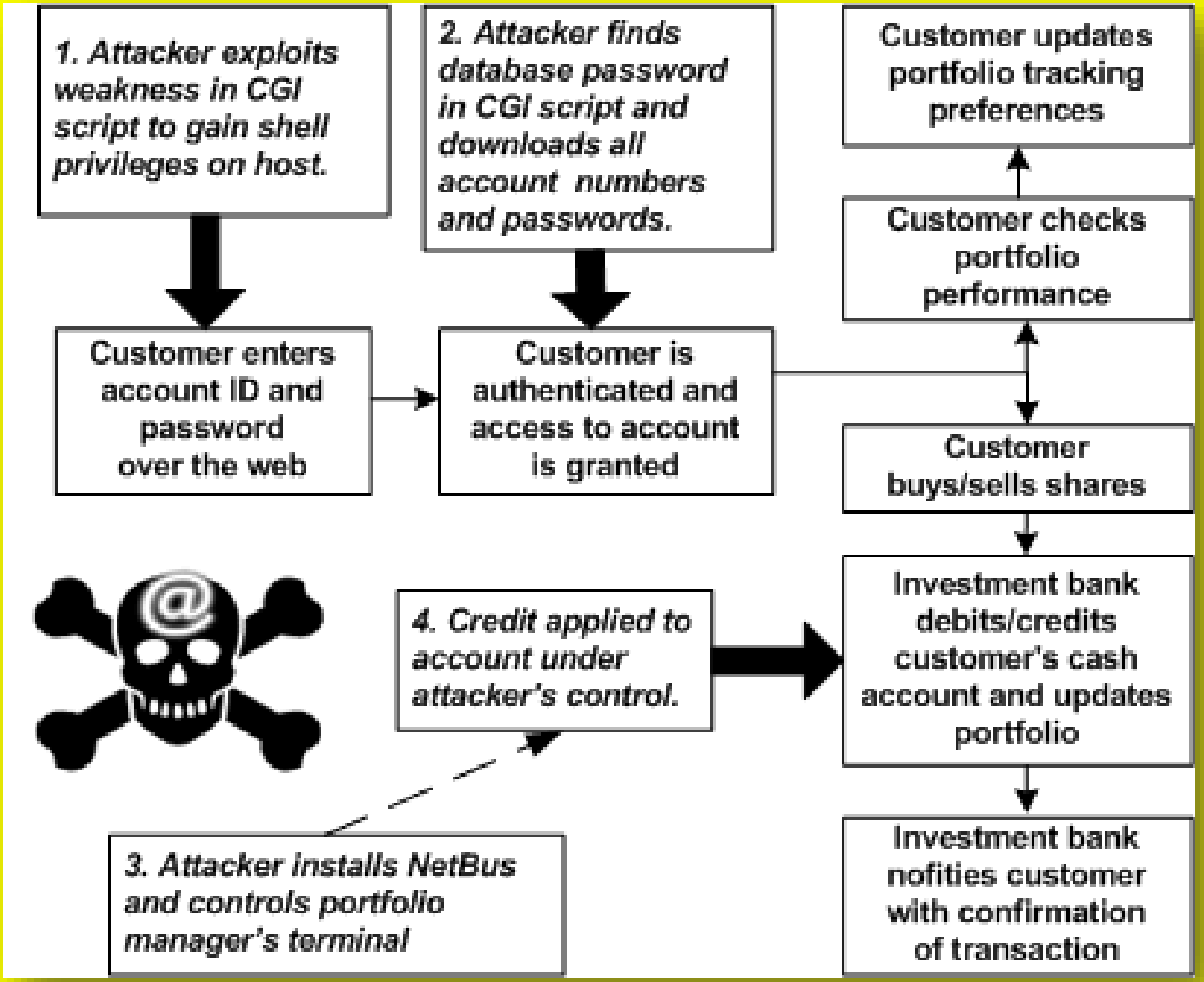
Breaking E-Commerce Systems

- Thinking about how criminal hackers think
  - Attack weakest link
  - Look for monetary gain
  - Low-hanging fruit
  - Attack servers when possible
- Must harden not only perimeter but also core
- Asymmetric attacks
  - Defense harder & more costly than offense
  - Script kiddies have caused $M damage
    - ✓E.g., MafiaBoy 2000 vs eBay, Amazon, Schwab….

Case Study of Breaking an E-Business (1)



Case Study of Breaking an E-Business (2)

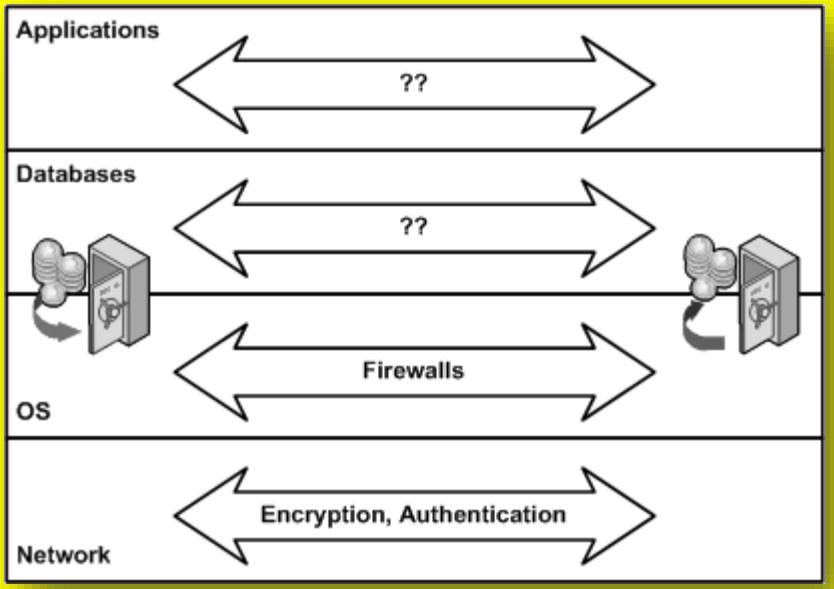


Web Application System Security

- Absolutely require corporate security policy
  - Informs decisions on specific security configurations
  - Inconsistencies can doom security
- Security systems should be independently evaluated
  - System audits (do measures conform with policy?)
  - Vulnerability analysis (can we locate obvious gaps in security?)
  - Penetration testing (can we break through the barriers using criminal hacker methods?)

Protecting Web Applications

- Layered view of systems
- Network, OS flaws usually documented
  - Alerts
  - National Vulnerability Database http://nvd.nist.gov/
- Vulnerability scanners available (see *CSH6* Ch 46)
- Firewalls critical element
- Application servers (Java etc) must be secured
- Application security = function of how programs are configured & used (not just of patches)



Components & Vulnerabilities in E-Commerce Systems

- Client-Side Risks
- Network Protocol Risks
- Business Application Logic
- CGI Script Vulnerabilities
- Application Subversion
- Web Server Exploits
- Database Security
- Platform Security

Client-Side Risks

- Most e-commerce uses browsers
  - Also extending to hand-held devices
- Threats from malicious mobile code (*CSH6* Ch 16 & 17); e.g., Web scripts, Java applets, ActiveX controls, Trojan horse programs
- Serious risk from loss of privacy
  - Identity theft against *data subjects*
  - Business & legal consequences for corporate victims
  - Browsers typically convey much private info
  - Spyware tracks computer usage

Network Protocol Risks

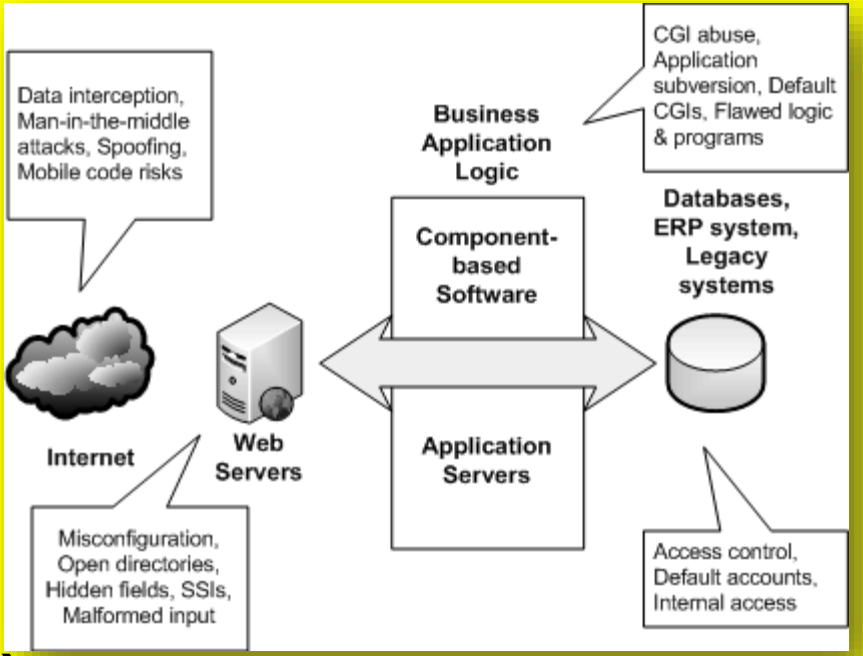
- Primarily result from sending unencrypted data over the 'Net
- Several protocols preserve confidentiality by using encryption
  - SET (Secure Electronic Transaction)
  - SSL (Secure Sockets Layer)
  - S/HTTP (Secure HTTP)(superseded)
  - S/MIME (Secure Multipurpose Internet Mail Extensions)
  - CyberCash (proprietary credit-card system)(bankrupt 2001, bought by VeriSign & First Data Merchant Services Corp.)
- See *CSH6* Ch 30

Network Protocol Attacks

- Man-in-the-middle (intercepting, inserting)
- DNS attacks (altering tables to misdirect users)
- War dialing (scanning all phone numbers in block for modems)
- Exploiting software holes (FTP, Bind, SMTP, HTTP)
- Internal access (unauthorized behavior by authorized personnel)
- Leveraging trusted hosts (attack from linked system)
- Brute-force decryption (test all possible keys)

Business Application Logic

- Key area of vulnerability
  - Usually custom SW
  - Complex
  - May not be tested as thoroughly as COTS
- Critical elements include
  - Common Gateway Interface (CGI)
  - Hypertext Processor (PHP)
  - Component-based software (CBS)
    - ✓Enterprise JavaBeans (EJB)
    - ✓Java 2 Enterprise Edition (J2EE)
    - ✓Common Object Request Broker Architecture (CORBA)
    - ✓Common Object Model (COM & DCOM)



CGI Script Vulnerabilities

- Frequent object of attack
- Inputs not under control of programmer
- Misconfiguration common problem
  - Individuals can add CGI to Web pages
  - Can go out of control – introduce holes
  - Best to limit execution of CGI to central directory under control of admin
- Protect cgi-script directories (*cgi-bin*)
- Languages create weaknesses
  - Perl, JavaScript, Python
  - Don't include Perl interpreter in cgi-bin
    - ✓Could allow unauthorized execution of commands

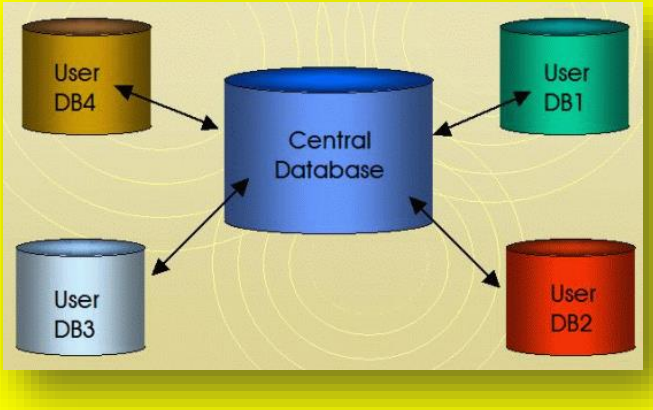
Application Subversion

- Program misuse
- Exploit program logic
  - Raise user privileges
  - Gain unauthorized data access
- Attacker may discover unauthorized ways of using system
- Send malformed input including commands
- Redirect program output
- Beware of amateurs
- Apply strict software quality assurance to production code

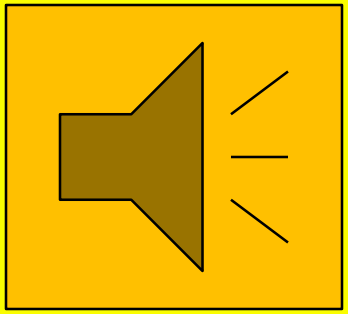
Web Server Exploits

- Configuration
  - Default = max function, min security
- HTML Coding & Server-Side Includes
  - Disallow SSI to prevent insertion of unauthorized commands
- Private Documents in Public Directories
  - Disallow *directory browsing*
- Cookies & Other Client-Side Risks
  - Users can alter cookies created by Web site
  - Cookie poisoning can exploit authentication tokens
  - E.g., alteration of discount codes → losses

Database Security



- Web interfaces too often added to formerly closed systems without proper analysis
- Most users do not encrypt their databases
- Buffer-overflow attacks can grant root access to intruder
- Some programmers *hard-code* passwords into programs (!!) NO NO NO!
- Default DB settings often weak
- Audit DB log files for anomalies



Platform Security

- Operating system security essential
- See *CSH6* Ch 24
- Must not count solely on perimeter security
  - Harden OS configuration to resist attack even if perimeter is breached
  - Maintain up-to-date patches (see *CSH6* Ch 40)
  - Vulnerability assessments
  - Penetration testing

DISCUSSION