CS3157: Advanced Programming

Lecture #5
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Shlomo Hershkop
shlomo@cs.columbia.edu

Outline

- CGI
- CGI security
- CGI Graphics
- Alternative Technologies
- Threading

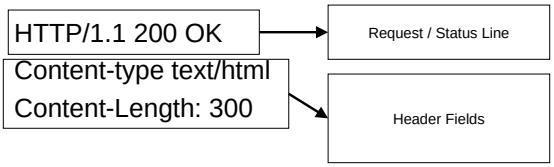
CGI

- Minimum the web server needs to provide to allow an external process to create WebPages.
- Goal: responding to queries and presenting dynamic content via HTTP.

Requirements

- Webserver setup correctly
  - Will not talk about it in class.
- Configure the cgi script
  - Will cover this lab.
- Basic http/html knowledge

http headers



GET /index.html HTTP/1.1

- GET
- HEAD
- POST
- PUT
- DELETE
- CONNECT
- OPTIONS
- TRACE

Server responses

HTTP/1.1 200 OK
Date: Sun, 25 Sep 2005 20:30:12 GMT
Server: Apache/1.3.5 (Unix)
Last-Modified: Wed, 20 May 1998 13:12:11 GMT
ETag: “2345-7227363ed”
Content-Length: 141
Content-Type: text/html

<HTML>
<HEAD><TITLE>…….

CGI Environment

- In perl avaiable through the %ENV global hash
- Changing any of the values will only be seen by your own subprocess
  - Why?
- Some of the variables will be blank
  - Why?

Side Note: Line Endings

- Carriage return \r
- Line Feed \n
- CRLF
- Unix – LF (\n) CR (\r)

- print “Content-type: text/html\n\n”

- Why not \n\r\n\r ????

Serving web pages

```
#!/usr/local/bin/perl
use strict;
$|=1;

my $time = localtime;
my $remote_id = $ENV{REMOTE_HOST}| $ENV{REMOTE_ADDR};
print "Content-type: text/html\n\n";

print <<END_OF_PRINTING;
This is the time : $time <P>
and your id is $remote_id

END_OF_PRINTING
```

Serving more than webpages

```
print "Content-type: text/html\n\n";


print “Content-type: image/jpeg\n\n”;
print “Content-type: image/png\n\n”;
print “Content-type: audio/mp3\n\n”;
```

Serving mp3 files

```
open(MP3FILE,”….”) || die ….

my $buffer;
print “Content-type: audio/mp3\n\n”;
binmode STDOUT;
while( read(MP3FILE, $buffer, 16384)){
 print $buffer;
}
```

Example

- http://..../cgi-bin/mp3server.cgi/Song.mp3

Argument passing

- Say you have a cool program which you can hook to the web…..
  - Give a cell phone
  - Give a message
  - Will send the cell phone a message

```
<HTML><HEAD>
<TITLE>Cool</TITLE>
</HEAD>
<BODY>

<form action="cgi-bin/cool.cgi" method="GET">
<p>Enter cell phone to use:
<input type="text" name="cellphone"></p>
<p>Enter Message:
<input type="text" name"message"></p>
<input type="submit">
</form>
</BODY></HTML>
```

```
Use CGI;
my $coolp = '/usr/local/bin/cellmsg';

my $q = new CGI;
my $cell = $q->param("cellphone");
my $msg = $q->param("message");
#error checking here
open PIPE, "$coolp $cell $message |" or die "Can
   not open cellphone program";
print $q->header( "text/plain");
print while <PIPE>
close PIPE;
```

What can go wrong?

- When executing command can in theory pass in the following arguments

Something ; rm –rf *.*

Perl Taint mode

- -T
  - Taints all data references (incoming)
- #!/usr/bin/perl –wT
- Flags data to make sure perl doesn't do anything insecure

Tainted?

- STDIN
- CGI

- If variables/values are tainted
- Tainted follows it around with assignments

```
Sub is_tainted {
   my $var = shift;
   my $blank = substr($var ,0,0);
   return not eval { eval “1 || $blank” || 1};
}
```

Why

- Why would you want to keep track of tainted data?

Getting out of taint

- Match related patterns ($1,$2 ..)
- Idea: would check for security problems and then allow it
- Reminder: only in taint mode if set

Command shell

- A better way of executing command shell arguments to a program is to divide the work
- Create an instance of the program you want to run
- Pass arguments directly to it, instead of using the command shell (where can combine multiple commands

fork/exec

```
my $pid = open PIPE, “-|”;
die “problem forking $!” unless defined $pid;

unless($pid) {
  exec COOL, $message or die “cant open
  pipe $!”;
```

Graphics

- Formats:
  - GIF (Graphic Interchange Format)
    - 256 colors
    - LZW compression
    - Animation
    - Transparent bit
  - PNG (Portable Network Graphic)
    - 256 color / 16-bit gray / 48-bit true color
    - NOT LZW
    - Alpha channels
    - Interlacing algorithms

- JPEG (Joint Photographic Expert Group)
  - 24-bit color
  - Lossy compression
  - No animation/transparency
- PDF (Portable Document Format)
  - Postscript language for document layout

Image manipulation

- Many packages in perl to work with image data
- GD
  - Lightweight package
  - Port of c graphics library
  - Manipulation routines for PNG

File Locking

```
use Fcntl ":flock";

open FILE, "?????.txt" or die $!;

#one of these
flock FILE, LOCK_EX;
flock FILE, LOCK_SH;
…..
flock FILE, LOCK_UN;
```

Alternatives

- ASP
  - Created by Microsoft for its servers
  - Mix code into html
  - Visual basic/javascript
- PHP
  - Apache webserver
  - Similar to perl
  - Embed code in html

Alt II

- Coldfusion
  - Webserver interprets std coldfusion call embedded in html, and can add code to run custom functions
  - Windows, and linux
- Java servelts
  - Compiled java classes invoked by web client
  - Code creates documents
- FastCGI
  - Threaded instance of perl continuasly running to help cgi perl run faster
- Mod_perl
  - Appache server perl thread to make perl cgi faster

Wednesday

- Meet in the clic lab 2-4pm or 4-6pm
  - Please choose a spot in either lab
  - Feel free to bring your own laptop if you want to stay full time
  - Feel free to ask help for anything during lab.
- Make sure you have a cs account.
- Graded lab assignment part of class, will be due Friday afternoon.

Outputting text

- Many times will have multiple fields per line
- Common delimiters:
  - Comma
  - Tabs
  - Pipe |
- Make sure what ever you choose is not in the data
- How to represent these delimiters if they are present??

Socket

- In order to communicate across computer networks (or between processes on the same computer) need to setup a communication address.
- IO::Socket

IO:Socket client

```
Use IO::Socket::INET;

$socket = IO::Socket::INET->new(
   PeerAddr => $remote_host,
   PeerAddr => $remote_port,
   PeerAddr => “tcp”,
   PeerAddr => SOCK_STREAM) or die…
```

```
#writing out
print $socket “hello World”;

$answer = <socket>;

close($socket);
```

Server version

```
$server = IO::Socket::INET->new( LocalPort=>
   $server_port,
   Type => SOCK_STREAM,
   Reuse => 1,
   Listen = 10) or die….

while($client = $server->accept()) {
   #...
}
```

Other topics

- Multi threading
  - Fork processes
  - Process space
- Communication
  - Pipes
  - Sockets