Day 15: Web Applications

suggested reading:

Agile Web Development with Rails (3e),
by Ruby, Thomas, & Heinemeier Hansson

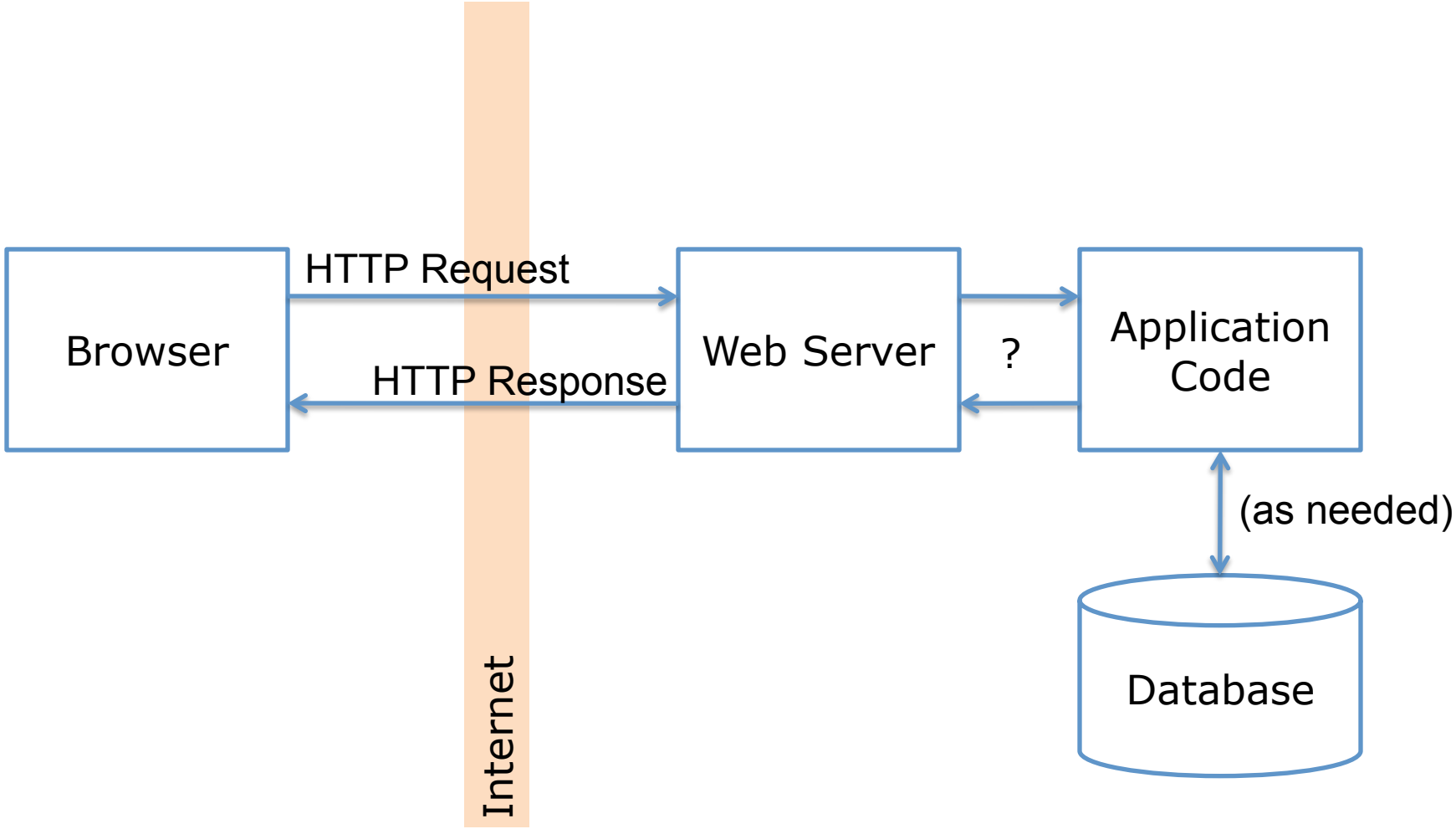
but I may be biased… (^_^)

HOMEWORK

What a Tangled Web We Weave

- In the beginning… static web pages
- Dynamic pages add interactivity
  - Forms
  - Banner ads
  - JavaScript
  - Web applications
  - Web 2.0
- Code runs on server, browser, both

Web Architecture



HTTP Request

```
http://foo.com/page?name1=val1&n2=2
```

- Path: **/page**
- Parameters (from URL, form, etc.):
  - **name1** => "**val1**"
  - **n2** => "**2**"
- Protocol version (1.0, 1.1)
- Stuff (req. method, headers, …)
- Server may add more to "request"

HTTP Response

- Status (OK or type of failure)
- Headers (type, length, date, etc.)
- Payload
  - HTML
  - image file
  - CSS
  - PDF
  - etc.

HTML

```
<h1>My Cat</h1>
<p>Picture of <em>my cat</em>:</p>
<img src="cat.jpg">
```

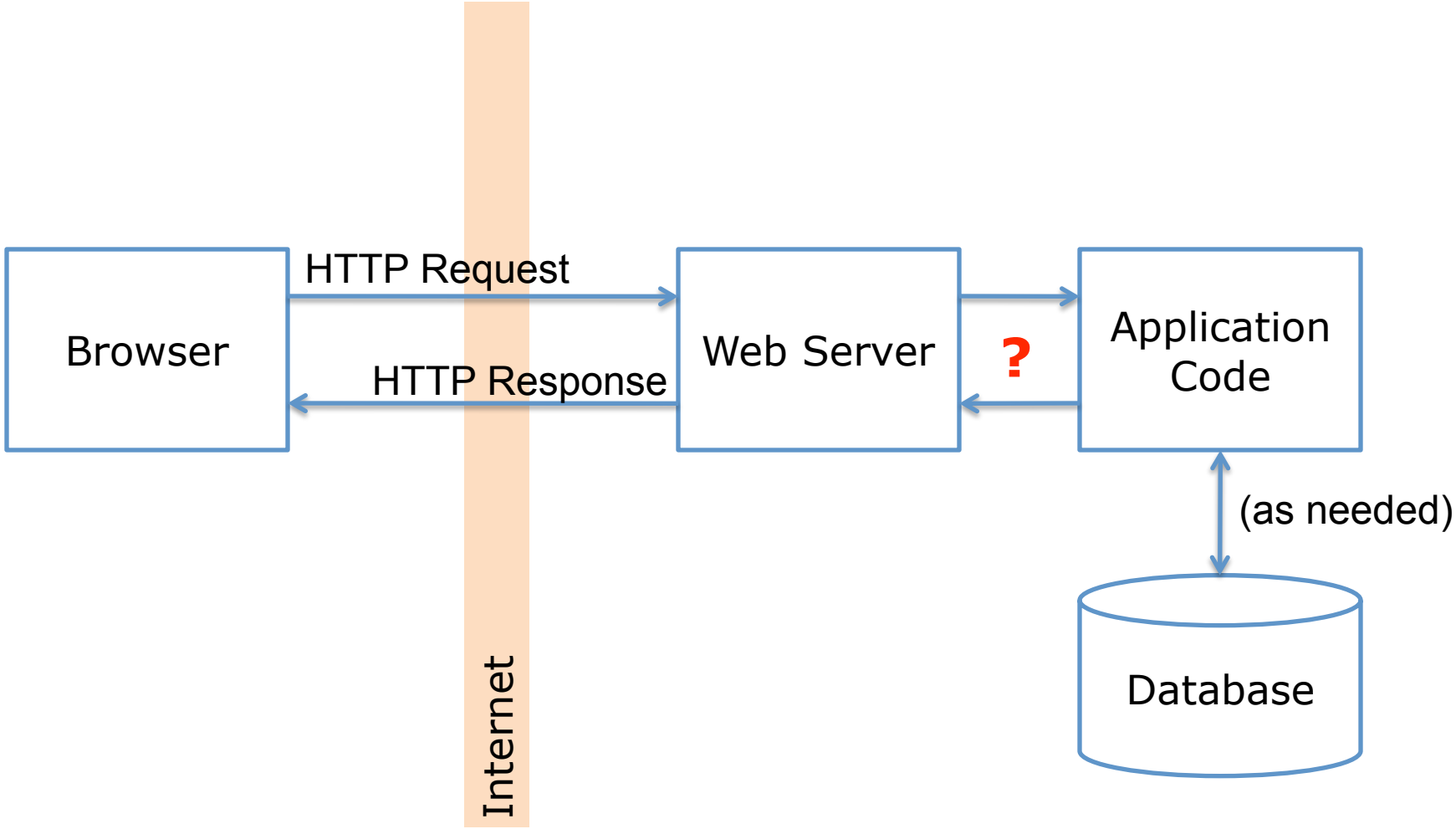
My Cat

Picture of *my cat*:

Dynamic Web Page

- Change HTML based on input
- Client-side (JavaScript, Flash, …):
  - Code loads along with page
  - Server not required after page load
- Server-side
  - Code runs on server *only*
  - Changes HTML *before* page is sent
  - Does not affect page after it's loaded

Web Architecture



CGI (Common Gateway Interface)

- Protocol between web server & app.
- Handles requests for dynamic pages
- Somewhat dated (but see FastCGI)
- Details:
  - Input via environment and stdin
  - Output via stdout
  - Output is: HTTP headers, blank, HTML
- Very quickly, gets tedious to code

Better Web Apps

- Use libraries to make things easy(er)
- Package request headers & params
- Make HTML generation easier
- Allow mixed HTML & code
- Examples:
  - Perl CGI
  - PHP
  - ASP

CGI.pm

```
use CGI;
my $query = new CGI;
my $name = $query->param('name');
print $query->header,
      $query->start_html('hello'),
      $query->h1("Hello, $name"),
      $query->end_html;
```

- OK for short code, but how do we organize longer applications?

Model-View-Controller (MVC)

- General code pattern
- Originally for GUI apps
- Helps organize code logically

Model

- Domain logic
- Domain data
- Data persistence (usu., database)

```
my $greeting = $salutation + $name;
my $expiration = today() + 14;
if (record_found()) {
  $total = record_total();
} else {
  $total = -1;
}
```

View

- Renders model element(s)
- Creates user interface

```
print $q->h3($greeting);
my $disp_tot =
  ($total >= 0 ? $total : 'n/a');
print $q->p("Total: $disp_tot");
print $q->p("Expires " .
  strftime('%M/%D/%Y', $expiration));
```

View Templates

- Simplify views using mostly HTML

```
...
<h1><%= @page_title %></h1>
<p>Hello, <%= @name %>!</p>
<% if @friends.size > 0 -%>
<p>
  Friends logged in:
  <%= @friends.join(', ') %>
</p>
<% end -%>
```

Controller

- Handles incoming requests
- Routes to correct code
- May initiate model changes
- May pick correct view

```
if ($q->param('update')) {
  update_totals();
}
render('summary');
```

Web Application Frameworks

- Next step up from a library
- Provides:
  - library functions
  - code organization scheme (e.g., MVC)
  - template system
  - database connectivity
  - object-relational mapping
  - INTEGRATION!
- Mason, Rails, Django, & dozens more

Live Rails Example