Using PHP in Web Applications

Internet Applications, ID1354

Contents

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- Server-Side Tasks
  - Cookies
  - HTTP Sessions
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  - Application Scope and File Handling
- AJAX
- Server-Side Architecture
- The Flight Framework

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- A cookie is a name/value pair passed between browser and server in the HTTP header.
- A cookie is only passed to the server from which it originated.

To Set a Cookie

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           string $domain, bool $secure = false,
           bool $httponly = false)
```

- **`name`** and **`value`** is the cookie's name/value pair.
- **`expire`** tells the instant in time when the cookie expires. **`time()`** returns the current time, so **`time()+60*60*24*30`** sets the cookie to expire in 30 days.

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- The following statement retrieves all cookies with the name **`userid`**.

```
$_COOKIE["userid"];
```

- The **`isset`** function can be used to check if a cookie is set.

```
if (!isset($_COOKIE["userid"])) {
    echo '<a href="login.php">log in</a>';
}
```

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- If many servers set the same third party cookie, the third party server can track the user's surfing.
- Typically used for marketing.
- There are many other ways, beside cookies, to identify a user for tracking purposes, for example IP address, installed software, fingerprinting browser information, social networks, pixel placement + url rewriting, etc.

The EU Cookie Law

A person shall not store or gain access to information stored, in the terminal equipment of a subscriber or user unless the requirements of paragraph (2) are met.

(2) The requirements are that the subscriber or user of that terminal equipment

1. is provided with clear and comprehensive information about the purposes of the storage of, or access to, that information; and
2. has given his or her consent.

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  - Not relevant here.
- The cookie is strictly necessary for the provision of an information society service requested by the subscriber or user.
  - Likely applies to authentication and shopping baskets.

Do Not Track Specification

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- Defines a HTTP header, and how to handle it on the server.
- It is not mandatory in any way to obey the users preferences.
- Must be implemented by server developer.

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- The UID is stored on the client, for example in a cookie or as part of URLs, and included in each request to the server.
- The only way to terminate a session is to manually unset all data related to the session in the server-side code.
- If a session is not explicitly terminated, it times out after an interval specified in server configuration, and session data is removed.

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- To delete all data from the session, use the `session_destroy` function.
- To stop a malicious user from faking a cookie with a session id, you have to keep track of valid sessions on the server.

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- This means that a variable created in one request will not exist in later requests.
- Therefore, the content of **`$_SESSION`** must be stored externally to the PHP interpreter.
- This storage is called a session save handler, and is configurable. Normally, and also normally by default, a file is used.

Session Example

At session start

```
const USER_KEY = 'user_key';
session_start();
//Assuming $user is an object with user data.
$_SESSION[USER_KEY] = serialize($user);
// If necessary to stop faked sessions.
add_to_my_valid_sessions(session_id());
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During the session

```
if (isset($_SESSION[USER_KEY])) {
   $my_data = unserialize($_SESSION[USER_KEY]);
}
```

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At session end.

```
// If keeping track of valid sessions.
remove_from_my_valid_sessions(session_id());
session_destroy();
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- **`$_GET`** is an array with all parameters in a HTTP GET request, **`$_POST`** is a similar array for a POST request.
- User input should be validated with JavaScript on the browser, since client-side validation is fast and reduces server load.
- Server-side validation is also needed since user might turn off JavaScript.

HTTP Parameter Example

The following code retrieves the value of the **address** parameter, which might originate from an HTML form.

```
//The text field where the user types the address
//must have the attribute name='address'

const ADDRESS_KEY = 'address';
if (isset($_POST[ADDRESS_KEY])) {
    $address = $_POST[ADDRESS_KEY];
}
```

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- If data is to be shared between different users, such a mechanism must be constructed.
- A simple approach is to store data with application scope in a file.
- Other alternatives are a database, an xml file or a plug-in such as memcached, `http://www.memcached.org/`, which stores key/value pairs in memory.

File Handling

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```
\file_put_contents($path_to_file,
                   $data, FILE_APPEND);
```

```
\file_get_contents($path_to_file));
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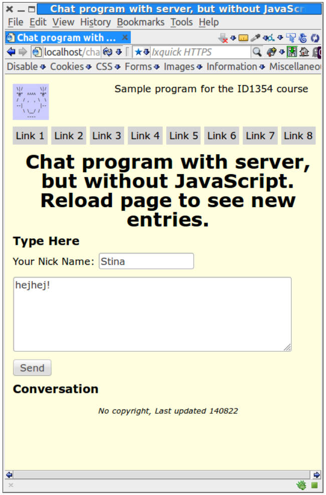
- Here, to load an entire page means that all HTML in the page is read from the server.
- Dynamic data is included on the server, before the HTML is sent to the client, for example using a PHP program.
- This behavior is appropriate if the entire page content really must change, but that is often not the case.

Loading an Entire Page


Chat program with server, but without JavaScr

Sample program for the ID1354 course

Link 1 Link 2 Link 3 Link 4 Link 5 Link 6 Link 7 Link 8

Chat program with server, but without JavaScript. Reload page to see new entries.

Type Here

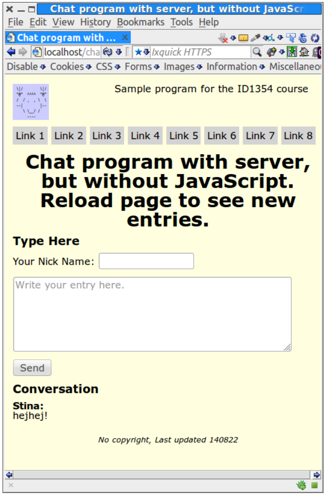
Your Nick Name: Stina

hejhej!

Send

Conversation

No copyright, Last updated 140822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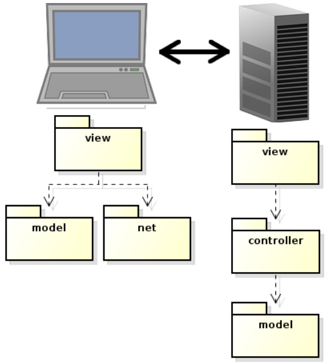
Consider for example the sample chat application. All that happens when the user clicks **`Send`** is that the new entry is added, the rest of the page is untouched.

Repetition: The MVVM Pattern



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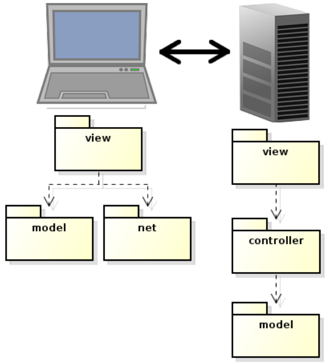

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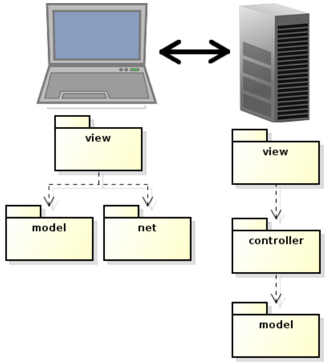

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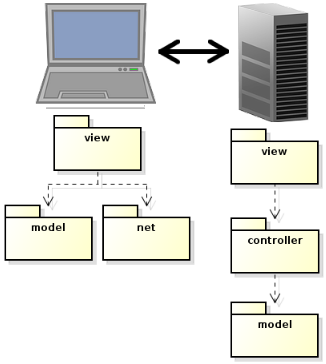

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- State changes, which means new data, are stored in the viewmodel.
- Therefore, the viewmodel will always contain the current state of the application.
- The browser view must reflect the viewmodel state, preferably using the observer pattern.

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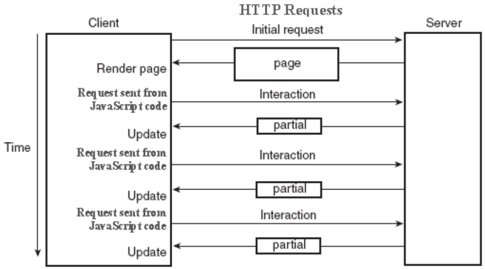
- AJAX is basically a way to use existing technologies, such as JavaScript, HTTP and XML.
  - No new language or markup.
- The only thing specific for AJAX is a JavaScript object, called **`XMLHttpRequest`**, which is standardized by W3C.

How Does It Work?



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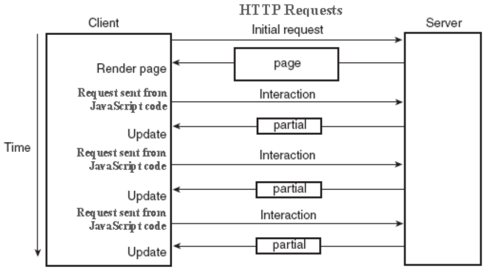

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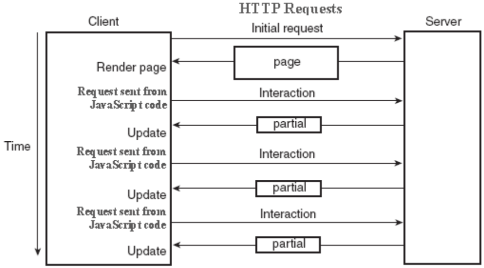

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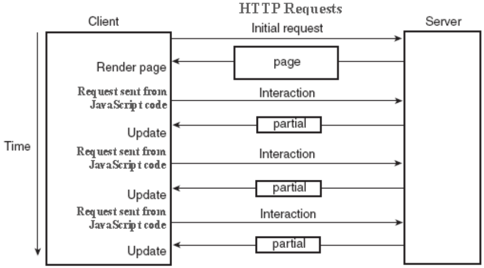

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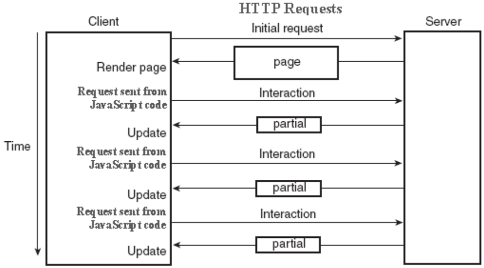

- Web page is loaded only on first request.
- Subsequent requests come from JavaScript code, using **`XMLHttpRequest`**.
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- Returned data is available to JavaScript code, and is used to update the web page, by updating the DOM.

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- The server directs the request to the specified resource, just as when loading a HTML document.
  - Actually, the server can not tell who issued the request.
- An AJAX request is normally handled by a program, for example PHP, which generates a response containing the new data.

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  - Using a XSLT stylesheet to generate a view is a bit tricky.
  - XML documents are quite long and wordy.
- Therefore, **J**ava**S**cript **O**bject **N**otation, JSON, is normally used instead of XML.
  - Compact and easy to translate to JavaScript objects.

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  - Arrays are denoted with **[** and **]**:

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  - Data types are JavaScript types, for example string, **“abcd”**; integer, **`123`**; boolean, **`false`**

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- JSON is just a format suitable for transferring JavaScript values.

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The Client: jQuery AJAX Methods

- Instead of covering the **`XMLHttpRequest`** object, we will look at some convenient jQuery functions.
- **`getJSON`** sends a HTTP GET request. Data can be included as a query string and the response is parsed as JSON data.
-
```
$.getJSON(url, "reqData=" + someVariable,
          function(returnedData) {
            //Handle returnedData, which is
            //the received JSON data, parsed
            //to a JavaScript variable.
          });
```

  An HTTP GET request is sent to the URL specified in **`url`**. The request has the query string **`reqData=<value of someVariable>`** and the anonymous callback function is executed when the server's response arrives.

jQuery AJAX Methods (Cont'd)

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- `json_encode($aPhpObject)`

  The **`json_encode`** PHP method encodes the PHP object in **`aPhpObject`** to JSON representation.

JSON handling in PHP (Cont'd)

```
class SomeClass implements \JsonSerializable {
   private $some_var;
   ...
   public function jsonSerialize() {
      $json_obj = new \stdClass;
      $json_obj->someVar = $this->some_var;
      ...
      return $json_obj;
   }
```

JSON handling in PHP (Cont'd)

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1. The client inserts data from server into the DOM. An attacker may place malicious JavaScript in this data, which is executed on the client without the user knowing.
2. An attacker can submit malicious data in an AJAX call. This threat is not AJAX specific, but AJAX often drastically increases the number of requests.This creates new doors on the server, which must all be protected.

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3. All security controls for submitted data must be performed on the server. Examples of such controls are authentication (log in) and data validation.

AJAX Security (Cont'd)

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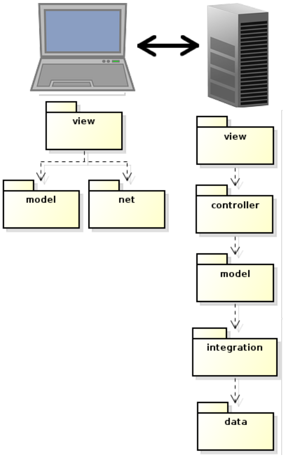
  - http://www.symantec.com/connect/articles/ajax-security-basics

Section

Remember: Server-Side Layers



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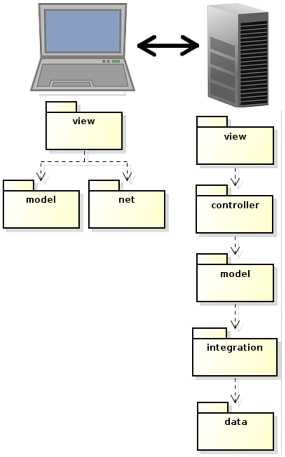
Remember: Server-Side Layers



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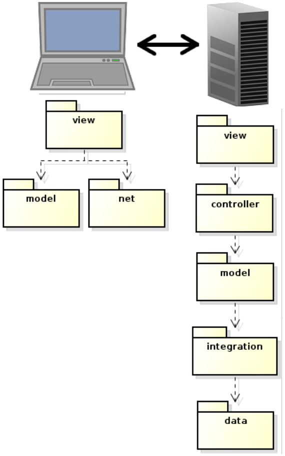

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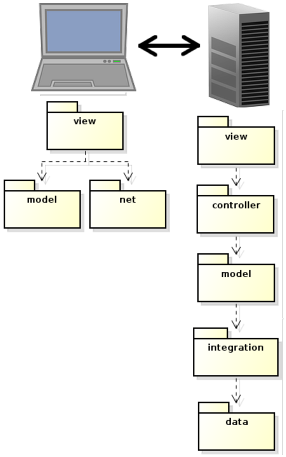

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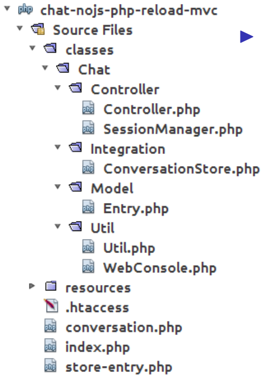
- The server's view layer gets HTTP requests and creates HTML/JSON responses.
- The MVC pattern states that all UI related code shall be in the view. From controller and down there is only plain object-oriented code.

- This means that controller and lower layers are coded exactly as for a stand-alone application. Only the view is specific for a web application.

File Structure


```
▾ chat-nojs-php-reload-mvc
  ▾ Source Files
    ▾ classes
      ▾ Chat
        ▾ Controller
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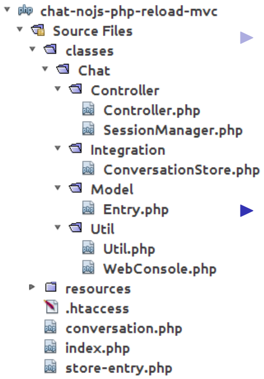
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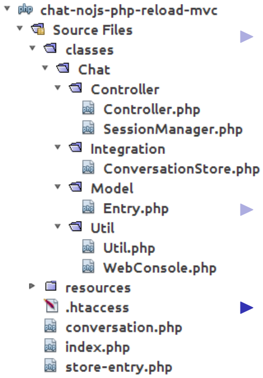

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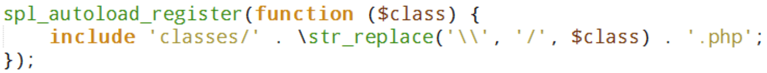

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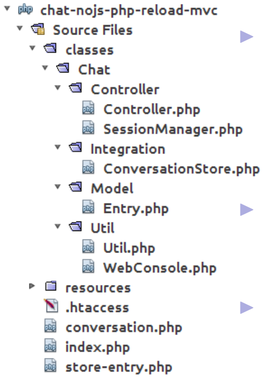

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- We can also protect classes from direct HTTP access by denying access to the **`classes`** directory.

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- If the response is a HTML document, we also need to include a HTML file, since we do not want to mix the HTML document with the PHP classes.

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  - Lots of documentation, easy to get help.
  - Infrastructure code is difficult to write.
  - Preferably, the framework should use callbacks, i.e., the framework calls our code. Thus, the framework also handles flow control.

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- Then, we will identify what we need the framework to do.
- Third, we will look at the chat with a framework.

Without Framework, **index.php**

```
require_once 'classes/Chat/Util/Util.php';
\Chat\Util\Util::initRequest();

$controller = \Chat\Controller\SessionManager::getController();
$conversation = $controller->getConversation();
\Chat\Controller\SessionManager::storeController($controller);

include 'conversation.php';
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- Line 1 loads the **`Util`** class. Since the autoloader is not yet registered, it is loaded manually.
- Line 2 calls the **`initRequest`** method, which performs tasks similar for all requests.
- Line 4 gets the controller stored in the current session. Remember that all state is lost after a request. Therefore, we have to store the controller, with its references to the model, in the session.

index.php (Cont'd)

```
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- Line 5 is the method call to the controller to handle the HTTP request to show the conversation. It is retrieved and stored in **`$conversation`**.
- Line 6 again stores the controller in the session, for use in the next request.
- Line 8 shows the next view. Note that **`$conversation`** is available in that view.

Util.php

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 1 public static function initRequest() {
 2     spl_autoload_register(function ($class) {
 3         include 'classes/' . \str_replace('\\', '/', $class)
 4                 . '.php';
 5     });
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 7     if (\session_id() === '') {
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10     self::defineHttpParams();
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```

- Lines 2-5 registers the autoloader.

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- Lines 2-5 registers the autoloader.
- Lines 7-9 starts a session if there is none.
- Line 10 creates constants for HTTP parameter keys:

```
const SYMBOL_PREFIX = "CHAT_";

private static function defineHttpParams() {
    self::defineHttpParam('AUTHOR_KEY', 'nickName');
    self::defineHttpParam('MSG_KEY', 'msg');
}
private static function defineHttpParam($param, $value) {
    define(self::SYMBOL_PREFIX . $param, $value);
}
```

SessionManager.php

```php
public static function getController() {
    if (isset($_SESSION[self::CONTROLLER_KEY])) {
        return unserialize($_SESSION[self::CONTROLLER_KEY]);
    } else {
        return new \Chat\Controller\Controller();
    }
}

public static function storeController(
            \Chat\Controller\Controller $controller) {
    $_SESSION[self::CONTROLLER_KEY] = serialize($controller);
}
```

- **`SessionManager`** has methods for storing and reading the controller to/from the **`$_SESSION`** superglobal.

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The view, **`conversation.php`**

- The view should consist of only HTML. Unfortunately, this goal is not reached:
- First, since there are header, footer and navigation fragments that appear on each page, we have to include them to avoid duplicated code. These inclusions are PHP statements, see lines 2 and 6 below.

```
1 ...
2     <header class="section group">
3         <?php include ’resources/fragments/header.html’; ?>
4     </header>
5 <main class="section group">
6     <nav class="section group">
7         <?php include ’resources/fragments/nav.html’; ?>
8     </nav>
9 ...
```

The view (Cont'd)

- Second, to generate the conversation view from the **`$conversation`** variable is also PHP code.

```
  ...
<div class="col span_4_of_4">
    <?php
    if (!empty($conversation)) {
        foreach ($conversation as $entry) {
            echo("<p class='author'>" . $entry->getNickName()
                  . ":</p>");
            foreach ($entry->getMsg() as $line) {
                echo("<p class='entry'>" . $line . "</p>");
            }
        }
    }
    ?>
</div>
  ...
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- Now we have seen all view code, which is normally the hardest part of a web application.

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- Now we have seen all view code, which is normally the hardest part of a web application.
- Controller and lower layers are plain PHP code, created with normal object-oriented analysis, design and programming methodologies.

Let's Look for Infrastructure Code

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- One could argue that the call to the controller in `index.php` is application specific. However we are rid of also this line if the framework allows us to specify a URL-to-method mapping, which most frameworks do.
- One could also argue that the names of the HTTP parameters are application specific, but most frameworks enable specifying those as method parameters in the URL to method mapping.

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  - Class loading, i.e., include PHP class files.
  - Routing, which means to map a URL to a specified method in a specified class.
  - HTTP parameters. It should be possible to specify how parameters are passed as arguments to the methods specified by the routing rules.

Infrastructure Code (Cont'd)

- Therefore, the framework must handle:
  - Class loading, i.e., include PHP class files.
  - Routing, which means to map a URL to a specified method in a specified class.
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  - HTTP parameters. It should be possible to specify how parameters are passed as arguments to the methods specified by the routing rules.
  - HTTP sessions
  - Templating, which means to generate a view from data, we need something to replace the PHP code looping through the **`$conversation`** variable.

Infrastructure Code (Cont’d)

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  - Composite views, there should be a mechanism to specify fragments (header, footer etc) for inclusion without having to mix HTML and PHP.
  - Not only should it be possible to reuse the fragments, also the page layout should be reused. This means only the content of the main area should be specific for a page.

Infrastructure Code (Cont'd)

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- There are also many other requirements that should be managed by the framework, but which we have skipped in this small example. Some examples are:
  - Navigation, to map a request to the next view without hardcoding.
  - Validation of HTTP parameters.
  - Various security issues, like authentication (to log in).

Section

- Server-Side Tasks
- AJAX
- Server-Side Architecture
- The Flight Framework

PHP Frameworks

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- Yet, it provides some very useful features, for example class loading, routing and composite views.
- Other features, on the other hand, are missing. For example there is no templating or session handling.
- Now, we will look at parts of the Flight framework and how it changes the Chat application.

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- These routes are checked for each request, the method indicated by the first found matching route is called.

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- Note that the parameters shall be path elements of the URL, not HTTP request parameters.

Composite Views

- Flight provides a basic mechanism for composite views. It is possible to define a HTML layout page, into which the page fragments are inserted.

```
<body>
    <header class="section group">
        <?php echo $header_content; ?>
    </header>
    <main class="section group">
        <nav class="section group">
            <?php echo $nav_content; ?>
        </nav>
        <?php echo $body_content; ?>
        <footer class="section group">
            <?php echo $footer_content; ?>
        </footer>
    </main>
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```

- Finally, the HTML page is rendered.

```
\Flight::render($this->layout, NULL);
```

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  - We still need PHP code to create the composite view.
  - Store and retrieve controller in session superglobal.
  - Pass HTTP parameters to setters and getters.
  - This is handled in the class **`AbstractExecutor`**. Normally, there is such a class in the framework.

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- Adding more functionality involves only new implementations of **`AbstractExecutor`**, new routes in **`index.php`** and ordinary object-oriented code in controller and lower layers.
- All this is application specific!