Connecting the Dots

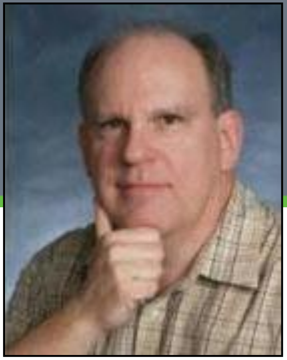
Building Web Applications with PHP, HTML, CSS, and JavaScript

John Valance
division 1 systems
johnv@div1sys.com

<div1>

www.div1sys.com

About John Valance



- **Independent consultant since Feb. 2000**
- **Founder and CTO of Division 1 Systems**
  - Helping IBM shops develop web applications and related skills
  - Extended team of 150+ technical people
  - Web and mobile systems development, design, project management
  - Training, mentoring, consultation and coding
- **30+ years IBM midrange experience (S/38 thru IBM i)**
- **15+ years of web development experience**
- **Frequent presenter on web development topics**
- **Relationship with Zend Technologies**
  - Taught Intro to PHP for RPG programmers for 4 years
  - Zend Certified Engineer
  - Zend Reseller

Goals of Presentation

- Introduce web development concepts to web beginner (experienced RPG programmer)
- Introduce major technical concepts and how components interact
- Introduce language syntax
- Show-and-tell demos and code examples (fun stuff)
- Prepare you for labs on HTML, CSS, PHP and JavaScript
- Come away with an idea of how to start

Languages Involved in a PHP Database Application

- **Client side (web browser):**
  - HTML
  - CSS
  - JavaScript

These are universal – part of all browser based applications

- **Server side (IBM i):**
  - PHP
  - SQL (accessing DB2 tables)
  - Possibly RPG & CL
    - Called via stored procedures or Zend Toolkit for IBMi

Server side could be any languages, though SQL usually involved

HTML

HTML Sample Structure

```
<!DOCTYPE html>
<html>
    <head>
      <title>Stat
    </head>

    <body>
      <h1>Hello,
    </body>
</html>
```

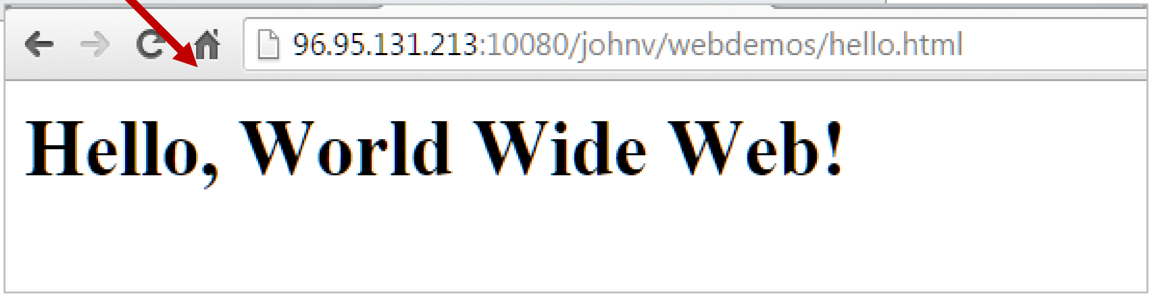
This ensures HTML5

<head>section not visible to user

<html> always outer-most tag. Defines document

<body>section contains all visible contents

Looks like this in browser:

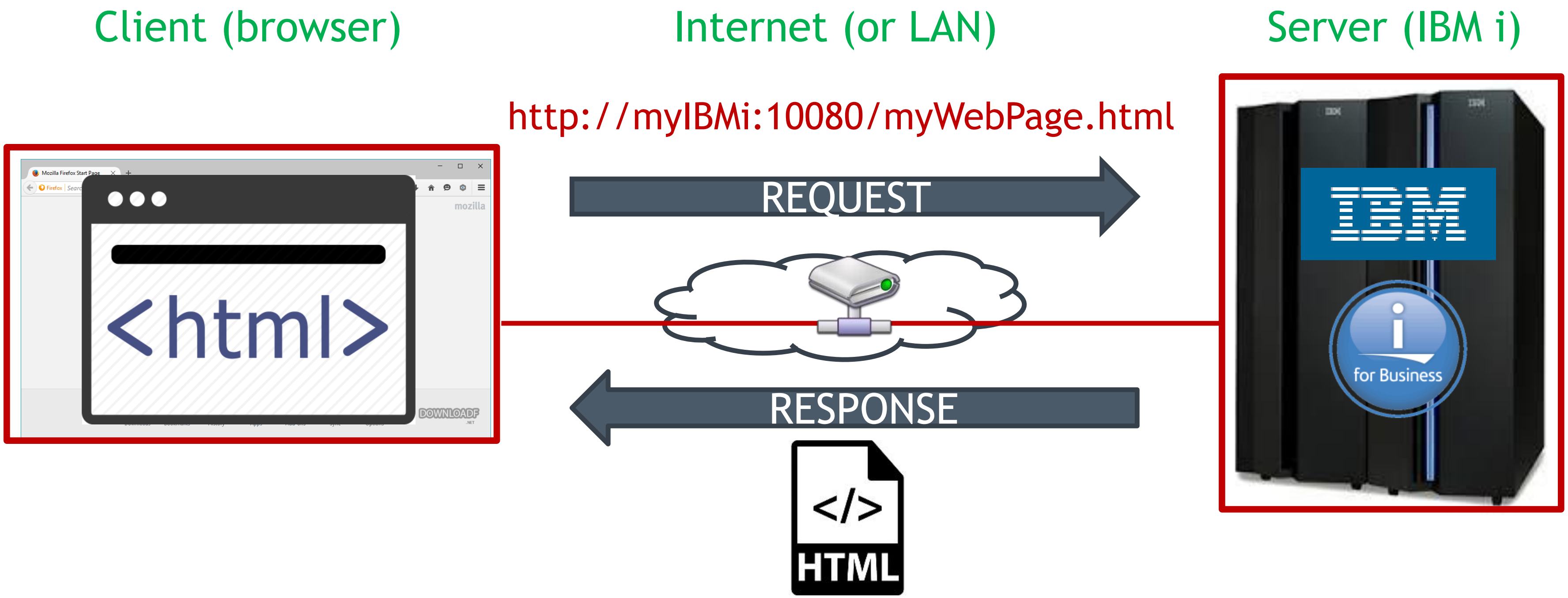


96.95.131.213:10080/johnv/webdemos/hello.html

Hello, World Wide Web!

HTTP Request/Response Cycle

- **REQUEST (Client) :**
  - User types URL in browser
    - http://www.mydomain.com/index.html
  - Browser connects to server and requests file
- **RESPONSE (Server):**
  - Apache server on www.mydomain.com listens for requests on port 80
  - Looks for index.html in web folder
  - If found, Apache retrieves file and sends it back to browser
- **Done!**
  - Connection is dropped



Client (browser)

Internet (or LAN)

Server (IBM i)

http://myIBMi:10080/myWebPage.html

REQUEST

RESPONSE

REQUEST:

- User types URL in browser
  - http://www.mydomain.com/index.html
- Browser connects to server and requests file
- Apache server listens for requests on port 80

RESPONSE:

- Apache retrieves file from IFS folder
  - Document root = /www/zendsvr6/htdocs
- Apache sends file back to browser

Done!

- Connection is dropped
- HTTP is a *Stateless* protocol
  - Applications must simulate statefulness between requests
  - Easy with PHP session variables

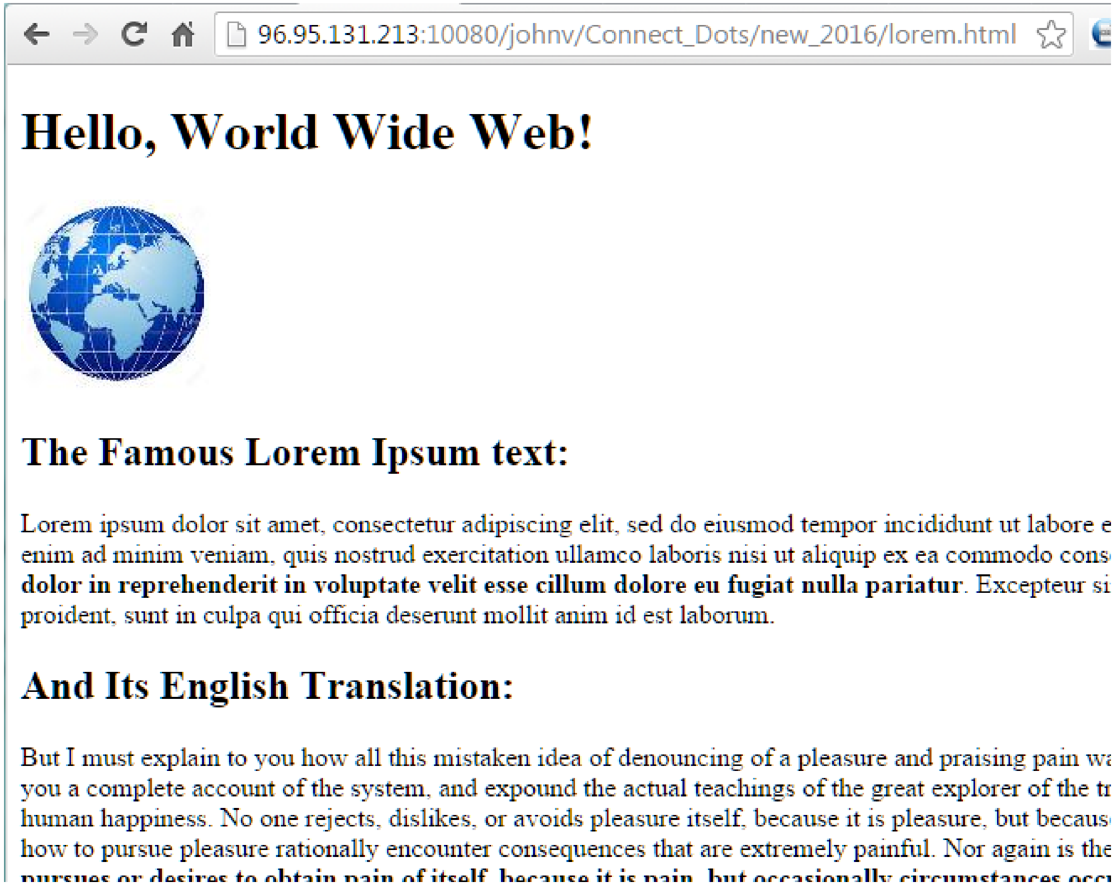
Where Are Web Files Stored?

- **In the “Document Root”:**
  - IFS Folder
  - For Zend Server on IBM i, doc root = /www/zendsvr6/htdocs
- **hello.html**
  - **IFS path:** /www/zendsvr6/htdocs/hello.html
  - **URL:** http://myibmi:10080/hello.html
- **Doc Root can have subfolders:**
  - **IFS path:** /www/zendsvr6/htdocs/**ecomm**/login.php
  - **URL:** http://myibmi:10080/**ecomm**/login.php

Basic Formatting – Lorem Ipsum

- **Demo of unstyled HTML**
  - look at source code

- **Then we will add CSS**



Hello, World Wide Web!

The Famous Lorem Ipsum text:

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore e
enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo cons
dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur si
proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

And Its English Translation:

But I must explain to you how all this mistaken idea of denouncing of a pleasure and praising pain wa
you a complete account of the system, and expound the actual teachings of the great explorer of the tr
human happiness. No one rejects, dislikes, or avoids pleasure itself, because it is pleasure, but becaus
how to pursue pleasure rationally encounter consequences that are extremely painful. Nor again is the
pursues or desires to obtain pain of itself, because it is pain, but occasionally circumstances occu

CSS

Styling with CSS

- CSS = Cascading Style Sheets
- Extension to HTML as of HTML v 4
- Allows fine-grained control of visual elements on a page
- Simple, intuititive syntax

Demo menu 14, 15

CSS Syntax

```
selector {
        property: value;
        property: value;
        . . .
}
```

- **selector**: identifies a part of the document to be styled

  HTML tag name, Class name, or a Unique ID

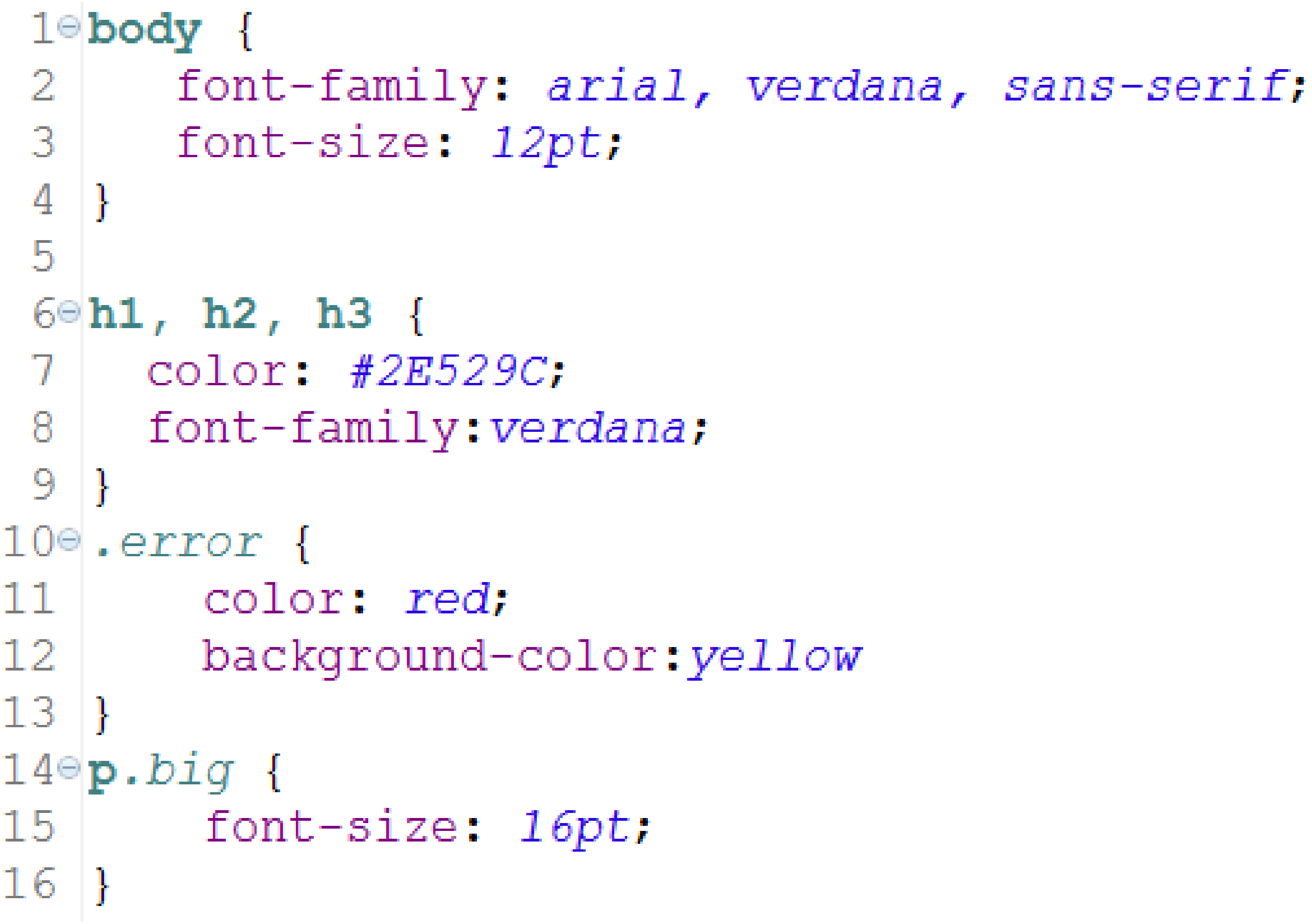
- **property**: A specific presentation attribute to be styled

  color, font-weight, border attributes, visibility

- **value**: How the presentation attribute should be styled

  ```
  color: red;
  font-weight: bold;
  border: 2px solid blue;
  ```

CSS Style Sheet Example



```
body {
   font-family: arial, verdana, sans-serif;
   font-size: 12pt;
}

h1, h2, h3 {
  color: #2E529C;
  font-family:verdana;
}
.error {
    color: red;
    background-color:yellow
}
p.big {
    font-size: 16pt;
}
```

Examples of CSS Selectors

- **HTML Tag Name:**

  CSS: `BODY { font: arial; font-size: 12pt; color: navy }`

  - *Can use any HTML tag name*
  - *Applies to all occurences of the tag throughout a document*

- **Class Name - precede with period (.) :**

  CSS: `.error { color: red; font-weight: bold}`

  HTML: `<p class=“error”>Invalid email address</p>`

  - *Can specify the same class on many different HTML tags*

- **Unique ID - precede with hash (#):**

  CSS: `#shipto { visibility: hidden }`

  HTML: `<div id=“shipto”> <table>... </div>`

  - *ID name should only occur once in HTML document*

Where Can Styles Be Defined?

- Inside a single HTML element

```
<table style=“border:none; color:blue”>
Applies only to this one element and its descendents
```

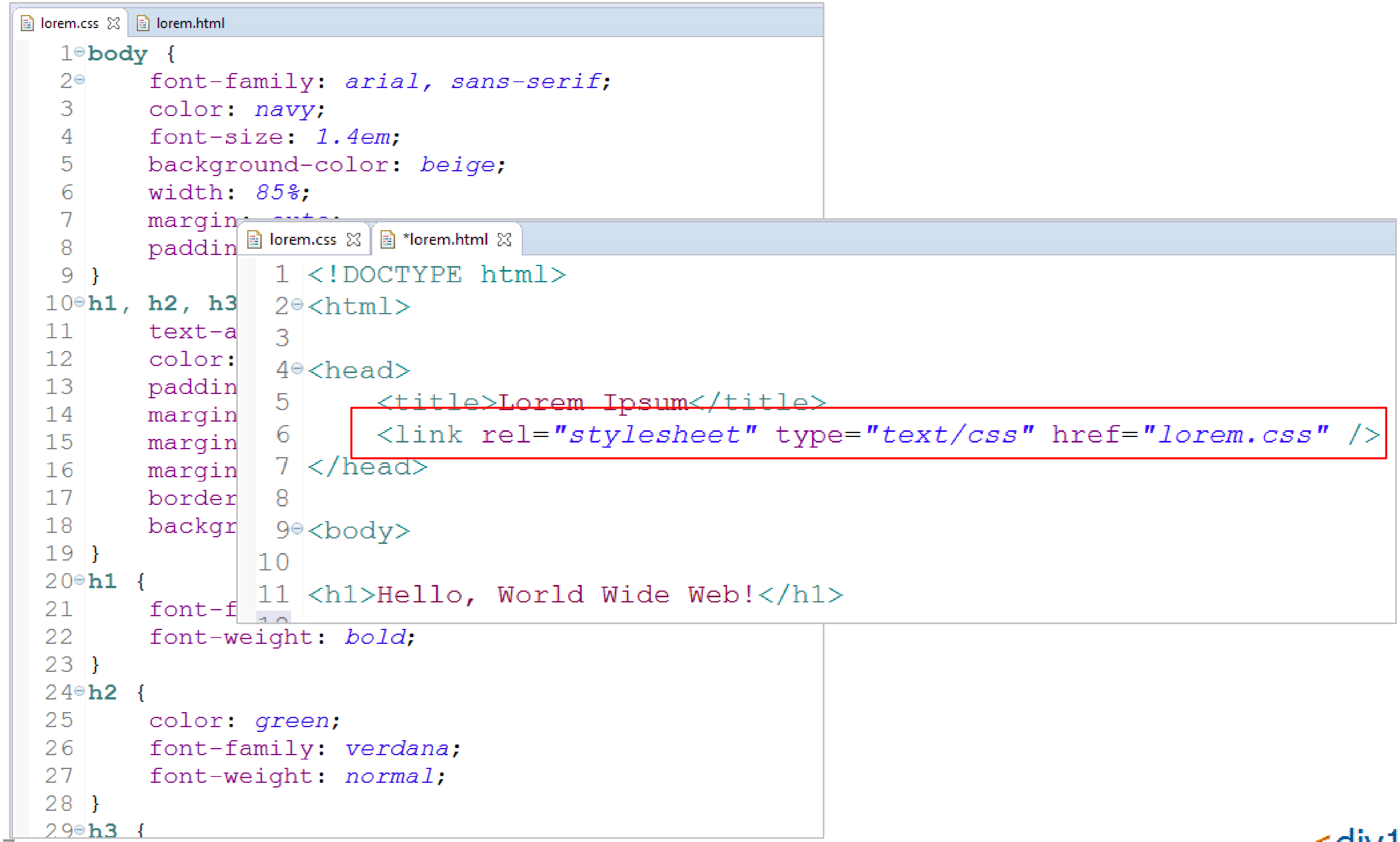
- Inside the <head> element of an HTML page

```
<head>
  <style type=“text/css”>
     table { border:none; color:blue }
  </style>
</head>                 Applies to the entire document (web page)
```

- In an external CSS file

```
<head>
  <link rel="stylesheet" type="text/css” href=“siteStyle.css" />
</head>    Can be used on every page of an entire site/application
```

Adding External Style Sheet to lorem.html



```
body {
    font-family: arial, sans-serif;
    color: navy;
    font-size: 1.4em;
    background-color: beige;
    width: 85%;
    margin: auto;
    paddin
}
h1, h2, h3
    text-a
    color:
    paddin
    margin
    margin
    margin
    border
    backgr
}
h1 {
    font-f
    font-weight: bold;
}
h2 {
    color: green;
    font-family: verdana;
    font-weight: normal;
}
h3 {
```

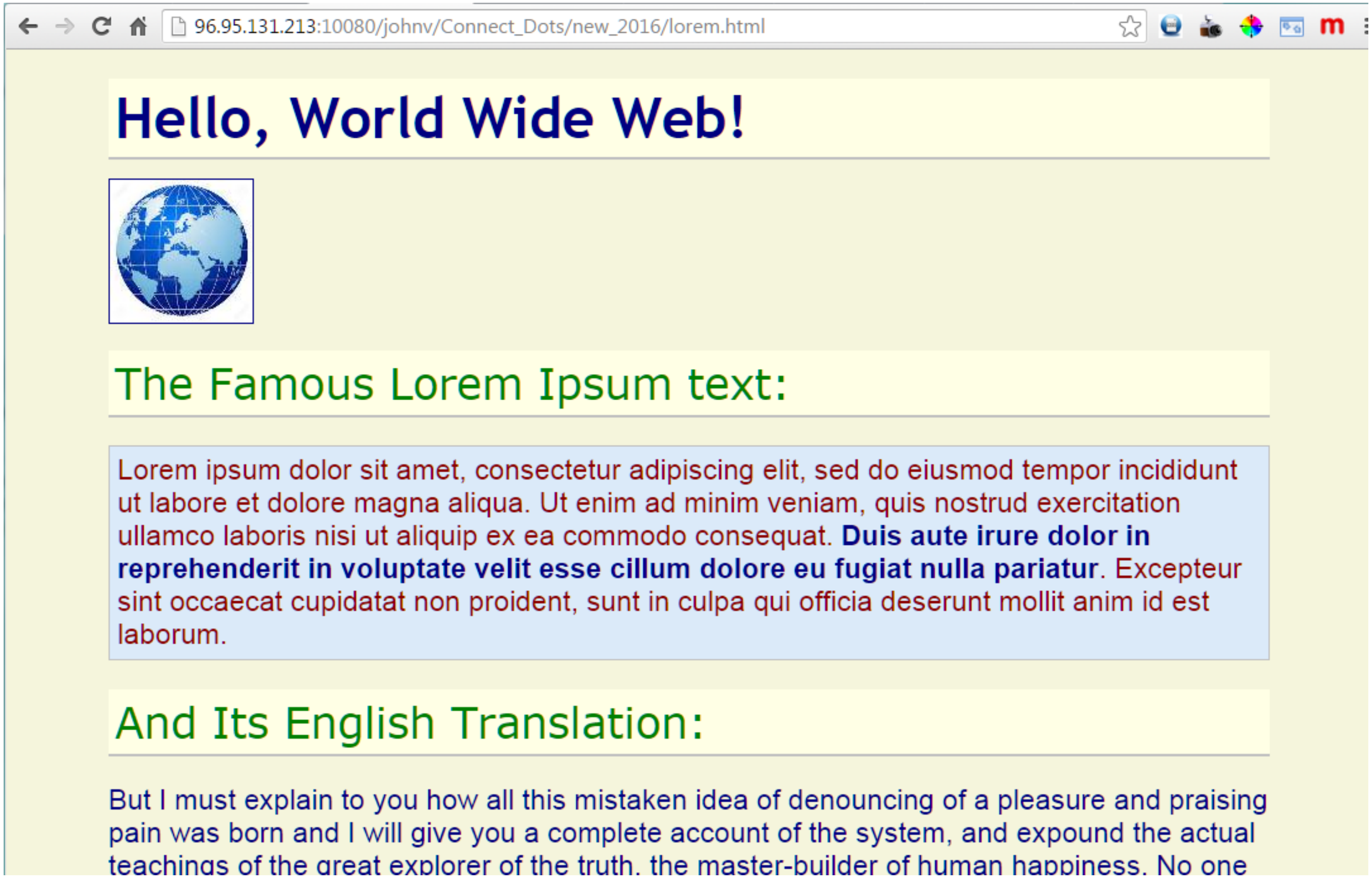
```
<!DOCTYPE html>
<html>

<head>
    <title>Lorem Ipsum</title>
    <link rel="stylesheet" type="text/css" href="lorem.css" />
</head>

<body>

<h1>Hello, World Wide Web!</h1>
```

Styled HTML using lorem.css style sheet



Hello, World Wide Web!

The Famous Lorem Ipsum text:

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. **Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur**. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

And Its English Translation:

But I must explain to you how all this mistaken idea of denouncing of a pleasure and praising pain was born and I will give you a complete account of the system, and expound the actual teachings of the great explorer of the truth, the master-builder of human happiness. No one

PHP

HTTP Request/Response - *PHP File*

- **Client requests file `myApp.php` from web server**
- **Apache sees '.php' file request**
  - File is retrieved and ***handed to PHP processor***
    - PHP file may ***combine HTML with embedded PHP code***.
    - Embedded PHP code is executed, which *may retrieve information from database*, and merge database content with HTML
- **Apache receives document (HTML) back from PHP**
- **Apache sends HTML back to browser**
- **Done!**

Simple PHP - Dynamic Content

```
<!DOCTYPE html>
<html>
<head>
<title>Hello world</title>
<link rel="stylesheet" type="text/css" href="lorem.css" />
</head>

<body>
<h2>Hello world wide web!</h2>

<p class="box">
<?php
echo 'This is a constant string.<br>';
$dateFormatted = date('D M d, Y \a\t g:i:s A');
echo "The current date and time is <b>$dateFormatted</b>.";
?>
</p>
</body>
</html>
```

- **PHP code block**
  1. Processing instructions
  2. Use echo to add dynamic content to HTML

PHP Code Block details

```php
<?php
echo 'This is a constant string.<br>';
$dateFormatted = date('D M d, Y \a\t g:i:s A');
echo "The current date and time is <b>$dateFormatted</b>.";
?>
```

- All php code blocks are surrounded by <?php and ?>
- PHP code will never be seen in the browser
- Only output from an `echo` or `print` statement will be seen in the browser (and a few other functions).
- Variables all start with ‘$’
- Rich string handling capabilities
  - variable interpolation

Arrays in PHP

- **Many features of PHP implemented as arrays**
  - Over 60 array handling functions
  - Very powerful aspect of PHP

- **Two types of arrays:**
  - Numeric Array:
    - index is an integer
    - starts at zero
  - Associative arrays:
    - index is character string
    - “key => value” lists

Numeric vs. Associative Arrays

Numeric array (zero-based):

```php
$fruit = array('apples', 'oranges', 'bananas');
echo $fruit[0];  // apples
echo $fruit[2];  // bananas
$fruit[100] = 'grapes';
$fruit[] = 'pears';  // assigned to $fruit[101]
```

Associative array (character index):

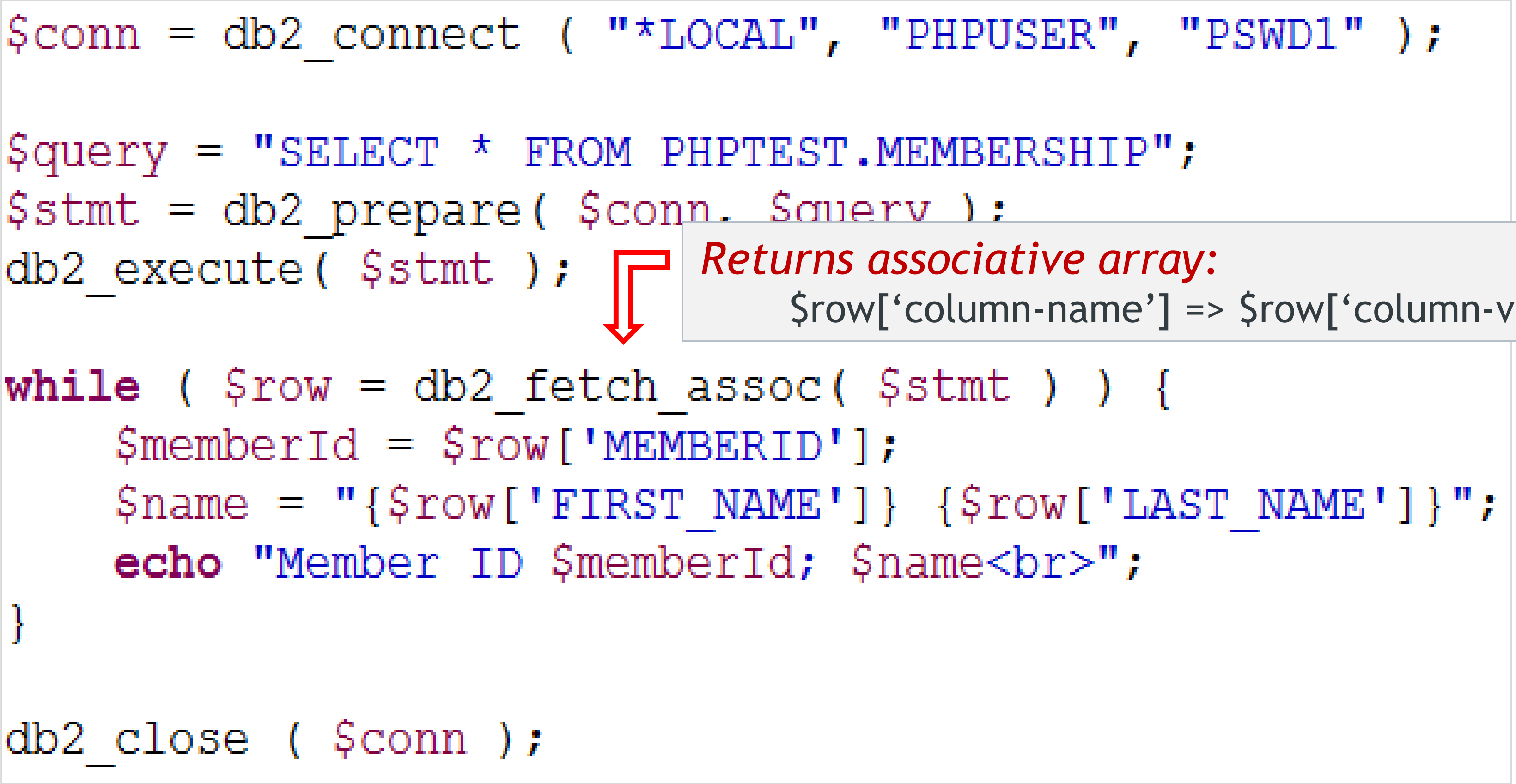
```php
$states = array(
    'CT' => 'Connecticut',
    'RI' => 'Rhode Island',
    'MA' => 'Massachusetts'
);
echo $states['RI'];  // Rhode Island
$states['VT'] = 'Vermont';  // add new element
```

Other features of PHP arrays

- **Multi-dimensional arrays**
  - any depth
- **Mixed data types in one array**
  - any combination of data types (including arrays - see above)
- **Numeric and Associative keys in same array**
- **Can add elements at run time**
  - arrays can grow infinitely
- **Useful for passing multiple values in/out of functions**

PHP Database Access

List all records from DB table:



```
$conn = db2_connect ( "*LOCAL", "PHPUSER", "PSWD1" );

$query = "SELECT * FROM PHPTEST.MEMBERSHIP";
$stmt = db2_prepare( $conn, $query );
db2_execute( $stmt );

while ( $row = db2_fetch_assoc( $stmt ) ) {
    $memberId = $row['MEMBERID'];
    $name = "{$row['FIRST_NAME']} {$row['LAST_NAME']}";
    echo "Member ID $memberId; $name<br>";
}

db2_close ( $conn );
```

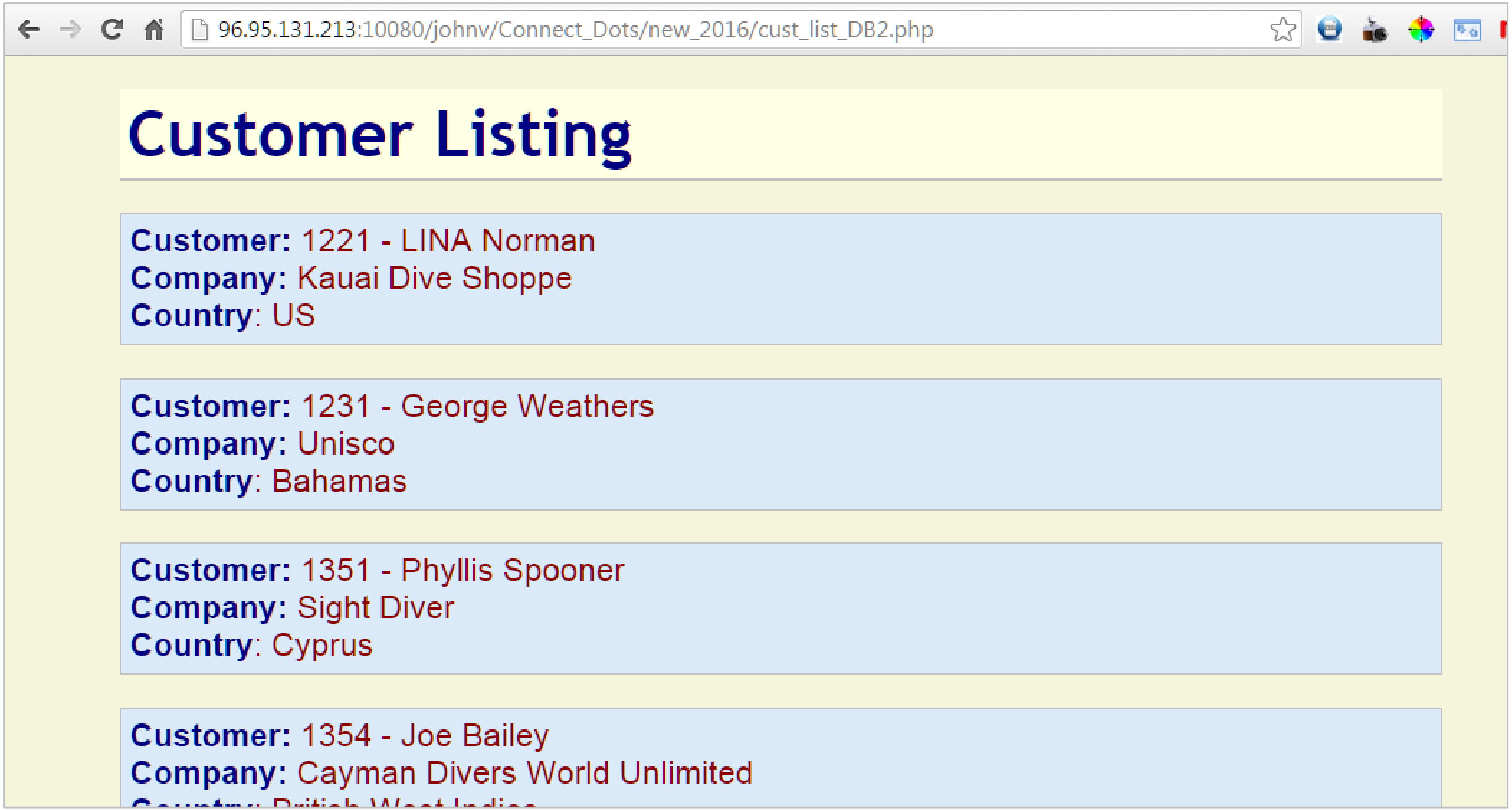
Returns associative array:

$row[‘column-name’] => $row[‘column-value’];

Demo menu 10, 11, 13

Customer Listing PHP (using <p> tags)

cust_list_DB2.php:



96.95.131.213:10080/johnv/Connect_Dots/new_2016/cust_list_DB2.php

Customer Listing

Customer: 1221 - LINA Norman
Company: Kauai Dive Shoppe
Country: US

Customer: 1231 - George Weathers
Company: Unisco
Country: Bahamas

Customer: 1351 - Phyllis Spooner
Company: Sight Diver
Country: Cyprus

Customer: 1354 - Joe Bailey
Company: Cayman Divers World Unlimited
Country: British West Indies

HTML Tables

Let’s change the listing to show fields in a grid of rows and columns.

`<table>` - Defines entire table
`<tr>` - One for each table row
`<td>` - Table data - One for each column (cell) in each row

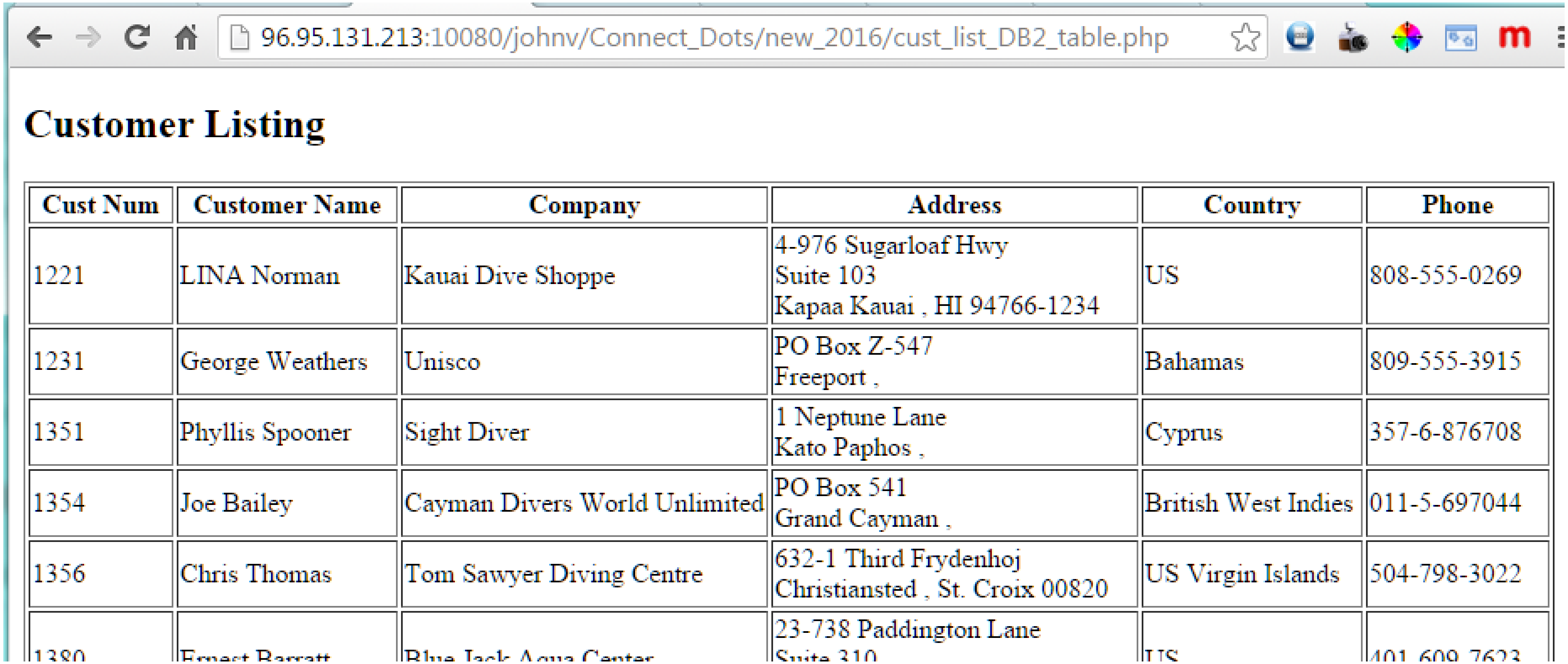
Tables can be nested – can start a new table within a `<td>`

```
<table>
   <tr>
      <td>Col 1</td> <td>Col 2</td> <td>Col 3</td>
   </tr>
   <tr>
      <td>Col 1</td> <td>Col 2</td> <td>Col 3</td>
   </tr>
</table>
```

Demo menu 11

Customer Listing using <table>

- **No styling**

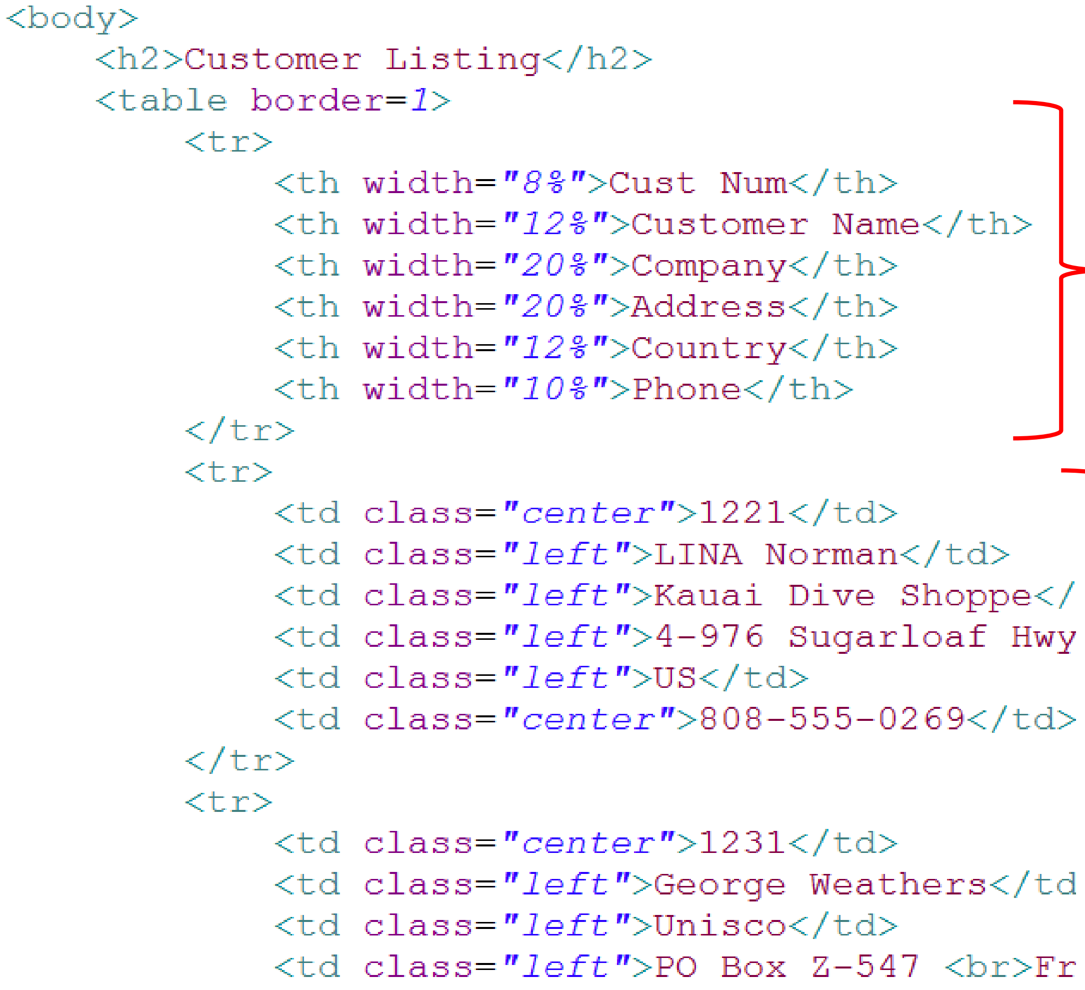


96.95.131.213:10080/johnv/Connect_Dots/new_2016/cust_list_DB2_table.php

Customer Listing

Cust Num	Customer Name	Company	Address	Country	Phone
1221	LINA Norman	Kauai Dive Shoppe	4-976 Sugarloaf Hwy Suite 103 Kapaa Kauai , HI 94766-1234	US	808-555-0269
1231	George Weathers	Unisco	PO Box Z-547 Freeport ,	Bahamas	809-555-3915
1351	Phyllis Spooner	Sight Diver	1 Neptune Lane Kato Paphos ,	Cyprus	357-6-876708
1354	Joe Bailey	Cayman Divers World Unlimited	PO Box 541 Grand Cayman ,	British West Indies	011-5-697044
1356	Chris Thomas	Tom Sawyer Diving Centre	632-1 Third Frydenhoj Christiansted , St. Croix 00820	US Virgin Islands	504-798-3022
1380	Ernest Barratt	Blue Jack Aqua Center	23-738 Paddington Lane Suite 310	US	401-609-7623

Customer Listing HTML (using <table>)



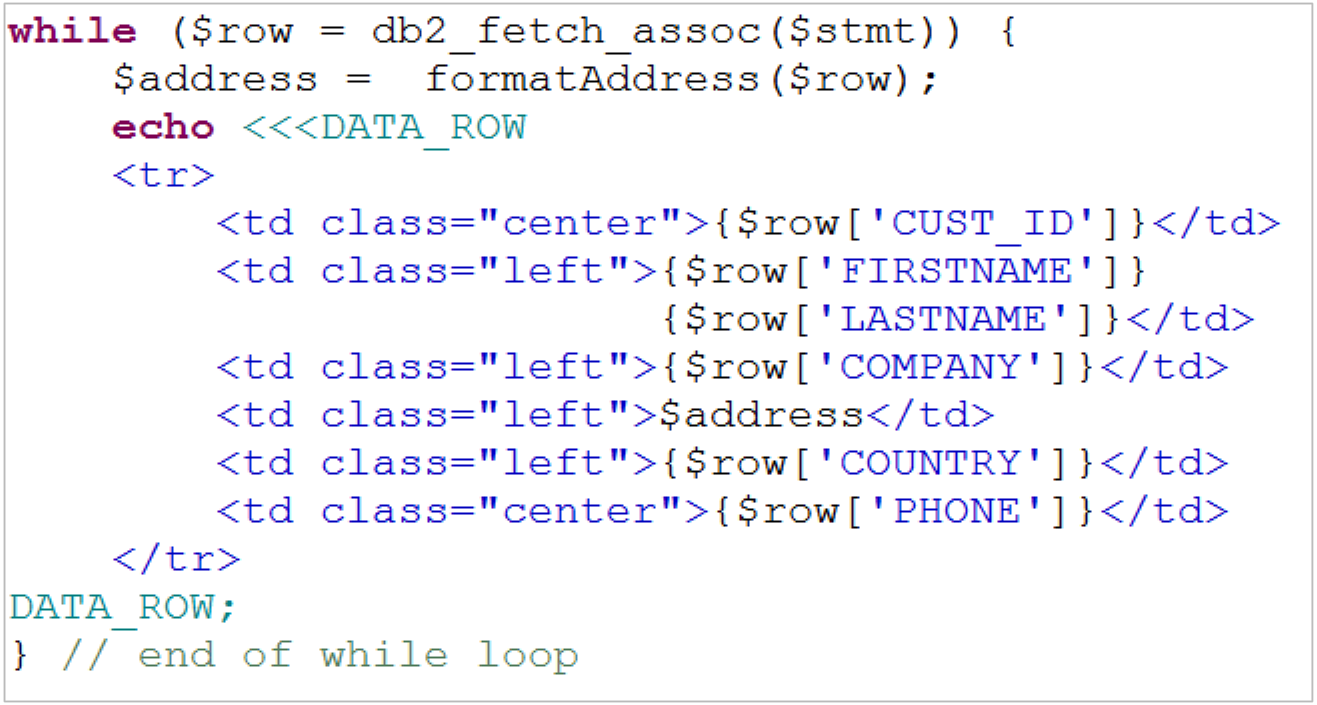
```
<body>
    <h2>Customer Listing</h2>
    <table border=1>
        <tr>
            <th width="8%">Cust Num</th>
            <th width="12%">Customer Name</th>
            <th width="20%">Company</th>
            <th width="20%">Address</th>
            <th width="12%">Country</th>
            <th width="10%">Phone</th>
        </tr>
        <tr>
            <td class="center">1221</td>
            <td class="left">LINA Norman</td>
            <td class="left">Kauai Dive Shoppe</
            <td class="left">4-976 Sugarloaf Hwy
            <td class="left">US</td>
            <td class="center">808-555-0269</td>
        </tr>
        <tr>
            <td class="center">1231</td>
            <td class="left">George Weathers</td
            <td class="left">Unisco</td>
            <td class="left">PO Box Z-547 <br>Fr
```

- **Headings row**
- **Data rows**
  - Create one template
  - Repeat for each row from database

Repeating Table Rows in PHP

- echo the HTML using the “here-doc” string syntax

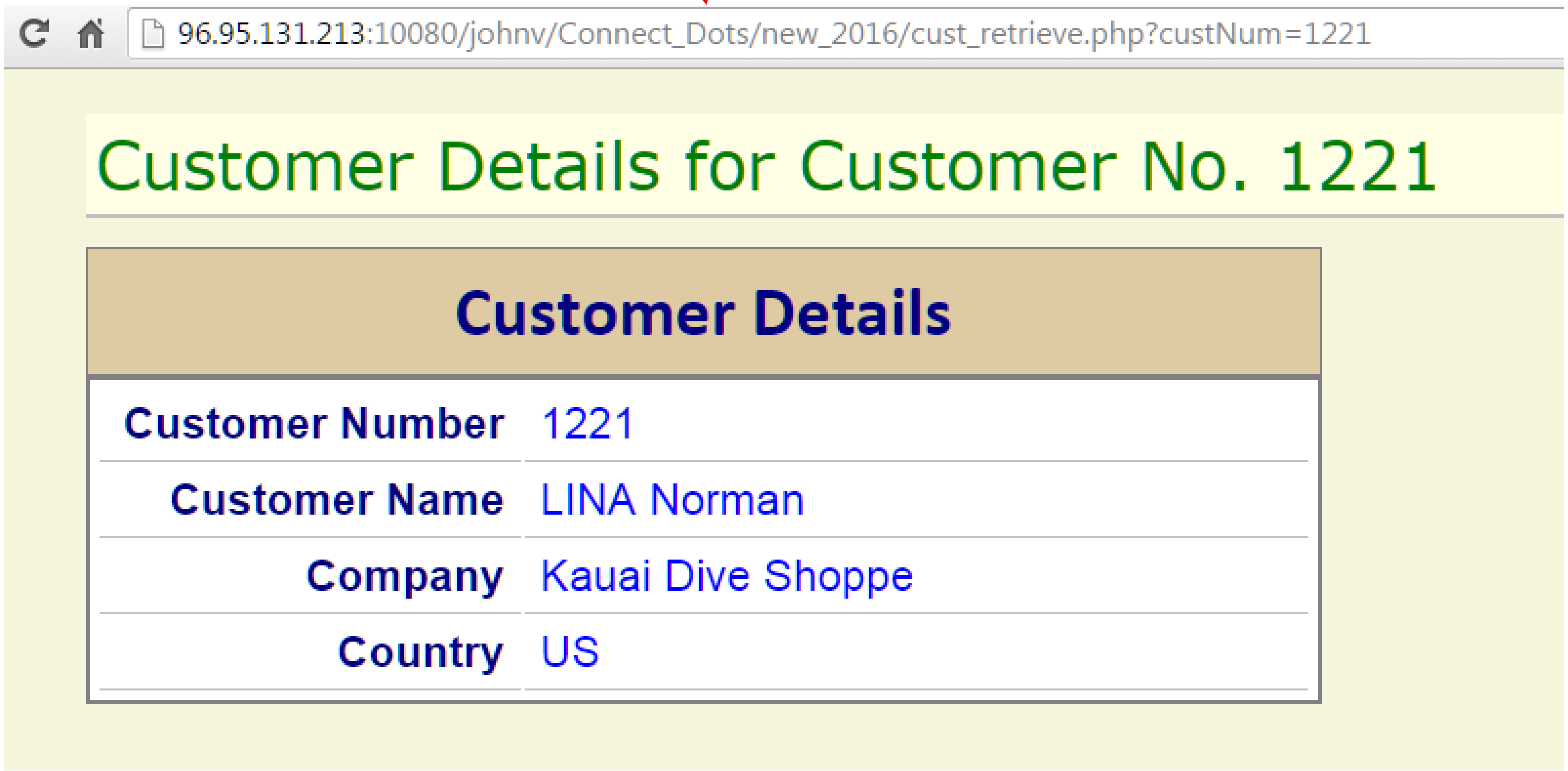
```
echo <<<DATA_ROW ... DATA_ROW;
```



```
while ($row = db2_fetch_assoc($stmt)) {
    $address =  formatAddress($row);
    echo <<<DATA_ROW
    <tr>
        <td class="center">{$row['CUST_ID']}</td>
        <td class="left">{$row['FIRSTNAME']}
                                  {$row['LASTNAME']}</td>
        <td class="left">{$row['COMPANY']}</td>
        <td class="left">$address</td>
        <td class="left">{$row['COUNTRY']}</td>
        <td class="center">{$row['PHONE']}</td>
    </tr>
DATA_ROW;
} // end of while loop
```

Customer Detail Page

http://96.95.131.213:10080/johnv/Connect_Dots/new_2016/
cust_retrieve.php?custNum=1221



96.95.131.213:10080/johnv/Connect_Dots/new_2016/cust_retrieve.php?custNum=1221

Customer Details for Customer No. 1221

Customer Details	
Customer Number	1221
Customer Name	LINA Norman
Company	Kauai Dive Shoppe
Country	US

Anatomy of a Request URL

http://www.mydomain.com/pubapps/myScript.php?cust=10357

http://www.mydomain.com/	Protocol // domain
pubapps/	Path to the script (relative to the web root folder)
myScript.php	Script file name
?	Delimiter (separates script name from the query string)
cust=10357	Query string (i.e. parameters the script can access)

Demo menu 6

Query String - Multiple Parameters

Name/Value Pairs, Separated by ‘&’

```
script.php?name1=value1&name2=value2…
```

```
http://www.myComp.com/
   myScript.php?cust=12345&action=update
```

PHP parses query string into $_GET array

```
$custNo = $_GET['cust']; // 12345
$action = $_GET['action']; // update
```

Form Tag

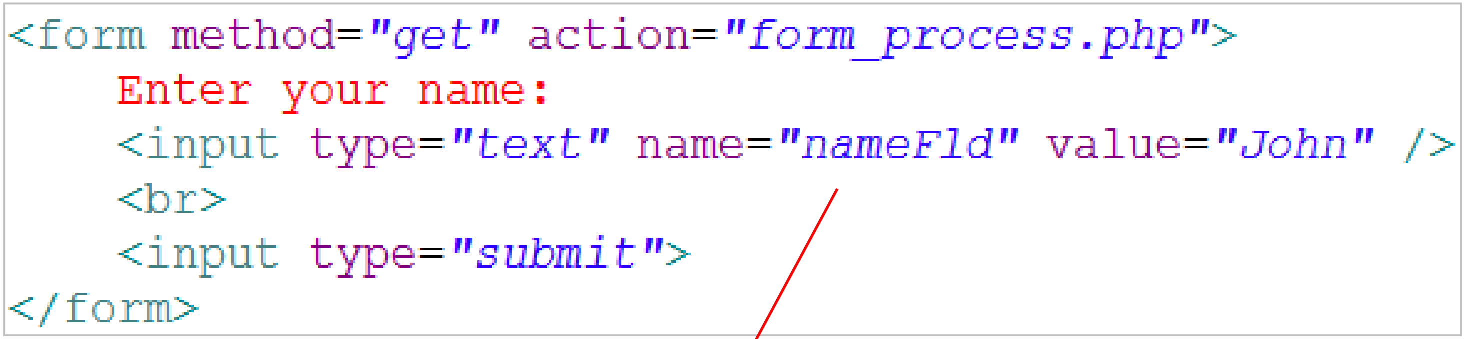
```
<form action="myScript.php" method="post">
  <input> tags…
</form>
```

<form> - defines a group of input fields

Makes user input easier than typing query string in URL

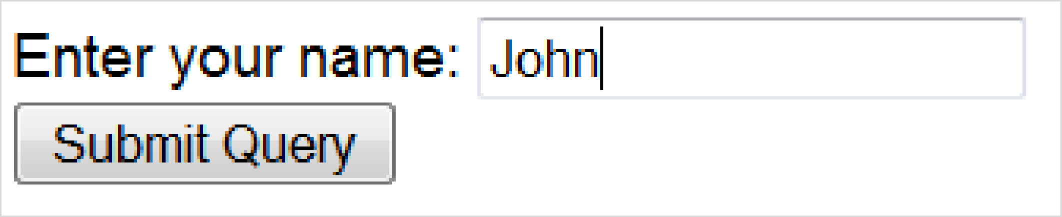
- action attribute
  - tells what PHP script will receive input values
- method attribute
  - defines how values are delivered to action script
  - method="get" - send inputs on URL, as a query string
    - *Limited data length*
  - method="post" - send inputs with HTTP headers
    - *Allows unlimited data to be sent*
    - *Typically used when updating the server*

Form Example



```
<form method="get" action="form_process.php">
    Enter your name:
    <input type="text" name="nameFld" value="John" />
    <br>
    <input type="submit">
</form>
```

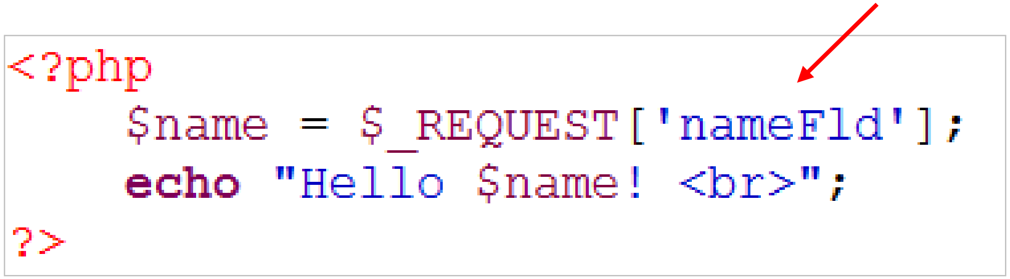
Looks like this in browser:



Enter your name: John

Clicking Submit button creates request for:

http://mydomain.com/form_process.php?nameFld=John

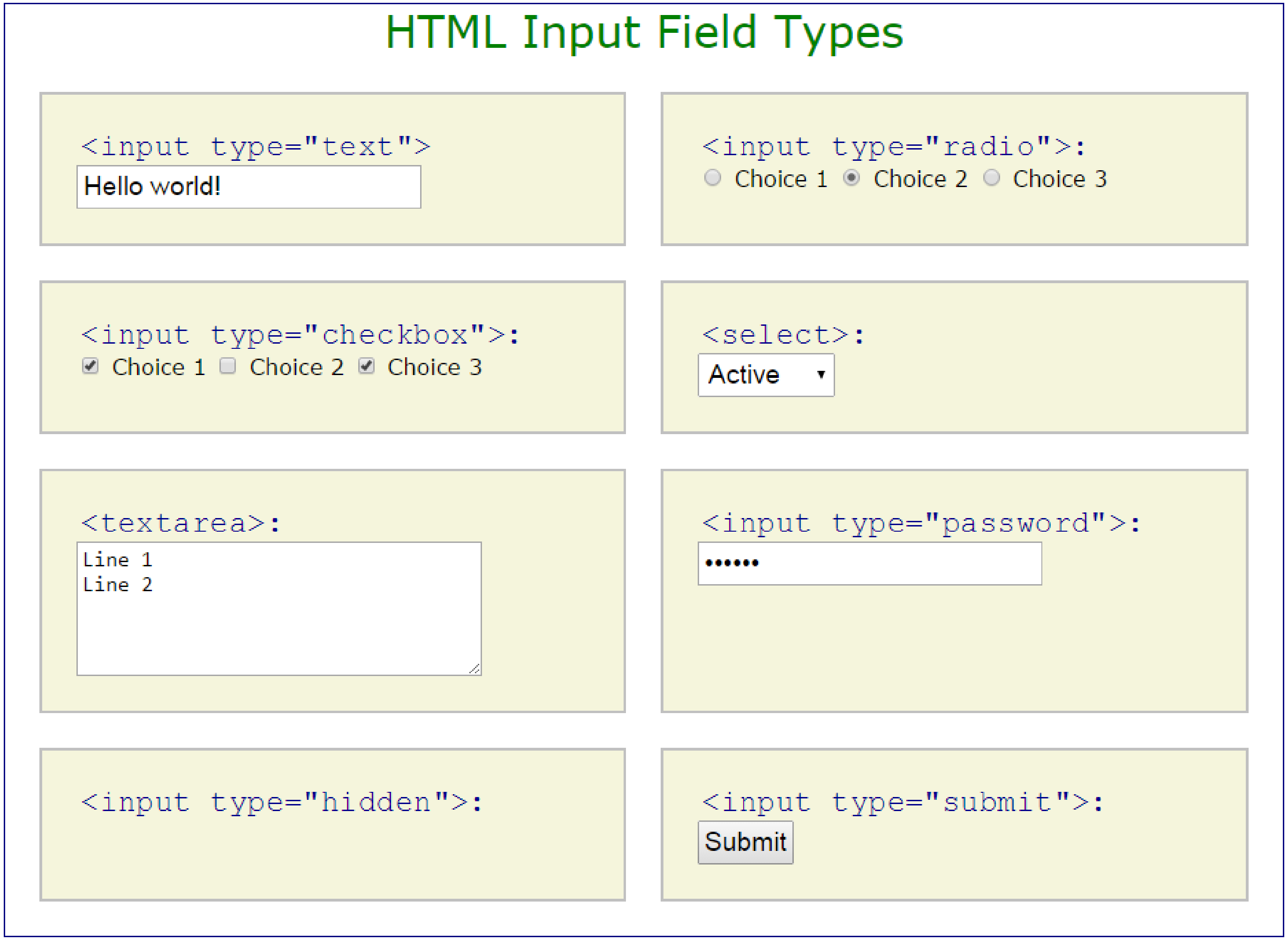


```
<?php
    $name = $_REQUEST['nameFld'];
    echo "Hello $name! <br>";
?>
```

PHP can read form inputs
via the $_REQUEST array

Demo menu 7, 8

HTML 4 <input> types



HTML Input Field Types

`<input type="text">`

Hello world!

`<input type="radio">:`

○ Choice 1 ● Choice 2 ○ Choice 3

`<input type="checkbox">:`

☑ Choice 1 □ Choice 2 ☑ Choice 3

`<select>:`

Active ▾

`<textarea>:`

```
Line 1
Line 2
```

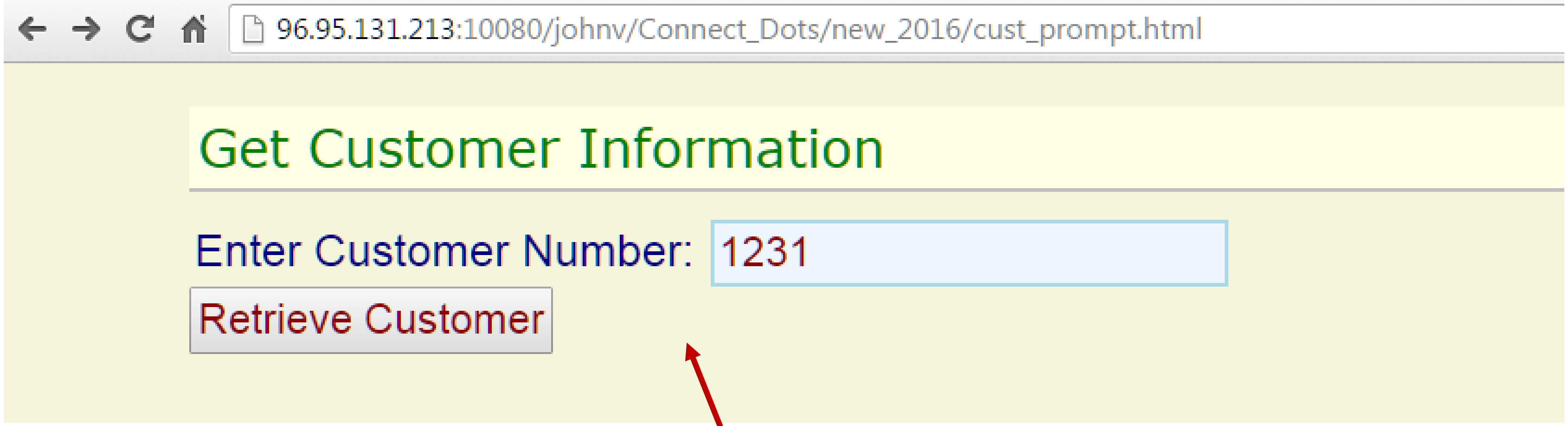
`<input type="password">:`

••••••

`<input type="hidden">:`

`<input type="submit">:`

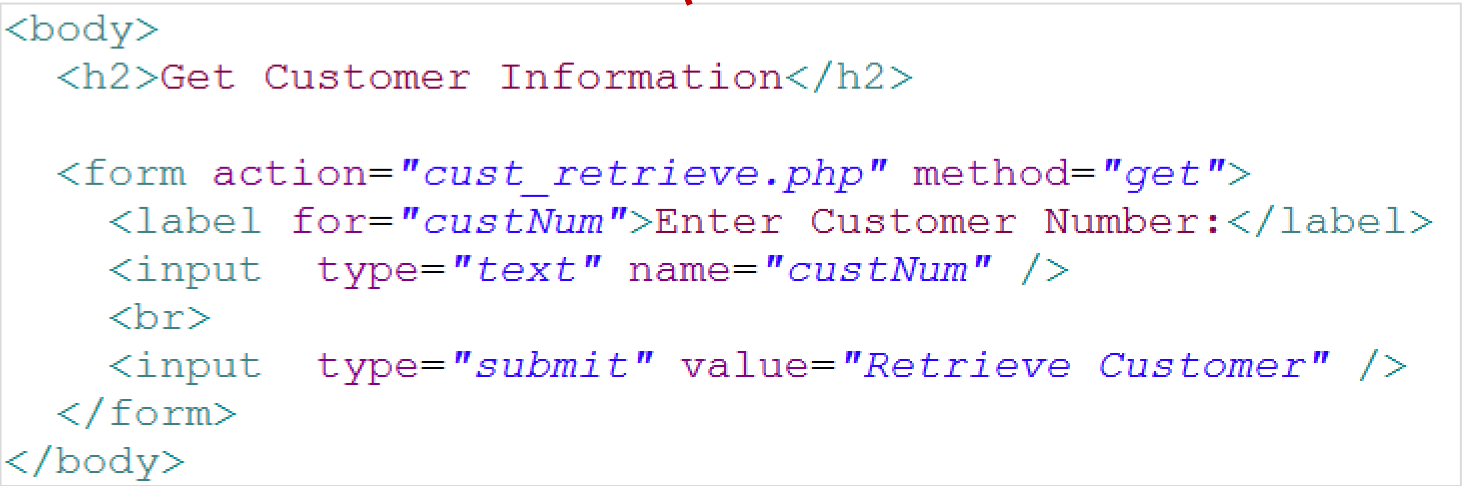
Customer Prompt Form



96.95.131.213:10080/johnv/Connect_Dots/new_2016/cust_prompt.html

Get Customer Information

Enter Customer Number: 1231

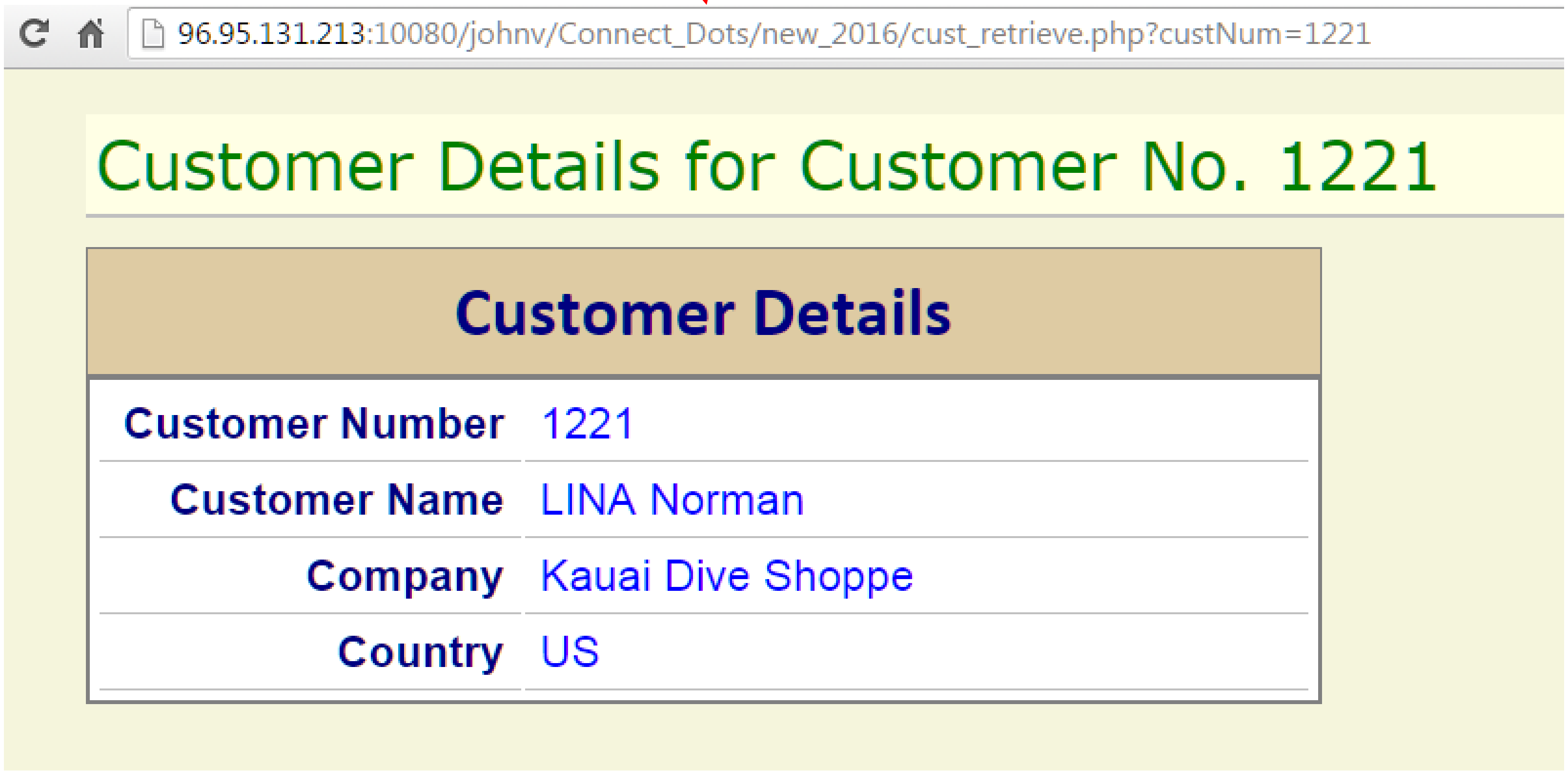


```
<body>
  <h2>Get Customer Information</h2>

  <form action="cust_retrieve.php" method="get">
    <label for="custNum">Enter Customer Number:</label>
    <input  type="text" name="custNum" />
    <br>
    <input  type="submit" value="Retrieve Customer" />
  </form>
</body>
```

Customer Detail Page

http://96.95.131.213:10080/johnv/Connect_Dots/new_2016/
cust_retrieve.php?custNum=1221



96.95.131.213:10080/johnv/Connect_Dots/new_2016/cust_retrieve.php?custNum=1221

Customer Details for Customer No. 1221

Customer Details	
Customer Number	1221
Customer Name	LINA Norman
Company	Kauai Dive Shoppe
Country	US

JavaScript

What is JavaScript?

- It isn’t Java! (but similar syntax, based on C).
- Runs on the client-side (usually) i.e. in browser
  - node.js is server-side JavaScript
- Scripting language for web browsers
- All browsers have built-in JavaScript interpreter – you don’t buy it or install it.
- Interpreted at run-time (as page loads)
- JavaScript code is downloaded with the HTML document, but only runs in the browser.

JavaScript Sample

```
<html>
<head>
<title>JavaScript Example</title>
<script>
    function checkInput() {
      var custNo = document.getElementById(‘custNo’);
       if (custNo.value == '') {
          alert(‘Customer number is required.');
       } else {
          document.getElementById(‘myForm’).submit();
       }
    }
</script>
</head>
<body>  <form id=“myform” action=“cust_retrieve.php”>...
      <input id=“custNo” /> <input type=“button” onclick=“checkInput()”>
... </form>
</body></html>
```

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What Can JavaScript Do?

- Validate input data
- Handle events
  - e.g.: mouse clicks or cursor movement into/out of fields
- Control Dynamic HTML
  - make things move around, appear and disappear
- Read and alter document elements, including HTML tags and CSS attributes
- Open & close windows, and communicate between windows.
- *Key technology in Ajax and Web 2.0 applications*

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Where Is JavaScript Coded in HTML?

- Can be inserted just about anywhere, but must be enclosed in <script> </script> tag
- Typically, functions are defined in <head> section.
- Can also be included as external file
  - Function libraries, Frameworks
  - Linked to document in <head> section
- Can also be included as event handler in certain HTML tags:

```
<form action=“checkInputs();”>

<button onclick=“alert(‘You clicked me.’)”>

<a href=“javascript:openHelpWindow();”>
```

Current State of Web Development

Present/Future State of Web Development

- **Mobile First**
  - HTML 5 / CSS 3
- **Responsive Design**
  - Apps on multiple devices / different orientations (landscape / portrait)
  - CSS Frameworks (Twitter Bootstrap, LESS, others…)
- **JavaScript Ascendance**
  - Ajax – Asynchronous JavaScript and XML
    - Uses JSON more often than XML (easy with PHP's `json_encode()` function)
- **Application Architecture**
  - APIs and Service Oriented Architecture (SOA)
  - Object Oriented code base / Frameworks - many (especially JavaScript)
  - Shift from server side control (PHP) to Client side (JavaScript)
  - NodeJS = JavaScript on server

Case Study

- Soda Distributor
- E-Commerce System
- Uses PHP with Zend Framework to build online orders
  - Replaced an outdated Java online ordering system
- Using SQL stored procedures for all database access in PHP
- Submits orders into BPCS/LX database
- Went live January 2017

**** DEMO ****

More Information

- Email me if you would like the source code:

  johnv@div1sys.com

- Attend the hands-on Labs for more details!

Thank you!

Contact Info

John Valance

johnv@div1sys.com

802-355-4024

Division 1 Systems

<div1>

http://www.div1sys.com