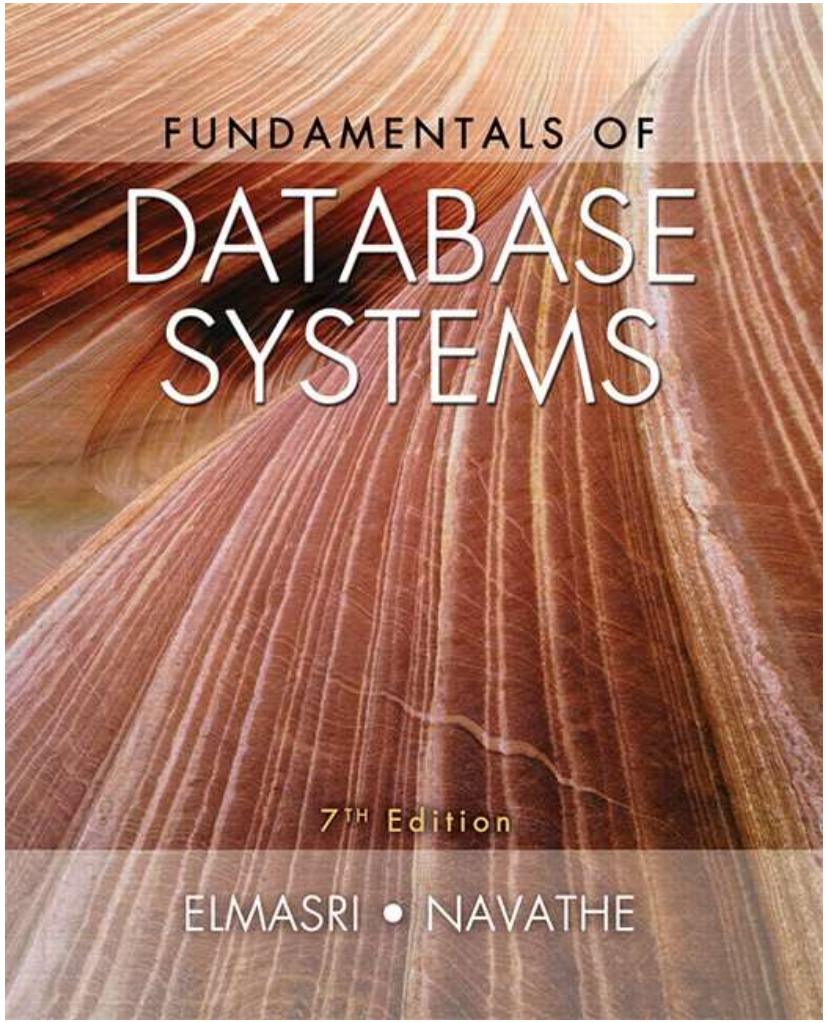


Chapter 11 Outline

- A Simple PHP Example
- Overview of Basic Features of PHP
- Overview of PHP Database Programming

Web Database Programming Using PHP

- Techniques for programming dynamic features into Web
- PHP
  - Open source scripting language
  - Interpreters provided free of charge
  - Available on most computer platforms

A Simple PHP Example

- PHP
  - Open source general-purpose scripting language
  - Comes installed with the UNIX operating system

A Simple PHP Example (cont'd.)

- DBMS
  - **Bottom-tier database server**
- PHP
  - **Middle-tier Web server**
- HTML
  - **Client tier**

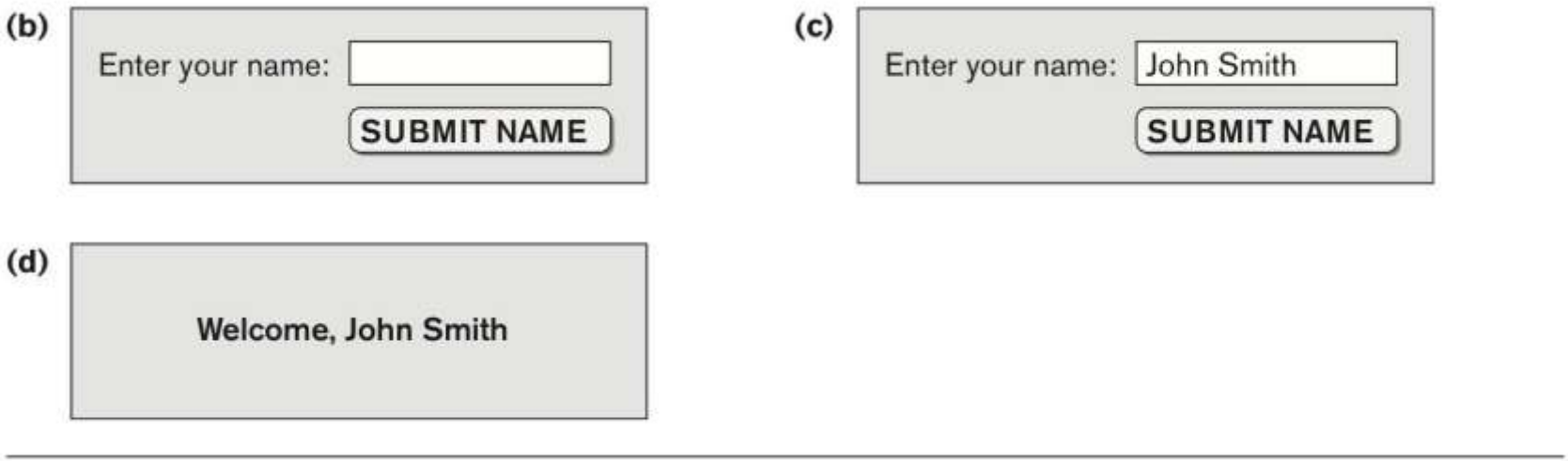
Figure 11.1a PHP program segment for entering a greeting.

(a)

```
    //Program Segment P1:
 0) <?php
 1) // Printing a welcome message if the user submitted their name
    // through the HTML form
 2) if ($_POST['user_name']) {
 3)   print("Welcome, ") ;
 4)   print($_POST['user_name']);
 5) }
 6) else {
 7)   // Printing the form to enter the user name since no name has
      // been entered yet
 8)   print <<<_HTML_
 9)   <FORM method="post" action="$_SERVER['PHP_SELF']">
10)   Enter your name: <input type="text" name="user_name">
11)   <BR/>
12)   <INPUT type="submit" value="SUBMIT NAME">
13)   </FORM>
14)   _HTML_;
15) }
16) ?>
```

continued on next slide

Figure 11.1b-d (b) Initial form displayed by PHP program segment. (c) User enters name *John Smith*. (d) Form prints welcome message for *John Smith*.



A Simple PHP Example (cont'd.)

- Example Figure 11.1(a)
- PHP script stored in:
  - http://www.myserver.com/example/greeting.php
- `<?php`
  - PHP start tag
- `?>`
  - PHP end tag
- Comments: `//` or `/* */`

A Simple PHP Example (cont'd.)

- `$_POST`
  - **Auto-global** predefined PHP variable
  - Array that holds all the values entered through form parameters
- Arrays are dynamic
- **Long text strings**
  - Between opening `<<<_HTML_` and closing `_HTML_;`

A Simple PHP Example (cont'd.)

- PHP **variable names**
  - Start with $ sign

Overview of Basic Features of PHP

- Illustrate features of PHP suited for creating dynamic Web pages that contain database access commands

PHP Variables, Data Types, and Programming Constructs

- PHP **variable names**
  - Start with $ symbol
  - Can include characters, letters, and underscore character (_)
- Main ways to express strings and text
  - **Single-quoted strings**
  - **Double-quoted strings**
  - **Here documents**
  - **Single and double quotes**

PHP Variables, Data Types, and Programming Constructs (cont'd.)

- Period (.) symbol
  - String concatenate operator
- Single-quoted strings
  - Literal strings that contain no PHP program variables
- Double-quoted strings and here documents
  - Values from variables need to be interpolated into string

PHP Variables, Data Types, and Programming Constructs (cont'd.)

- Numeric data types
  - Integers and floating points
- Programming language constructs
  - For-loops, while-loops, and conditional if-statements
- Boolean expressions

Figure 11.2 Illustrating basic PHP string and text values.

```
 0) print 'Welcome to my Web site.';
 1) print 'I said to him, "Welcome Home"';
 2) print 'We\'ll now visit the next Web site';
 3) printf('The cost is $%.2f and the tax is $%.2f',
    $cost, $tax) ;
 4) print strtolower('AbCdE');
 5) print ucwords(strtolower('JOHN smith'));
 6) print 'abc' . 'efg'
 7) print "send your email reply to: $email_address"
 8) print <<<FORM_HTML
 9) <FORM method="post" action="$_SERVER['PHP_SELF']">
10) Enter your name: <input type="text" name="user_name">
11) FORM_HTML
```

PHP Variables, Data Types, and Programming Constructs (cont'd.)

- Comparison operators
  - == (equal), != (not equal), > (greater than), >= (greater than or equal), < (less than), and <= (less than or equal)

PHP Arrays

- Can hold database query results
  - Two-dimensional arrays
  - First dimension representing rows of a table
  - Second dimension representing columns (attributes) within a row
- Main types of arrays:
  - **Numeric** and **associative**

PHP Arrays (cont'd.)

- Numeric array
  - Associates a numeric index with each element in the array
  - Indexes are integer numbers
    - Start at zero
    - Grow incrementally
- Associative array
  - Provides pairs of (key => value) elements

Figure 11.3 Illustrating basic PHP array processing.

```
 0) $teaching = array('Database' => 'Smith', 'OS' => 'Carrick',
                      'Graphics' => 'Kam');
 1) $teaching['Graphics'] = 'Benson'; $teaching['Data Mining'] = 'Li';
 2) sort($teaching);
 3) foreach ($teaching as $key => $value) {
 4)   print " $key : $value\n";}
 5) $courses = array('Database', 'OS', 'Graphics', 'Data Mining');
 6) $alt_row_color = array('blue', 'yellow');
 7) for ($i = 0, $num = count($courses); i < $num; $i++) {
 8)   print '<TR bgcolor="' . $alt_row_color[$i % 2] . '">';
 9)   print "<TD>Course $i is</TD><TD>$course[$i]</TD></TR>\n";
10) }
```

PHP Arrays (cont'd.)

- Techniques for looping through arrays in PHP
- Count function
  - Returns current number of elements in array
- Sort function
  - Sorts array based on element values in it

PHP Functions

- Functions
  - Define to structure a complex program and to share common sections of code
  - Arguments passed by value
- Examples to illustrate basic PHP functions
  - Figure 11.4
  - Figure 11.5

Figure 11.4

```
    //Program Segment P1':
 0) function display_welcome() {
 1)     print("Welcome, ") ;
 2)     print($_POST['user_name']);
 3) }
 4)
 5) function display_empty_form(); {
 6) print <<<_HTML_
 7) <FORM method="post" action="$_SERVER['PHP_SELF']">
 8) Enter your name: <INPUT type="text" name="user_name">
 9) <BR/>
10) <INPUT type="submit" value="Submit name">
11) </FORM>
12) _HTML_;
13) }
14) if ($_POST['user_name']) {
15)   display_welcome();
16) }
17) else {
18)   display_empty_form();
19) }
```

Figure 11.5 Illustrating a function with arguments and return value.

```
 0) function course_instructor ($course, $teaching_assignments) {
 1)   if (array_key_exists($course, $teaching_assignments)) {
 2)   $instructor = $teaching_assignments[$course];
 3)   RETURN "$instructor is teaching $course";
 4)   }
 5)   else {
 6)   RETURN "there is no $course course";
 7)   }
 8) }
 9) $teaching = array('Database' => 'Smith', 'OS' => 'Carrick',
                      'Graphics' => 'Kam');
10) $teaching['Graphics'] = 'Benson'; $teaching['Data Mining'] = 'Li';
11) $x = course_instructor('Database', $teaching);
12) print($x);
13) $x = course_instructor('Computer Architecture', $teaching);
14) print($x);
```

PHP Server Variables and Forms

- Built-in entries
  - `$_SERVER` auto-global built-in array variable
  - Provides useful information about server where the PHP interpreter is running

PHP Server Variables and Forms (cont'd.)

- Examples:
  - **$_SERVER['SERVER_NAME']**
  - **$_SERVER['REMOTE_ADDRESS']**
  - **$_SERVER['REMOTE_HOST']**
  - **$_SERVER['PATH_INFO']**
  - **$_SERVER['QUERY_STRING']**
  - **$_SERVER['DOCUMENT_ROOT']**
- $_POST
  - Provides input values submitted by the user through HTML forms specified in <INPUT> tag

Overview of PHP Database Programming

- PEAR DB library
  - Part of PHP Extension and Application Repository (PEAR)
  - Provides functions for database access

Connecting to a Database

- Library module DB.php must be loaded
- DB library functions accessed using `DB::<function_name>`
- `DB::connect('string')`
  - Function for connecting to a database
  - Format for 'string' is: `<DBMS software>://<user account>:<password>@<database server>`

database, creating a table, and inserting a record.

```
 0) require 'DB.php';
 1) $d = DB::connect('oci8://acct1:pass12@www.host.com/db1');
 2) if (DB::isError($d)) { die("cannot connect - " . $d->getMessage());}
    ...
 3) $q = $d->query("CREATE TABLE EMPLOYEE
 4)   (Emp_id INT,
 5)   Name VARCHAR(15),
 6)   Job VARCHAR(10),
 7)   Dno INT);" );
 8) if (DB::isError($q)) { die("table creation not successful - " .
                          $q->getMessage()); }
      ...
 9) $d->setErrorHandling(PEAR_ERROR_DIE);
    ...
10) $eid = $d->nextID('EMPLOYEE');
11) $q = $d->query("INSERT INTO EMPLOYEE VALUES
12)   ($eid, $_POST['emp_name'], $_POST['emp_job'], $_POST['emp_dno'])" );
    ...
13) $eid = $d->nextID('EMPLOYEE');
14) $q = $d->query('INSERT INTO EMPLOYEE VALUES (?, ?, ?, ?)',
15) array($eid, $_POST['emp_name'], $_POST['emp_job'], $_POST['emp_dno']) );
```

Some Database Functions

- Query function
  - `$d->query` takes an SQL command as its string argument
  - Sends query to database server for execution
- `$d->setErrorHandling(PEAR_ERROR_DIE)`
  - Terminate program and print default error messages if any subsequent errors occur

Collecting Data from Forms and Inserting Records

- Collect information through HTML or other types of Web forms
- Create unique record identifier for each new record inserted into the database
- PHP has a function `$d->nextID` to create a sequence of unique values for a particular table
- **Placeholders**
  - Specified by `?` symbol

Retrieval Queries from Database Tables

- `$q`
  - Variable that holds query result
  - `$q->fetchRow()` retrieve next record in query result and control loop
- `$allresult = $d->getAll(query)`
  - Holds all the records in a query result in a single variable called `$allresult`

Figu

```
 0) require 'DB.php';
 1) $d = DB::connect('oci8://acct1:pass12@www.host.com/dbname');
 2) if (DB::isError($d)) { die("cannot connect - " . $d->getMessage()); }
 3) $d->setErrorHandling(PEAR_ERROR_DIE);
    ...
 4) $q = $d->query('SELECT Name, Dno FROM EMPLOYEE');
 5) while ($r = $q->fetchRow()) {
 6)   print "employee $r[0] works for department $r[1] \n" ;
 7) }
    ...
 8) $q = $d->query('SELECT Name FROM EMPLOYEE WHERE Job = ? AND Dno = ?',
 9)   array($_POST['emp_job'], $_POST['emp_dno']) );
10) print "employees in dept $_POST['emp_dno'] whose job is
      $_POST['emp_job']: \n"
11) while ($r = $q->fetchRow()) {
12)   print "employee $r[0] \n" ;
13) }
    ...
14) $allresult = $d->getAll('SELECT Name, Job, Dno FROM EMPLOYEE');
15) foreach ($allresult as $r) {
16)   print "employee $r[0] has job $r[1] and works for department $r[2] \n" ;
17) }
    ...
```

Other techniques

- PHP runs on server
  - Sends HTML to client
- Many other languages/technologies for Web Db programming
- Examples:
- Java servlets:
  - Java objects on server, interact with client
  - Store information about interaction session

Other techniques (cont.)

- Java Server Pages (JSP)
  - Creates dynamic Web pages through scripting at server to send to client (somewhat like PHP)
- JavaScript
  - Scripting language, can run at client or server
- Java Script Object Notation (JSON):
  - Text-based representation of objects
  - Similar function to XML
  - Used in many NOSQL systems

Summary

- PHP scripting language
  - Very popular for Web database programming
- PHP basics for Web programming
- Data types
- Database commands include:
  - Creating tables, inserting new records, and retrieving database records
  - Looping over a query result