

CSC 375

Database Management Systems

Haidar Harmanani

Department of Computer Science and Mathematics
Lebanese American University
Byblos, 1401 2010 Lebanon



Introduction

- PHP
 - PHP Hypertext Preprocessor
 - Originally called “Personal Home Page Tools”
 - Popular server-side scripting technology
 - Open-source
 - Anyone may view, modify and redistribute source code
 - Supported freely by community
 - Platform independent

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PHP

- Basic application
 - Scripting delimiters
 - <? php ?>
 - Must enclose all script code
 - Variables preceded by \$ symbol
 - Case-sensitive
 - End statements with semicolon
 - Comments
 - // for single line
 - /* */ for multiline
 - Filenames end with .php by convention



What do You Need?

- Our server supports PHP
 - You don't need to do anything special!
 - You don't need to compile anything or install any extra tools!
 - Create some .php files in your web directory - and the server will parse them for you.
- Most servers support PHP
 - Download PHP for free here: <http://www.php.net/downloads.php>
 - Download MySQL for free here: <http://www.mysql.com/downloads/index.html>
 - Download Apache for free here: <http://httpd.apache.org/download.cgi>

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Basic PHP syntax

A PHP scripting block always starts with `<?php` and ends with `?>`. A PHP scripting block can be placed anywhere in an HTML document.

```
<html>
<!-- hello.php COMP519 -->
<head><title>Hello World</title></head>
<body>
<p>This is going to be ignored by the PHP interpreter.</p>

<?php echo '<p>While this is going to be parsed.</p>'; ?>

<p>This will also be ignored by PHP.</p>

<?php print('<p>Hello and welcome to <i>my</i> page!</p>');
?>

<?php
// This is a comment
/*
This is
a comment
block
*/
?>
</body>
</html>
```

[view the output page](#)

print and echo
for output

a semicolon (`:`) at the end
of each statement (can be
omitted at the end of
block/file)

`//` for a single-line comment

`/*` and `*/` for a large comment
block.

The server executes the
print and echo
statements, substitutes
output.



PHP

• Variables

- Can have different types at different times
- Variable names inside strings replaced by their value
- Type conversions
 - `settype` function
 - Type casting
- Concatenation operator
 - `.` (period)
 - Combine strings

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Scalars

All variables in PHP start with a `$` sign symbol.

A variable's type is determined by the context in which that variable is used (i.e. there is no strong-typing in PHP).

```
<html><head></head>
<!-- scalars.php COMP519 -->
<body> <p>
<?php
$foo = True; if ($foo) echo "It is TRUE! <br />\n";
$txt="1234"; echo "$txt <br />\n";
$Sa = 1234; echo "Sa <br />\n";
$Sa = -123;
echo "Sa <br />\n";
$Sa = 1.234;
echo "Sa <br />\n";
$Sa = 1.2e3;
echo "Sa <br />\n";
$Sa = 7E-10;
echo "Sa <br />\n";
echo 'Arnold once said: "I'll be back", "<br />\n";
Sheer = 'Heineken';
echo "Sheer's taste is great <br />\n";
$Str = <<<EOD
Example of string
spanning multiple lines
using "heredoc" syntax.
EOD;
echo $str;
?> </p>
</body>
</html>
```

[view the output page](#)

Four scalar types:
`boolean`
TRUE or FALSE
`integer`,
just numbers
`float`
float point numbers
`string`
single quoted
double quoted



Constants

A constant is an identifier (name) for a simple value. A constant is case-sensitive by default. By convention, constant identifiers are always uppercase.

```
<?php
```

// Valid constant names

```
define("FOO", "something");
define("FOO2", "something else");
define("FOO_BAR", "something more");
```

// Invalid constant names

```
define("2FOO", "something");
```

// This is valid, but should be avoided:

```
// PHP may one day provide a "magical" constant
```

```
// that will break your script
```

```
define("__FOO__", "something");
```

```
?>
```

You can access constants
anywhere in your script
without regard to scope.



Operators

- Arithmetic Operators: +, -, *, /, %, ++, --
- Assignment Operators: =, +=, -=, *=, /=, %=
- Comparison Operators: ==, !=, >, <, >=, <=
- Logical Operators: &&, ||, !
- String Operators: ., .=

```
$a = "Hello ";
$b = $a . "World!"; // now $b contains "Hello World!"

$a = "Hello ";
$a .= "World!";
```

Example Is the same as

x+=y	x=x+y
x-=y	x=x-y
x*=y	x=x*y
x/=y	x=x/y
x%y	x=x%y



Conditionals: switch

- Can select one of many sets of lines to execute

```
<html><head></head>
<body>
<!-- switch-cond.php COMP519 -->
<?php
$x = rand(1,5); // random integer
echo "x = $x <br/><br/>";
switch ($x)
{
    case 1:
        echo "Number 1";
        break;
    case 2:
        echo "Number 2";
        break;
    case 3:
        echo "Number 3";
        break;
    default:
        echo "No number between 1 and 3";
}
?>
</body>
</html>
```

```
switch (expression)
{
    case label1:
        code to be executed if expression =
        label1;
        break;
    case label2:
        code to be executed if expression =
        label2;
        break;
    default:
        code to be executed
        if expression is different
        from both label1 and label2;
}
```

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Conditionals: if else

- Can execute a set of code depending on a condition

```
<html><head></head>
<!-- if-cond.php COMP519 -->
<body>
<?php
$d=date("D");
if ($d=="Fri")
    echo "Have a nice weekend! <br/>";
else
    echo "Have a nice day! <br/>";
$x=10;
if ($x==10)
{
    echo "Hello<br />";
    echo "Good morning<br />";
}
?>
</body>
</html>
```

if (condition)
code to be executed if condition is true;
else
code to be executed if condition is false;

date() is a built-in function that can be called with many different parameters to return the date (and/or local time) in various formats

In this case we get a three letter string for the day of the week.
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Looping: while and do-while

- Can loop depending on a condition

```
<html><head></head>
<body>
<?php
$i=1;
while($i <= 5)
{
    echo "The number is $i <br />";
    $i++;
}
?>
</body>
</html>
```

loops through a block of code if and as long as a specified condition is true

```
<html><head></head>
<body>
<?php
$i=0;
do
{
    $i++;
    echo "The number is $i <br />";
}
while($i <= 10);
?>
</body>
</html>
```

loops through a block of code once, and then repeats the loop as long as a special condition is true

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Looping: foreach

```
<?php
foreach (array_expression as $value)
    statement
foreach (array_expression as $key => $value)
    statement?>
```

- The first loops over the array given by *array_expression*.
 - On each loop, the value of the current element is assigned to *\$value* and the internal array pointer is advanced by one (so on the next loop, you'll be looking at the next element).
- The second form does the same thing, except that the current element's key will be assigned to the variable *\$key* on each loop.



Looping: foreach

```
<?php
$arr = array(1, 2, 3, 4);
foreach ($arr as &$value) {
    $value = $value * 2;
}
// $arr is now array(2, 4, 6, 8)
unset($value); // break the reference with the last element
?>
```

modify array's elements by preceding *\$value* with *&*.
This will assign reference instead of copying the value



Looping: for and foreach

Can loop depending on a "counter"

```
<?php
for ($i=1; $i<=5; $i++)
{
    echo "Hello World!<br />";
}
?>
```

loops through a block of code a specified number of times

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```
<?php
$a_array = array(1, 2, 3, 4);
foreach ($a_array as $value)
{
    $value = $value * 2;
    echo "$value <br/> \n";
}
?>
```

loops through a block of code for each element in an array



Variable Scope

The scope of a variable is the context within which it is defined.

```
<?php
$a = 1; /* global scope */
function Test()
{
    echo $a;
    /* reference to local scope variable */
}
Test();
?>
```

The scope is local within functions.

```
<?php
$a = 1;
$b = 2;
function Sum()
{
    global $a, $b;
    $b = $a + $b;
}
Sum();
echo $b;
?>
```

global
refers to its global version.

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```
<?php
function Test()
{
    static $a = 0;
    echo $a;
    $a++;
}
Test();
Test();
Test();
?>
```

static
does not lose its value.



Arrays

An array in PHP is actually an ordered map. A map is a type that maps values to keys.

```
<?php  
$arr = array("foo" => "bar", 12 => true);  
echo $arr["foo"]; // bar  
echo $arr[12]; // 1  
?>
```

array() = creates arrays

key = either an integer or a string.

value = any PHP type.

if no key, the maximum of the integer indices + 1.

if an existing key, its value will be overwritten.

can set values in an array

unset() removes a key/value pair

array_values() makes reindex effect (indexing numerically)

*Find more on arrays

```
<?php  
array(5 => 43, 32, 56, "b" => 12);  
array(5 => 43, 6 => 32, 7 => 56, "b" => 12);  
?>
```

```
<?php  
$arr = array(5 => 1, 12 => 2);  
$arr[] = 56; // the same as $arr[13] = 56;  
$arr["x"] = 42; // adds a new element  
unset($arr[5]); // removes the element  
unset($arr); // deletes the whole array  
$a = array(1 => 'one', 2 => 'two', 3 => 'three');  
unset($a[2]);  
$b = array_values($a);  
?>
```

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User Defined Functions

Can define a function using syntax such as the following:

```
<?php  
function foo($arg_1, $arg_2, /* ... */ $arg_n)  
{  
    echo "Example function.\n";  
    return $retval;  
}  
?>
```

Can also define conditional functions, functions within functions, and recursive functions.

Can return a value of any type

```
<?php  
function square($num)  
{  
    return $num * $num;  
}  
echo square(4);  
?>
```

```
<?php  
function small_numbers()  
{  
    return array (0, 1, 2);  
}  
list ($zero, $one, $two) = small_numbers();  
echo $zero, $one, $two;  
?>
```

```
<?php  
function takes_array($input)  
{  
    echo "$input[0] + $input[1] = ", $input[0]+$input[1];  
}  
takes_array(array(1,2));  
?>
```

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Files

PHP can:

- Deal with any files on the server
- Deal with any files on the Internet, using either http or ftp
- Instead of file handles, PHP associates a variable with a file, called the *file variable* (for program reference)

File Open

The fopen ("file_name", "mode") function is used to open files in PHP.

r	Read only.	r+	Read/Write.
w	Write only.	w+	Read/Write.
a	Append.	a+	Read/Append.
x	Create and open for write only.	x+	Create and open for read/write.

For w, and a, if no file exists, it tries to create it (use with caution, i.e. check that this is the case, otherwise you'll overwrite an existing file).

For x if a file exists, it returns an error.

```
<?php  
$fh=fopen("welcome.txt", "r");  
?>
```

```
<?php  
if (!$fh=fopen("welcome.txt", "r"))  
exit("Unable to open file!");  
?>
```

If the fopen() function is unable to open the specified file, it returns 0 (false).



Examples: Working with files

fclose() closes a file.
fgetc() reads a single character
fwrite(), fputs writes a string with and without \n

```
<?php  
$myFile = "welcome.txt";  
if (!$fh=fopen($myFile,'r'))  
exit("Unable to open file.");  
while (!feof($fh))  
{  
$x=fgetc($fh);  
echo $x;  
}  
fclose($fh);  
?>
```

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```
<?php  
$lines = file('welcome.txt');  
foreach ($lines as $l_num => $line)  
{  
echo "Line #{$l_num}:\".$line."  
}  
?>
```

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feof() determines if the end is true.
fgets() reads a line of data
file() reads entire file into an array

```
<?php  
$myFile = "welcome.txt";  
$fh = fopen($myFile, 'r');  
$theData = fgets($fh);  
fclose($fh);  
echo $theData;  
?>
```

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```
<?php  
$myFile = "testFile.txt";  
$fh = fopen($myFile, 'a') or die("can't open file");  
$stringData = "New Stuff 1\n";  
fwrite($fh, $stringData);  
$stringData = "New Stuff 2\n";  
fwrite($fh, $stringData);  
fclose($fh);  
?>
```

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PHP Information

The **phpinfo()** function is used to output PHP information about the version installed on the server, parameters selected when installed, etc.

```
<html><head></head>  
<!-- info.php COMP519  
<body>  
<?php  
// Show all PHP information  
phpinfo();  
?  
<?php  
// Show only the general information  
phpinfo(INFO_GENERAL);  
?  
</body>  
</html>
```

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INFO_GENERAL	The configuration line, php.ini location, build date, Web Server, System and more
INFO_CREDITS	PHP 4 credits
INFO_CONFIGURATION	Local and master values
INFO_MODULES	for php directives
INFO_ENVIRONMENT	Loaded modules
INFO_VARIABLES	Environment variable information
INFO_LICENSE	All predefined variables from EGPCS
INFO_ALL	Shows all of the above (default)



Including Files

The **include()** statement includes and evaluates the specified file.

```
vars.php  
<?php  
  
$color = 'green';  
$fruit = 'apple';  
  
?>  
test.php  
<?php  
  
echo "A $color $fruit"; // A  
  
include 'vars.php';  
  
echo "A $color $fruit"; // A green apple  
  
?>
```

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```
<?php  
function foo()  
{  
global $color;  
  
include ('vars.php');  
  
echo "A $color $fruit";  
}  
  
/* vars.php is in the scope of foo() so *  
* $fruit is NOT available outside of this *  
* scope. $color is because we declared it *  
* as global. */  
  
foo(); // A green apple  
echo "A $color $fruit"; // A green  
?>
```

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The scope of variables in "included" files depends on where the "include" file is added!

You can use the include_once, require, and require_once statements in similar ways.



Server Variables

The **\$_SERVER** is a reserved variable that contains all server information.

```
<html><head></head>  
<body>  
  
<?php  
echo "Referer: " . $_SERVER["HTTP_REFERER"] . "<br />";  
echo "Browser: " . $_SERVER["HTTP_USER_AGENT"] . "<br />";  
echo "User's IP address: " . $_SERVER["REMOTE_ADDR"];  
?  
</body>  
</html>
```

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The **\$_SERVER** is a super global variable, i.e. it's available in all scopes of a PHP script.



Getting Time and Date

`date()` and `time()` formats a time or a date.

```
<?php  
//Prints something like: Monday  
echo date("l");  
  
//Like: Monday 15th of January 2003 05:51:38 AM  
echo date("l dS of F Y h:i:s A");  
  
//Like: Monday the 15th  
echo date("l \t\h\ejS");  
?>
```

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`date()` returns a string formatted according to the specified format.

```
<?php  
$nextWeek = time() + (7 * 24 * 60 * 60);  
    // 7 days; 24 hours; 60 mins; 60secs  
echo 'Now: '.date('Y-m-d')."\n";  
echo 'Next Week: '.date('Y-m-d', $nextWeek)."\n";  
?>
```

[view the output page](#)

`time()` returns current Unix timestamp

*Here is more on date/time formats: <http://uk.php.net/manual/en/function.date.php>



Cookies

`setcookie(name, value, expire, path, domain)` creates cookies.

```
<?php  
setcookie("uname", $_POST["name"], time()+36000);  
?  
<html>  
<body>  
<p>  
Dear <?php echo $_POST["name"] ?>, a cookie was set on this  
page! The cookie will be active when the client has sent the  
cookie back to the server.  
</p>  
</body>  
</html>
```

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NOTE:
`setcookie()` must appear BEFORE `<html>` (or any output) as it's part of the header information sent with the page.

```
<html>  
<body>  
<?php  
if (isset($_COOKIE["uname"]))  
echo "Welcome ". $_COOKIE["uname"] . "!<br />";  
else  
echo "You are not logged in!<br />";  
?  
</body>  
</html>
```

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`$_COOKIE` contains all COOKIE data.

`isset()` finds out if a cookie is set

use the cookie name as a variable



Forms Handling

Any form element is automatically available via one of the built-in PHP variables.

```
<html>  
<!-- form.html COMP519 --&gt;<br/><body>  
<form action="welcome.php" method="POST">  
Enter your name: <input type="text" name="name" /><br />  
Enter your age: <input type="text" name="age" /><br />  
<input type="submit" /> <input type="reset" />  
</form>  
</body>  
</html>
```

```
<html>  
<!-- welcome.php COMP 519 --&gt;<br/><body>  
Welcome <?php echo $_POST["name"]."; ?><br />  
You are <?php echo $_POST["age"]; ?> years old!  
  
</body>  
</html>
```

`$_POST` contains all POST data.

`$_GET` contains all GET data.

[view the output page](#)



PHP sessions

- Web servers don't keep track of information entered on a page when the client's browser opens another page
 - Difficult to do anything involving the same information across several pages
- Sessions help by maintaining data during a user's visit by storing data that can be accessed from page to page in a site.
- One can use session variables for storing information



Session Tracking

- A session is the time span during which a browser interacts with a particular server
- For session tracking, PHP creates and maintains a session tracking id
- Create the id with a call to `session_start` with no parameters
- Subsequent calls to `session_start` retrieves any session variables that were previously registered in the session



Logging into MySQL Server

- You can log into our MySQL server from Linux by typing in the prompt

```
bash-2.05$ mysql -h mysql <user name>
```



Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 209201 to server version: 5.0.22

Type 'help;' or '\h' for help. Type '\c' to clear the buffer.

```
mysql>
```

From here you can create and drop tables, and modify the data in your tables. But first you must specify which database on the server you want to use.

```
mysql> use <database>;
```



Database changed



The MySQL Database System

- A free, efficient, widely used SQL implementation

• Available from <http://www.mysql.org>

- Logging on to MySQL (starting it):

```
mysql [-h host] [-u username] [database name] [-p]
```

- Host is the name of the MySQL server
 - Default is the user's machine

- Username is that of the database
 - Default is the name used to log into the system

- The given database name becomes the "focus" of MySQL

- If you want to access an existing database, but it was not named in the mysql command, you must choose it for focus
 - use cars;

- Response is: Database changed



Creating a Table

Next, you can create the table you will be using for the upcoming project. For example,

```
mysql> CREATE TABLE students(
```

```
    > num INT NOT NULL AUTO_INCREMENT,  
    > f_name VARCHAR(48),  
    > l_name VARCHAR(48),  
    > student_id INT,  
    > email VARCHAR(48),  
    > PRIMARY KEY(num));
```

Hit Enter after each line (if you want). MySQL doesn't try to interpret the command itself until it sees a semicolon (;

```
Query OK, 0 rows affected (0.02 sec)
```

*If the server gives you a big ERROR, just try again from the top!



Viewing The Table Structure

Using `DESCRIBE` you can see the structure of a table

```
mysql> DESCRIBE students;
```

Field	Type	Null	Key	Default	Extra
num	int(11)	NO	PRI	NULL	auto_increment
f_name	varchar(48)	YES		NULL	
l_name	varchar(48)	YES		NULL	
student_id	int(11)	YES		NULL	
email	varchar(48)	YES		NULL	



Inserting Data

Using `INSERT INTO` you can insert a new row into your table. For example,

```
mysql> INSERT INTO students
```

```
> VALUES(NULL,'Russell','Martin',396310,'martin@csc.liv.ac.uk');
```

```
Query OK, 1 row affected (0.00 sec)
```

Using `SELECT FROM` you select some data from a table.

```
mysql> SELECT * FROM students;
```

num	f_name	l_name	student_id	email
1	Russell	Martin	396310	martin@csc.liv.ac.uk

```
1 row in set (0.00 sec)
```



Inserting Some More Data

You can repeat inserting until all data is entered into the table.

```
mysql> INSERT INTO students
```

```
> VALUES(NULL,'James','Bond',007,'bond@csc.liv.ac.uk');
```

```
Query OK, 1 row affected (0.01 sec)
```

```
mysql> SELECT * FROM students;
```

num	f_name	l_name	student_id	email
1	Russell	Martin	396310	martin@csc.liv.ac.uk
2	James	Bond	7	bond@csc.liv.ac.uk

```
2 rows in set (0.00 sec)
```



Altering the Table

- The `ALTER TABLE` statement is used to add or drop columns in an existing table.

```
mysql> ALTER TABLE students ADD date DATE;
```

```
Query OK, 2 rows affected (0.00 sec)
```

```
Records: 2 Duplicates: 0 Warnings: 0
```

```
mysql> SELECT * FROM students;
```

num	f_name	l_name	student_id	email	date
1	Russell	Martin	396310	martin@csc.liv.ac.uk	NULL
2	James	Bond	7	bond@csc.liv.ac.uk	NULL

```
2 rows in set (0.00 sec)
```



Updating the Table

- The UPDATE statement is used to modify the data in a table.

```
mysql> UPDATE students SET date='2007-11-15' WHERE num=1;
```



```
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```

```
mysql> SELECT * FROM students;
```

num	f_name	l_name	student_id	email	date
1	Russell	Martin	396310	martin@csc.liv.ac.uk	2007-11-15
2	James	Bond	7	bond@csc.liv.ac.uk	NULL

2 rows in set (0.00 sec)

Note that the date is expected in the format "YYYY-MM-DD" and I don't believe this default setting can be changed.



Other SQL Commands

- SHOW tables;
 - Give a list of tables that have been defined in the database
- ALTER TABLE students DROP email;
 - Drop the "email" column from all records
- DROP TABLE students;
 - Delete the entire "students" table, and its definition (use the DROP command with extreme care!!)
- DELETE FROM students;
 - Removes all rows from the "students" table (so once again, use the DELETE command with great caution), the table definition remains to be used again
- A more useful(?) command is something like
 - DELETE FROM students WHERE (num > 5) AND (num <= 10);
 - Selectively deletes students based on their "num" values (for example).
- HELP;
 - Give SQL help
- HELP DROP;
 - Give help on the DROP command, etc.



Deleting Some Data

- The DELETE statement is used to delete rows in a table.

```
mysql> DELETE FROM students WHERE l_name='Bond';
```



```
Query OK, 1 row affected (0.00 sec)
```

```
mysql> SELECT * FROM students;
```

num	f_name	l_name	student_id	email	date
1	Russell	Martin	396310	martin@csc.liv.ac.uk	2006-11-15

1 row in set (0.00 sec)



Using aliases in queries

- Especially long queries might benefit from the SQL capability for using aliases.
- Aliases can be used to refer to a column in GROUP BY, ORDER BY, or HAVING clauses
 - An alias uses the SQL keyword 'AS' to associate a new identifier with a table.
 - It should appear after the table name and before the alias. Once a table is aliased you must use that alias everywhere in the SQL query.
 - SQL doesn't allow references to a column alias in a WHERE clause



Using aliases in queries

```
mysql> select p.purchase_id, title FROM purchases AS p, clients AS c, itemlist AS i, books WHERE (p.client_id=c.client_id) AND (l_name='Martin') AND (p.purchase_id=i.purchase_id) AND (i.book_id=books.book_id) ORDER BY p.purchase_id;  
+-----+-----+  
| purchase_id | title      |  
+-----+-----+  
| 1 | Blackbeard |  
| 1 | Learning SQL |  
| 1 | Abstract Algebra |  
| 2 | Rising Sun |  
| 2 | Round the Moon |  
+-----+-----+  
5 rows in set (0.00 sec)
```



Searching tables (cont.)

```
mysql> SELECT clients.client_id, f_name, l_name FROM clients NATURAL JOIN purchases  
where l_name LIKE '%a%';  
+-----+-----+-----+  
| client_id | f_name | l_name |  
+-----+-----+-----+  
| 1 | Russell | Martin |  
| 1 | Russell | Martin |  
| 4 | Larry | Vance |  
| 5 | Paul | Abbott |  
+-----+-----+-----+  
4 rows in set (0.00 sec)
```

```
mysql> SELECT clients.client_id, f_name, l_name FROM clients, purchases WHERE (l_name  
LIKE '%a%') AND (clients.client_id=purchases.client_id)  
AND (clients.client_id > 1);  
+-----+-----+-----+  
| client_id | f_name | l_name |  
+-----+-----+-----+  
| 4 | Larry | Vance |  
| 5 | Paul | Abbott |  
+-----+-----+-----+  
2 rows in set (0.00 sec)
```



Searching tables

The SQL “wildcard” character is the % symbol. That is, it can literally represent anything.
Using it we can build searches like the following:

```
mysql> SELECT * FROM clients WHERE l_name LIKE '%a%';  
+-----+-----+-----+-----+  
| client_id | f_name | l_name | address | city | postcode |  
+-----+-----+-----+-----+  
| 1 | Russell | Martin | Dept of Computer Science | Liverpool | L69 3BX |  
| 4 | Larry | Vance | 76 Jarhead Ln | Liverpool | L12 4RT |  
| 5 | Paul | Abbott | 90 Crabtree Pl | Leamington Spa | CV32 7YP |  
+-----+-----+-----+-----+  
3 rows in set (0.00 sec)
```

This above search finds all data that has a letter “a” in the user_id column.

```
mysql> SELECT * FROM clients where l_name LIKE '%an%';  
+-----+-----+-----+-----+  
| client_id | f_name | l_name | address | city | postcode |  
+-----+-----+-----+-----+  
| 4 | Larry | Vance | 76 Jarhead Ln | Liverpool | L12 4RT |  
+-----+-----+-----+-----+  
1 row in set (0.00 sec)
```



Architectures for Database Access

• Client-Server Architectures

– Client tasks:

- Provide a way for users to submit queries
- Run applications that use the results of queries
- Display results of queries

– Server tasks:

- Implement a data manipulation language that can directly access and update the database

• A two-tier system has clients that are connected directly to the server

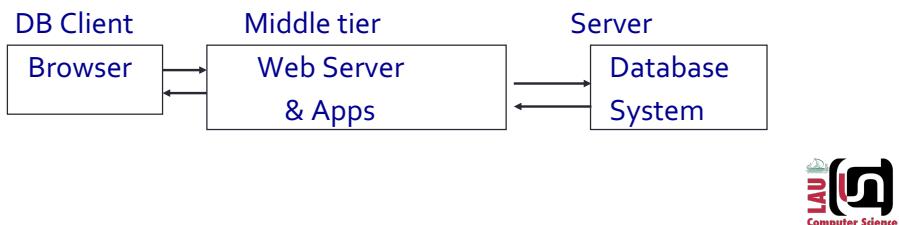
• Problems with a two-tier system:

- Because the relative power of clients has grown considerably, we could shift processing to the client, but then keeping all clients current with application updates is difficult



Architectures for Database Access

- A solution to the problems of two-tier systems is to add a component in the middle
 - Create a three-tier system
- For Web-based database access, the middle tier can run applications (client just gets results)



Architectures for Database Access

- *PHP & Database Access*
 - An API for each specific database system
 - Also convenient for Web access to databases, because PHP is run on the Web server
- *The Java JDBC Architecture*
 - Related to both embedded languages and to ODBC
 - JDBC is a standard protocol that can be implemented as a driver for any database system
 - JDBC allows SQL to be embedded in Java applications, applets, and servlets
 - JDBC has the advantage of portability over embedded SQL
 - A JDBC application will work with any database system for which there is a JDBC driver



Architectures for Database Access

- *Microsoft Access Architecture*
 - A tool to access any common database structure
 - Use either the Jet database engine, or go through the Open Database Connectivity (ODBC) standard
 - ODBC is an API for a set of objects and methods that are an interface to different databases
- *Database vendors provide ODBC drivers for their products*
 - The drivers implement the ODBC objects and methods
 - An application can include SQL statements that work for any database for which a driver is available



Database Access with PHP/MySQL

- To connect PHP to a database, use `mysql_connect`, which can have three parameters:
 - host (default is localhost)
 - Username (default is the username of the PHP script)
 - Password (default is blank, which works if the database does not require a password)
 - `$db = mysql_connect()` is usually checked for failure
- Sever the connection to the database with `mysql_close`



Putting Content into Your Database with PHP

- Connect to the database server and login
 - `mysql_connect("host","username","password");`
- Choose the database
 - `mysql_select_db("database");`
- Choose the database
 - `mysql_select_db("database");`
- Close the connection to the database server
 - `mysql_close();`



Database Access with PHP/MySQL

- Dealing with the result:

- Get the number of rows in the result

```
$num_rows = mysql_num_rows($result);
```

- Get the rows with `mysql_fetch_array`

```
for ($row_num = 0; $row_num < $num_rows; $row_num++) {  
    $row = mysql_fetch_array($result);  
    print "<p> Result row number" .  
        ($row_num + 1) .  
        " State_id: ";  
    print htmlspecialchars($row["State_id"]);  
    print "State: ";  
    etc.
```



Database Access with PHP/MySQL

- To focus MySQL,

```
mysql_select_db("cars");
```

- Requesting MySQL Operations

- Call `mysql_query` with a string parameter, which is an SQL command

```
$query = "SELECT * from States";  
$result = mysql_query($query);
```



Getting Content out of Your Database with PHP

Similarly, we can get some information from a database:

- Connect to the server and login, choose a database
 - `mysql_connect("host","username","password");`
 - `mysql_select_db("database");`
- Send an SQL query to the server to select data from the database into an array
 - `$result=mysql_query("query");`
- Either, look into a row and a fieldname
 - `$num=mysql_numrows($result);`
 - `$variable=mysql_result($result,$i,"fieldname")`
- Or, fetch rows one by one
 - `$row=mysql_fetch_array($result);`
- Close the connection to the database server
 - `mysql_close();`

