

Lecture #1

NEWM N510: Web-Database Concepts

Introduction to Web-Database Concepts

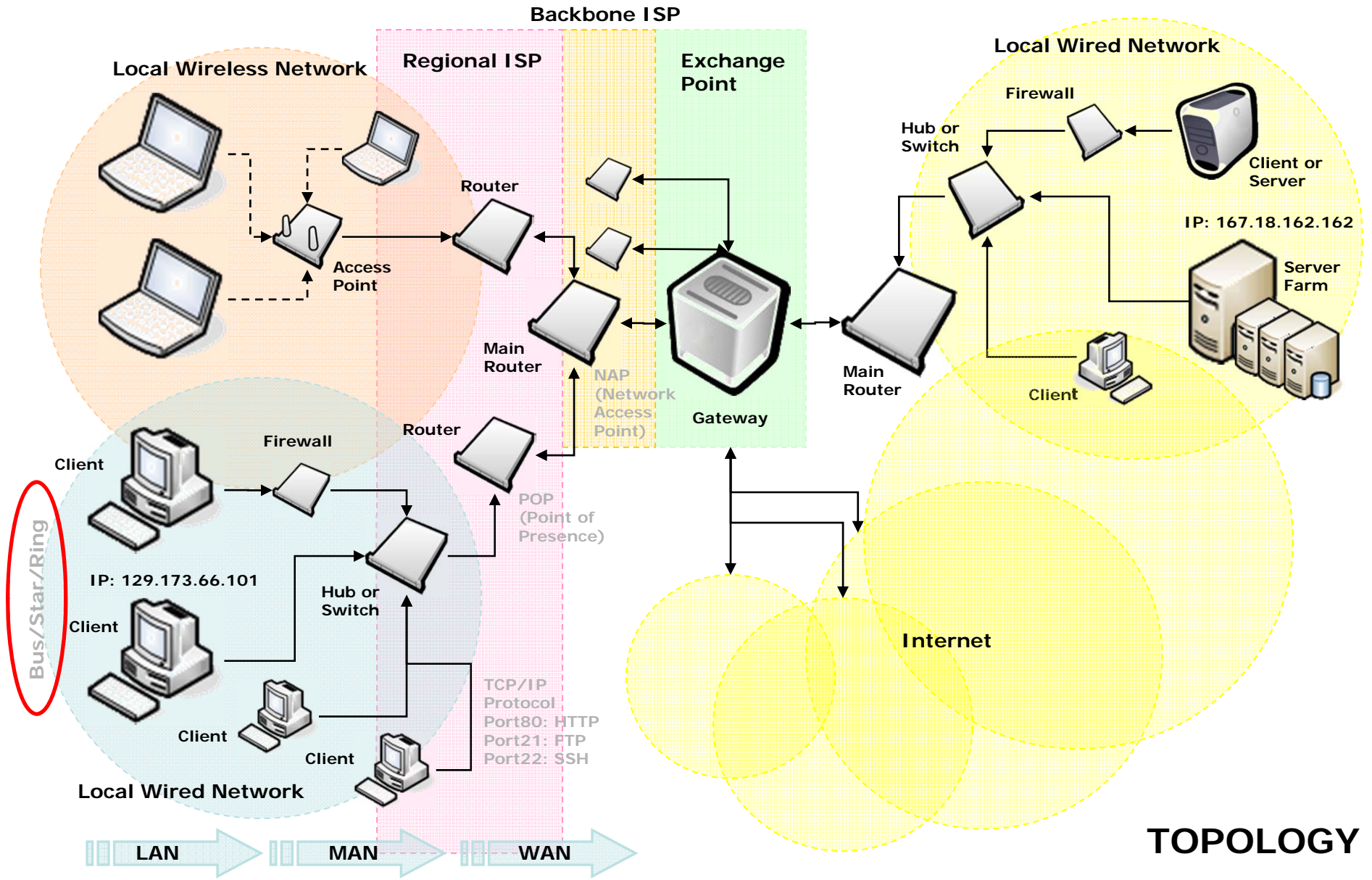
kharrazi@iupui.edu
<http://www.info510.com>

Lecture in a Nutshell

1. Networking Overview
2. Web Server
3. Static Languages - HTML
4. Server Side Languages – PHP
5. Databases - MySQL
6. HTML/PHP/MySQL Integration
7. Course Project

1. Networking Overview

- Networking is the construction, design, and use of network, including the physical (cabling, hub, switch, router, bridge, gateway, backbone and etc), the selection and use of telecommunication protocol and computer software for using and managing the network, and the establishment of operation policies and procedures related to the network.
- Common Terms:
Client, Server, Network (LAN, MAN, WAN), Hub, Switch, Router, Gateway, Backbone, Bridge

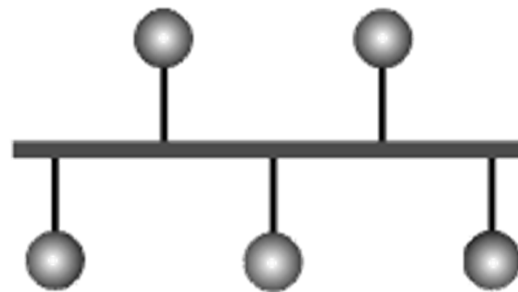


Networking Overview (cont.)

- A network is a series of points or nodes interconnected by communication paths.
- General configurations of networks is called **Topology** of network.
- The most common topology:
 - Bus
 - Star
 - Ring

Networking Overview (cont.)

- **Bus topology:**
 - All devices are attached to a line directly
 - All signals pass through each of the devices
 - Each device has a unique identity and can recognize those signals intended for it.

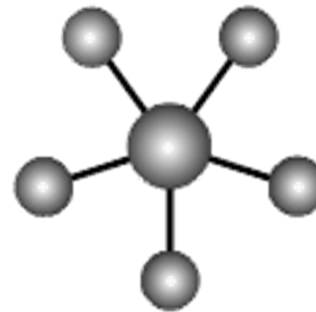


Bus network

Networking Overview (cont.)

- **Star topology**

- There is a central computer or server to which all the workstations are directly connected.
- Every workstation is indirectly connected to every other through the central computer.

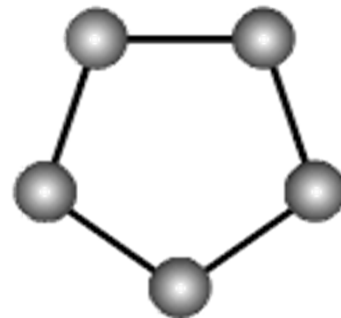


Star network

Networking Overview (cont.)

- **Ring topology**

- The workstations are connected in a closed loop configuration.
- Adjacent pairs of workstations are directly connected.
- Other pairs of workstations are indirectly connected, the data passing through one or more intermediate nodes.

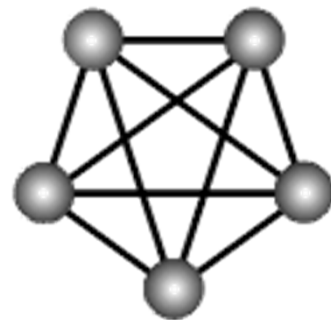


Ring network

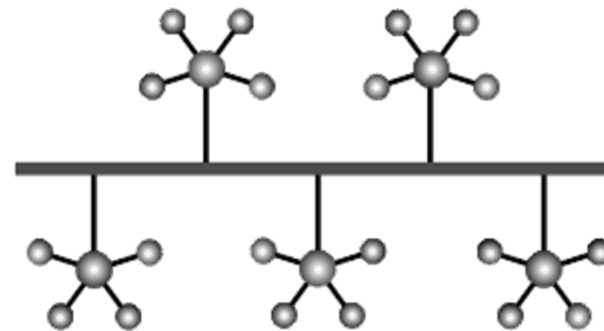
Networking Overview (cont.)

- **Hybrid topologies**

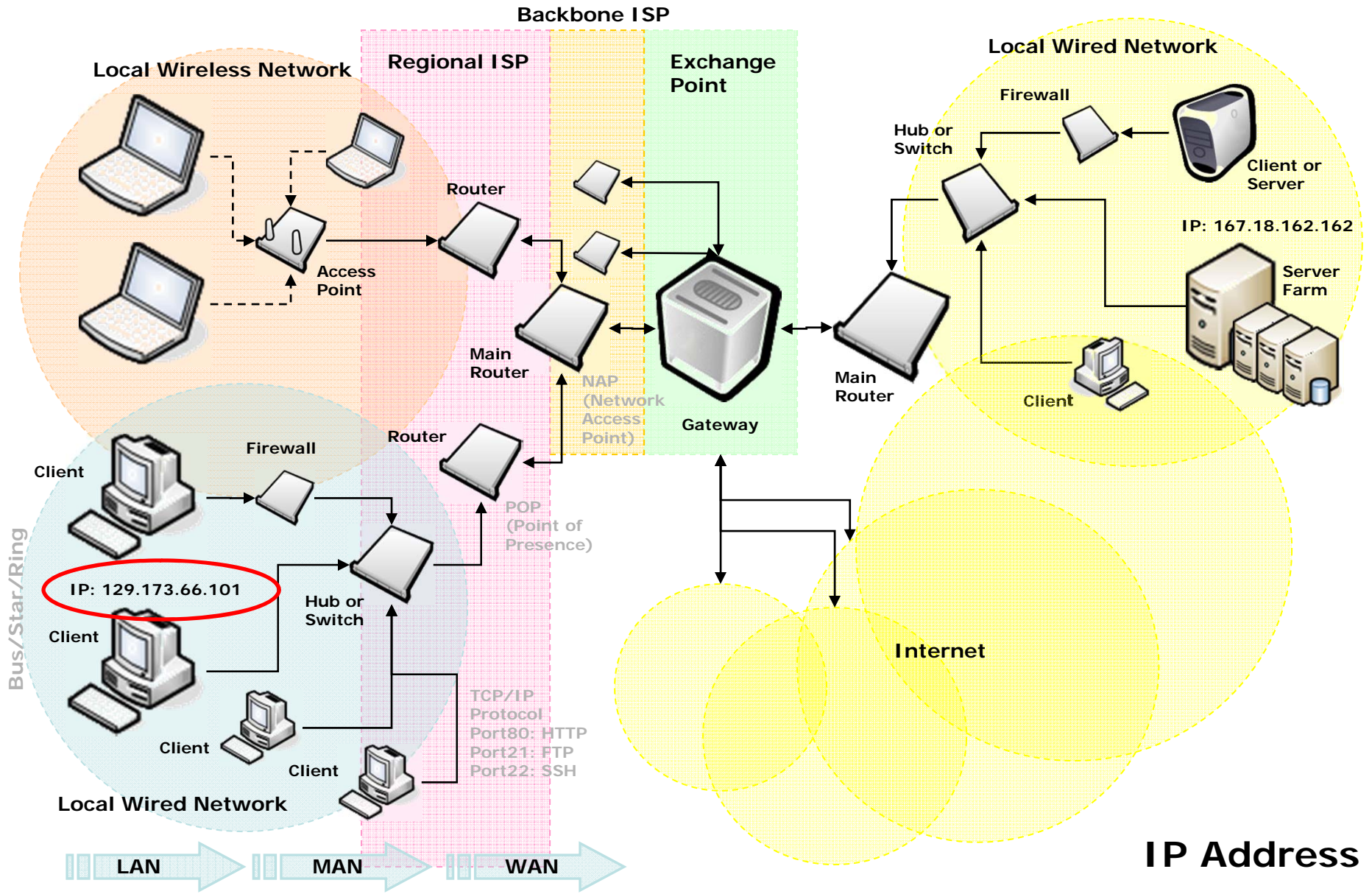
- Mesh network: each workstation is connected directly to each of the others
- Tree network: uses two or more star networks connected together. A tree network is a bus network of star networks.



Mesh network



Tree network



IP Address

Networking Overview (cont.)

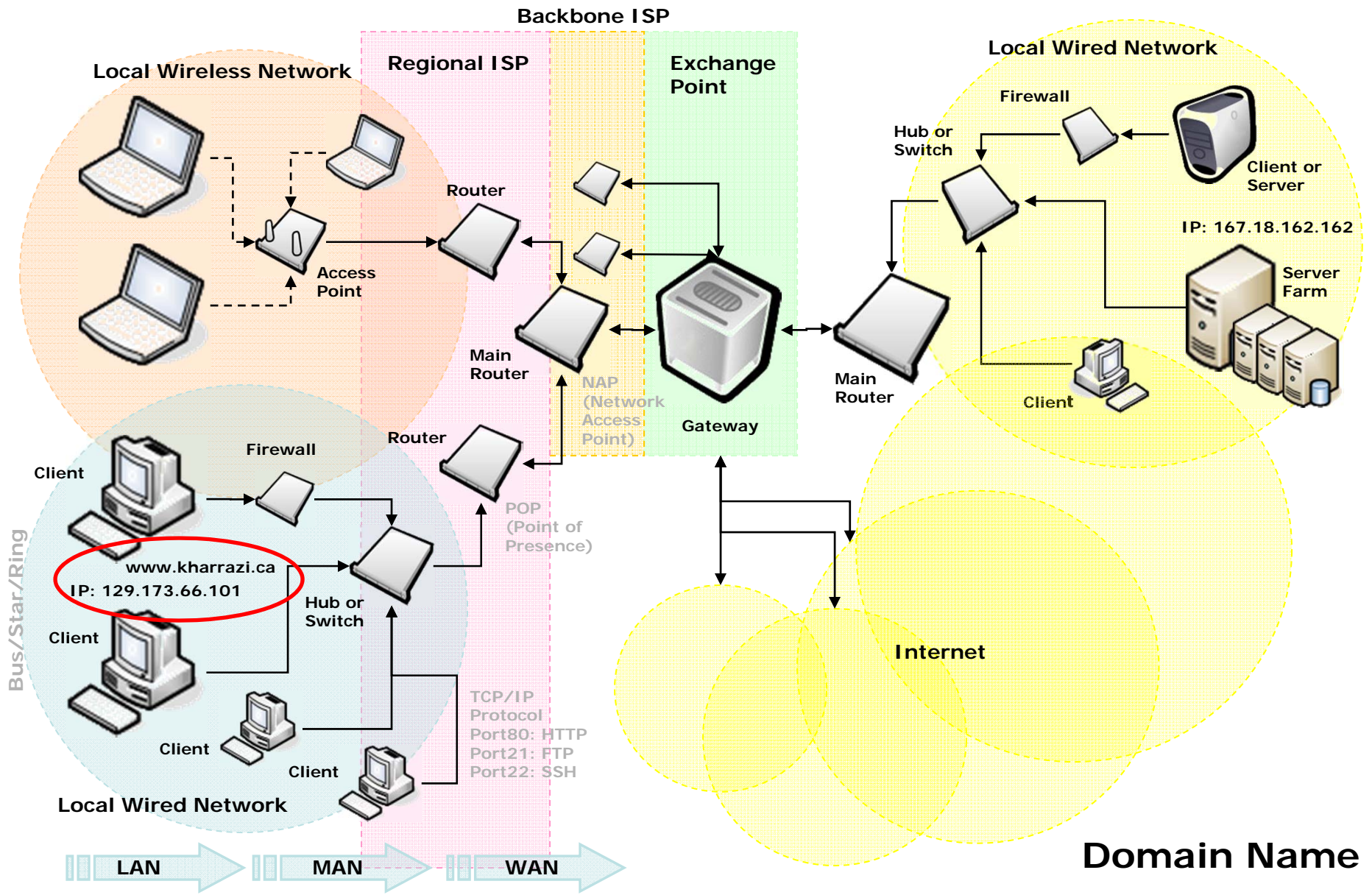
- **IP Address:**
 - Every machine on the Internet has a unique identifying number, called an IP Address.
 - A typical IP address looks like this: 216.27.61.137
 - To make it easier for humans to remember, IP addresses are normally expressed in decimal format as a "dotted decimal number" like the one above.
 - Computers communicate in binary form: 216.27.61.137
 - The same IP address in binary:
11011000.00011011.00111101.10001001

Networking Overview (cont.)

- **IP Address:**
 - The four numbers in an IP address are called octets, because they each have eight positions when viewed in binary form.
 - If you add all the positions together, you get 32, which is why IP addresses are considered **32-bit numbers**.
 - Since each of the eight positions can have two different states (1 or 0) the total number of possible combinations per octet is 2^8 or **256**. So each octet can contain any value between 0 and 255.
 - Combine the four octets and you get 2^{32} or a possible **4,294,967,296 unique values!**

Networking Overview (cont.)

- **IP Address:**
 - 32-bit addresses won't be enough for very much longer
 - **IPv6**, which uses 128-bit addresses, allowing a startlingly vast range of addresses: approximately **3.402824×10^{38}**
 - more than enough to allow every atom in the universe a unique IP address.
 - a routing table will keep track of: network numbers, the next router to use to get to that network and the interface this next router is reachable through.



Networking Overview (cont.)

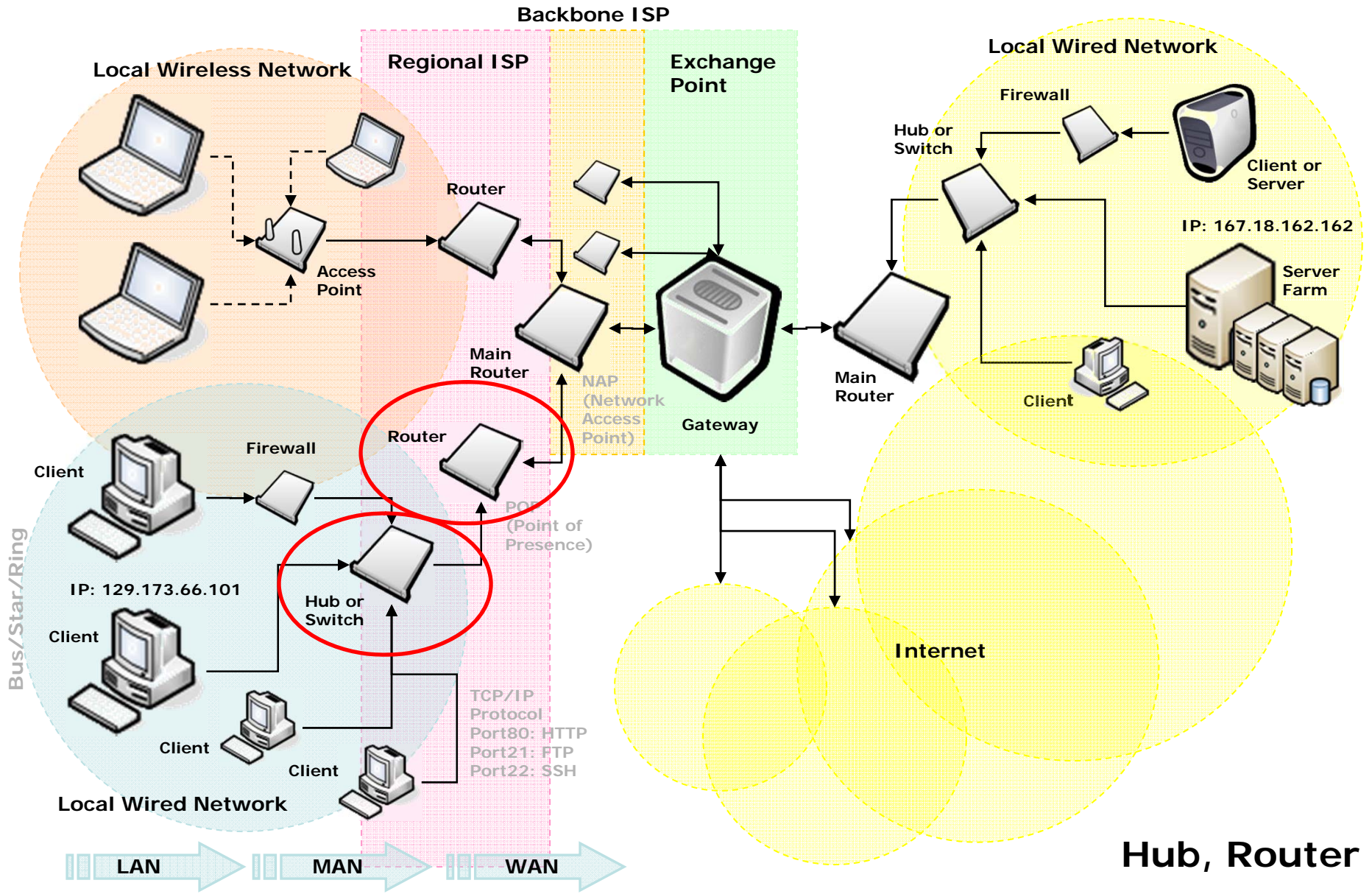
- **Domain Names:**
 - Domain name servers, or DNS, are an incredibly important but completely hidden part of the Internet.
 - The DNS system is a database, and *no other database on the planet gets this many requests*
 - When you use the Web or send an e-mail message, you use a domain name to do it.
 - the URL "http://www.dal.ca" and e-mail address student@dal.ca contain the domain name dal.ca

Networking Overview (cont.)

- **Domain Names:**
 - Every time you use a domain name, you use the Internet's domain name servers (DNS) to translate the human-readable domain name into the machine-readable IP address. Sounds simple!
 - During a day of browsing and e-mailing, you might access the domain name servers hundreds of times!

Networking Overview (cont.)

- **Domain Names:**
 - The COM, EDU and UK portions of these domain names are called the top-level domain or first-level domain.
 - There are several hundred top-level domain names, including **COM, EDU, GOV, MIL, NET, and ORG** , as well as **unique two-letter combinations for every country**.
 - Within every top-level domain there is a huge list of second-level domains. For example, in the COM first-level domain, you've got: yahoo, msn, microsoft plus millions of others...
 - Every name in the first top-level domain must be unique.



Networking Overview (cont.)

- **Hub**
 - In data communications, a hub is a place of convergence where data arrives from one or more directions and is forwarded out in one or more other directions.
 - It is “**dumb**” **system** that broadcasts the packet to all directions.
 - A hub usually includes a switch of some kind.

Networking Overview (cont.)

- **Hub (cont.)**
 - The distinction seems to be that the hub is the place where data comes together and the switch is what determines how and where data is forwarded from the place where data comes together.



Networking Overview (cont.)

- **Router:**
 - On the Internet, a router is a device or, in some cases, software in a computer, that **determines the next network point to which a packet should be forwarded** toward its destination.
 - The router is connected to **at least two networks** and decides which way to send each information packet based on its current understanding of the state of the networks it is connected to.
 - A router is located at any gateway (where one network meets another), including each Internet point-of-Presence (POP). A router is often included as part of a network switch.

Networking Overview (cont.)

- **Router (cont.):**
 - A router may create or maintain a table of the available routes and their conditions and use this information along with distance and cost algorithms to determine the best route for a given packet.
 - Typically, a packet may travel through a number of network points with routers before arriving at its destination.
 - Routing is a function associated with the Network layer in the **TCP/IP protocol**.

Networking Overview (cont.)

- **Gateway:**
 - A network point that acts as an entrance to another network. On the Internet, a node or stopping point can be either a gateway node or a host (end-point) node.
 - Both the computers of Internet users and the computers that serve pages to users are host nodes.
 - The computers that control traffic within company's network or at local **Internet Service Provider (ISP)** are gateway nodes.

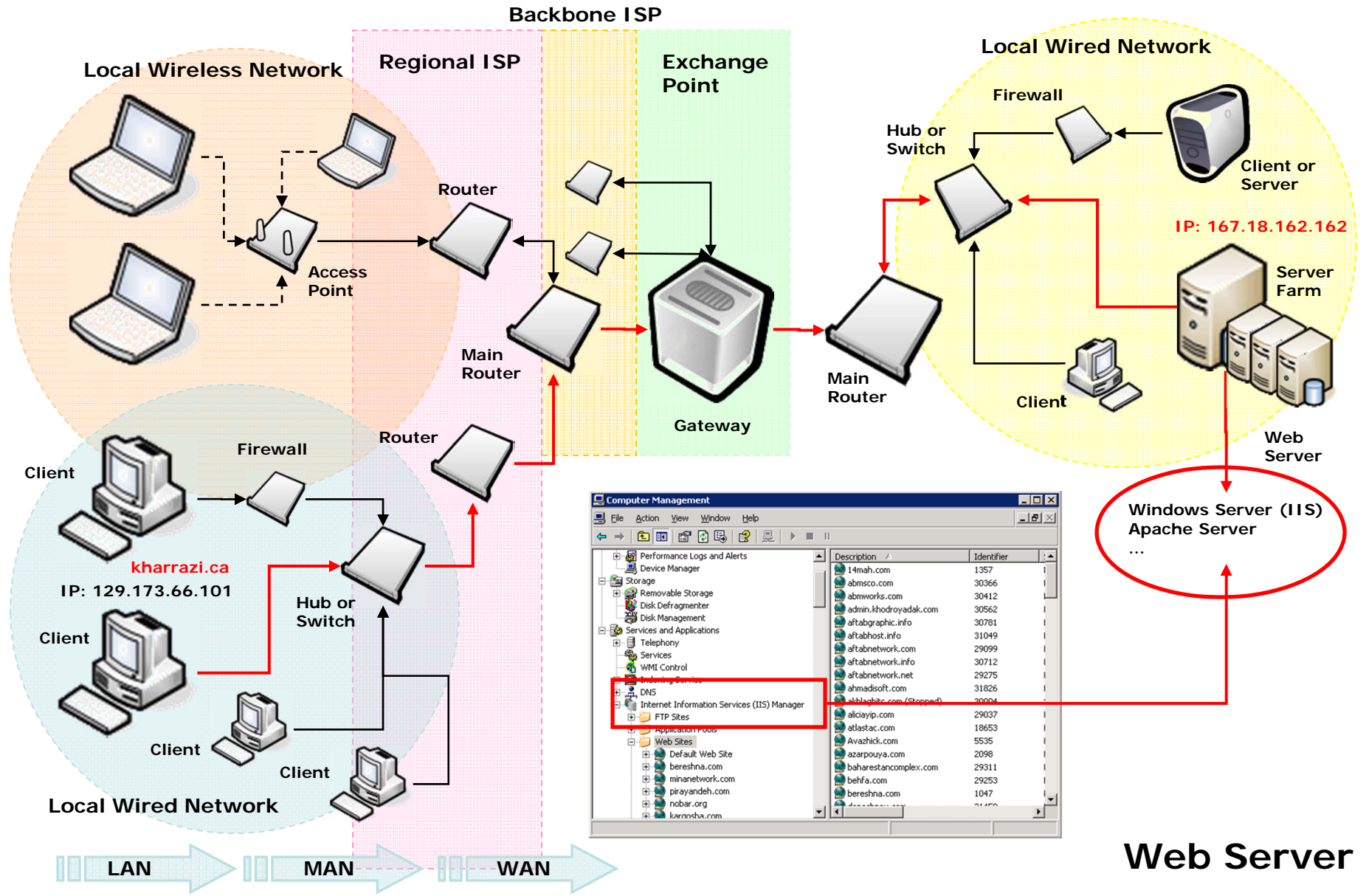
Networking Overview (cont.)

- **Backbone:**
 - A backbone is a larger transmission line that carries data gathered from smaller lines that interconnect with it.
 - On the Internet or other wide area networks, a backbone is a set of paths that local or regional networks connect to for long-distance interconnection.

2. Web Server

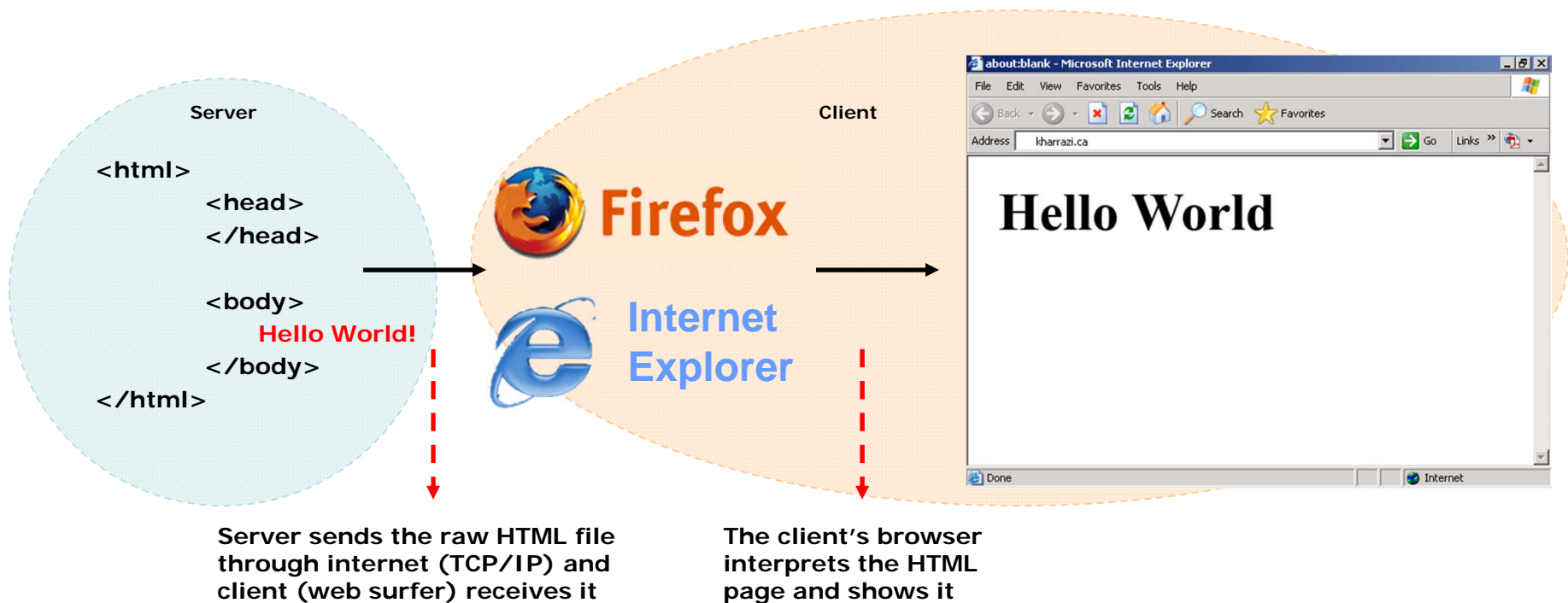
The term web server can mean one of two things:

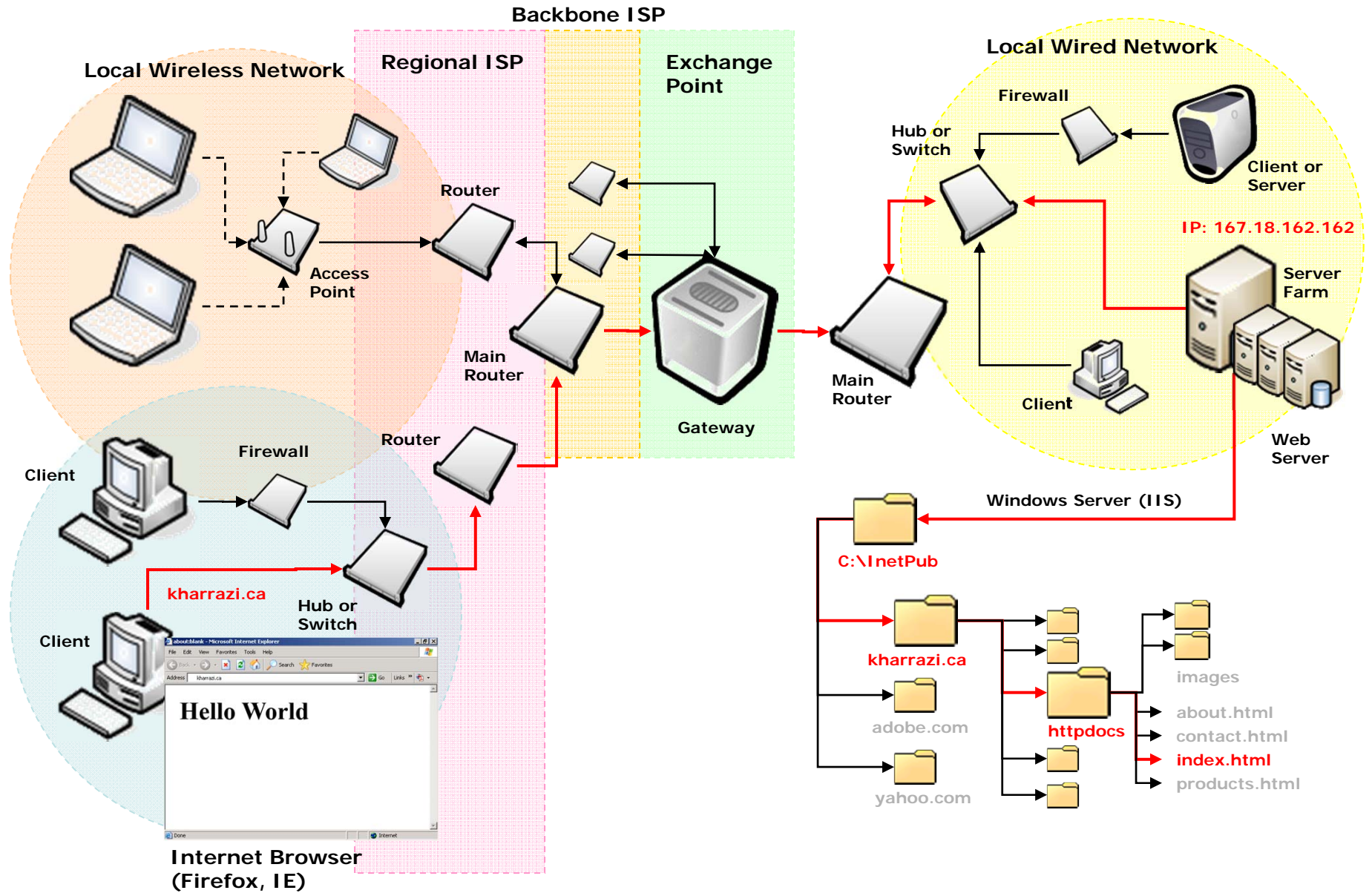
1. A computer responsible for serving web pages, mostly HTML documents, via the HTTP protocol to clients, mostly web browsers. Servers can have different Operating Systems such as Microsoft Windows, Mac OS, Linux, UNIX and FreeBSD.
2. A software program that is working as a daemon serving web documents such as Apache Server (Open Source) or Internet Information Server - IIS (Microsoft/Commercial).



3. HTML

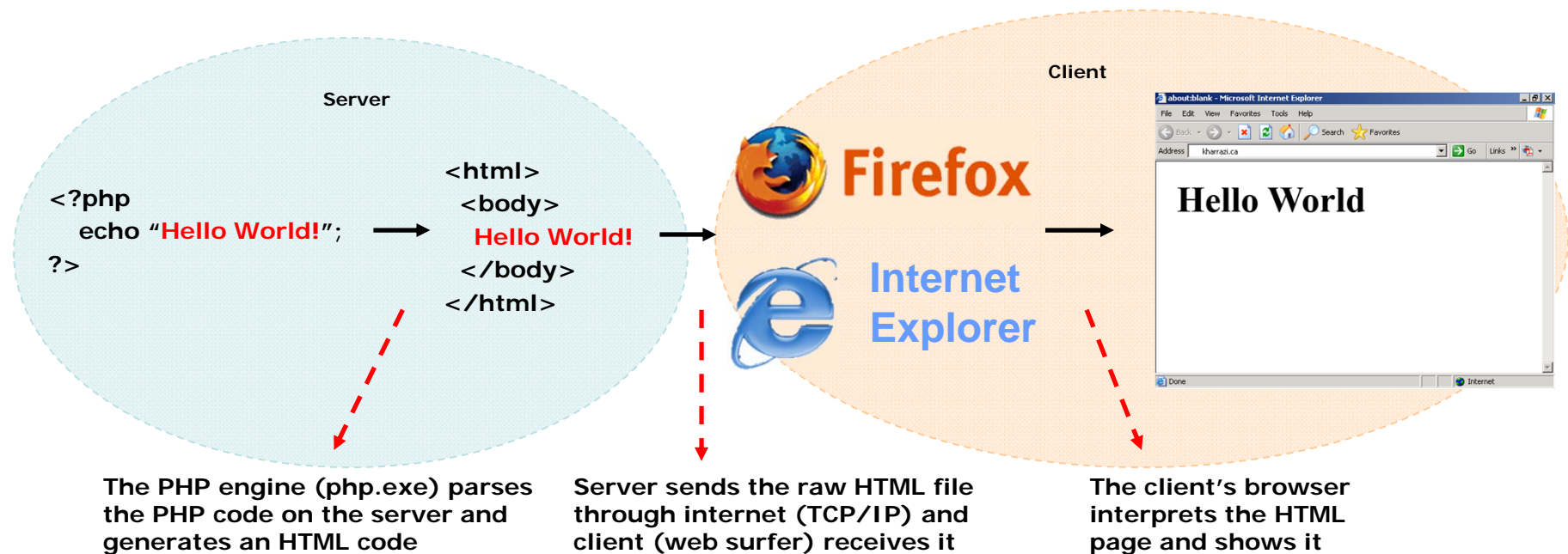
- HTML (Hypertext Markup Language) is the document format language used on the World Wide Web. Web browsers read HTML and display the page.
- Sample code (tags):

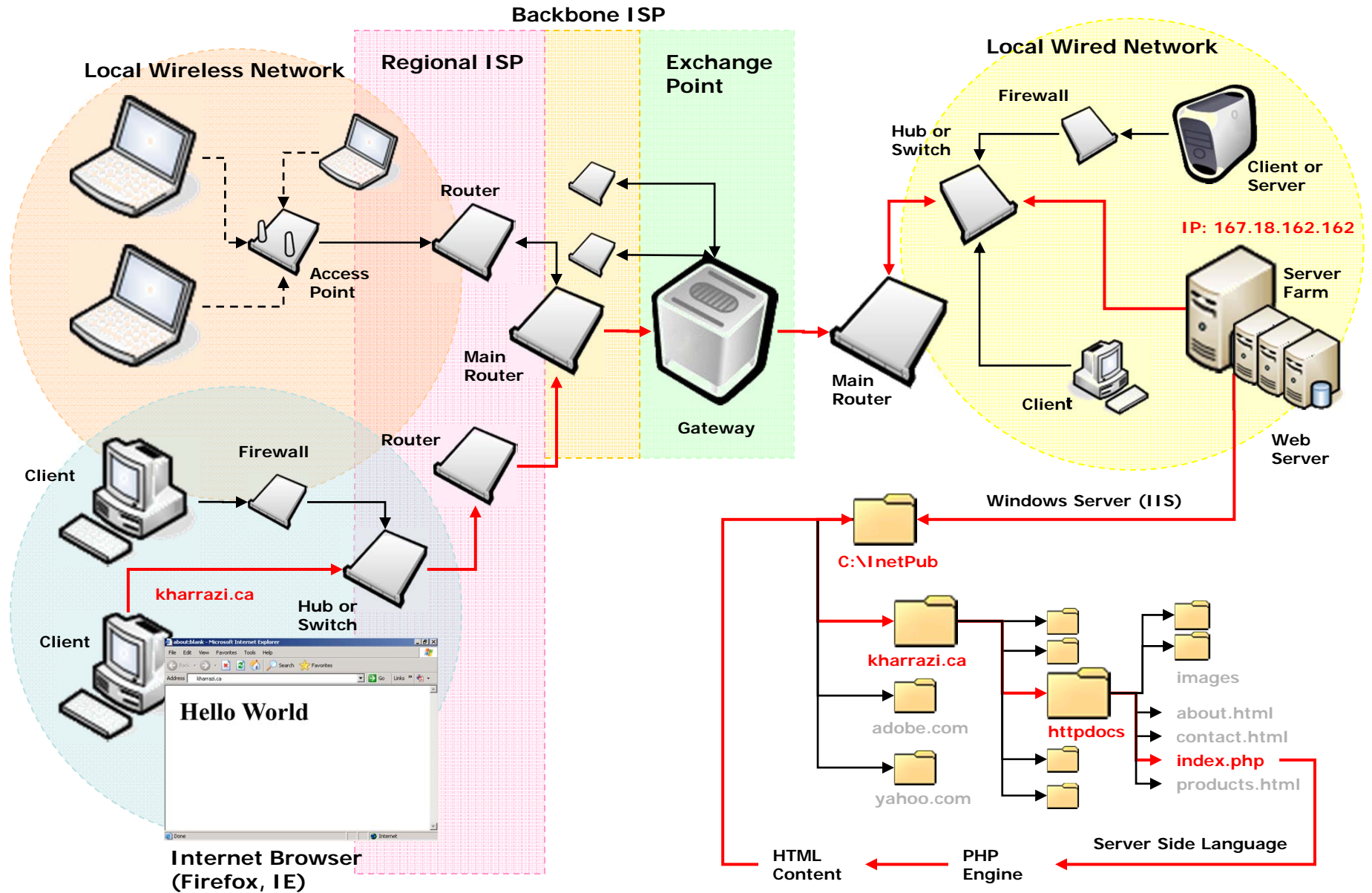




4. PHP

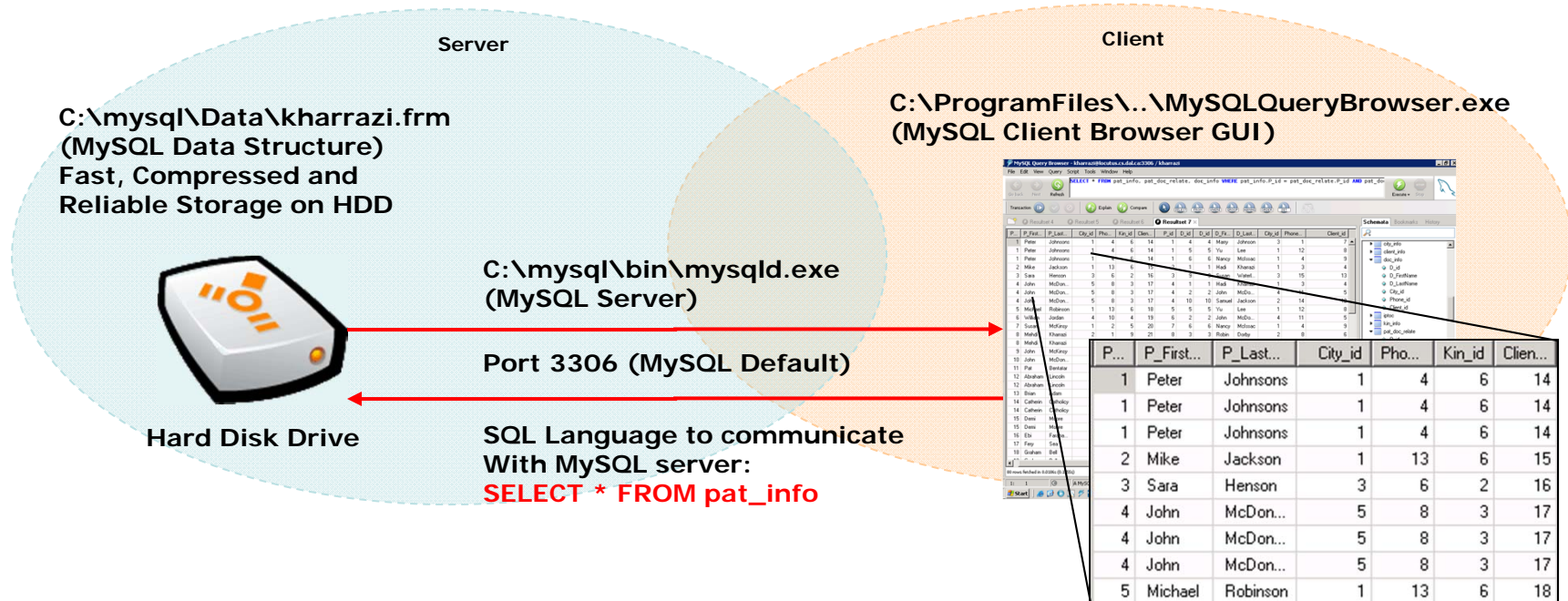
- PHP (Hypertext Preprocessor) is a server-side, cross-platform, HTML embedded scripting language that lets you create dynamic web pages. PHP-enabled web pages are treated just like regular HTML pages and you can create and edit them the same way you normally create regular HTML pages.

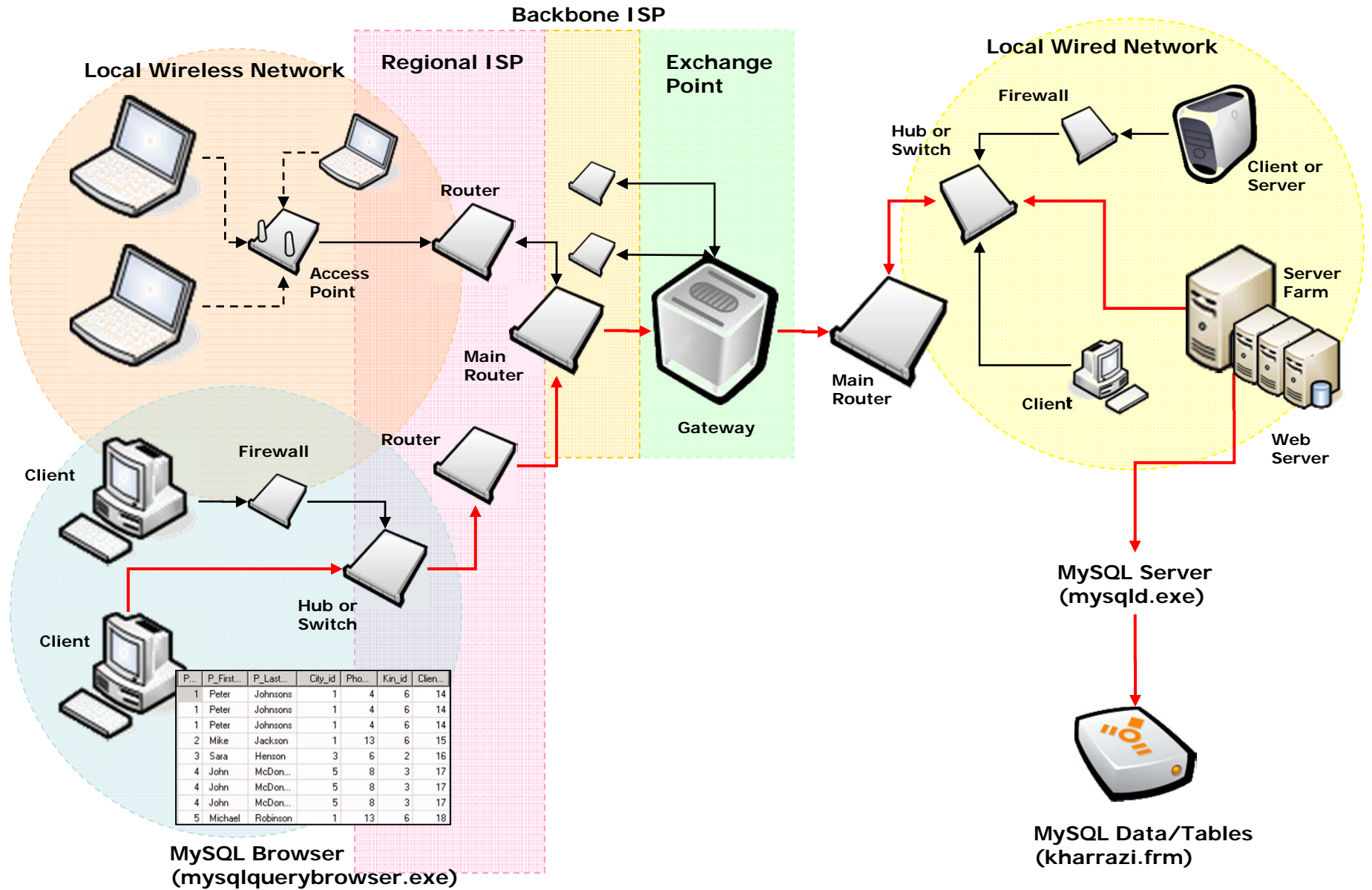




5. MySQL

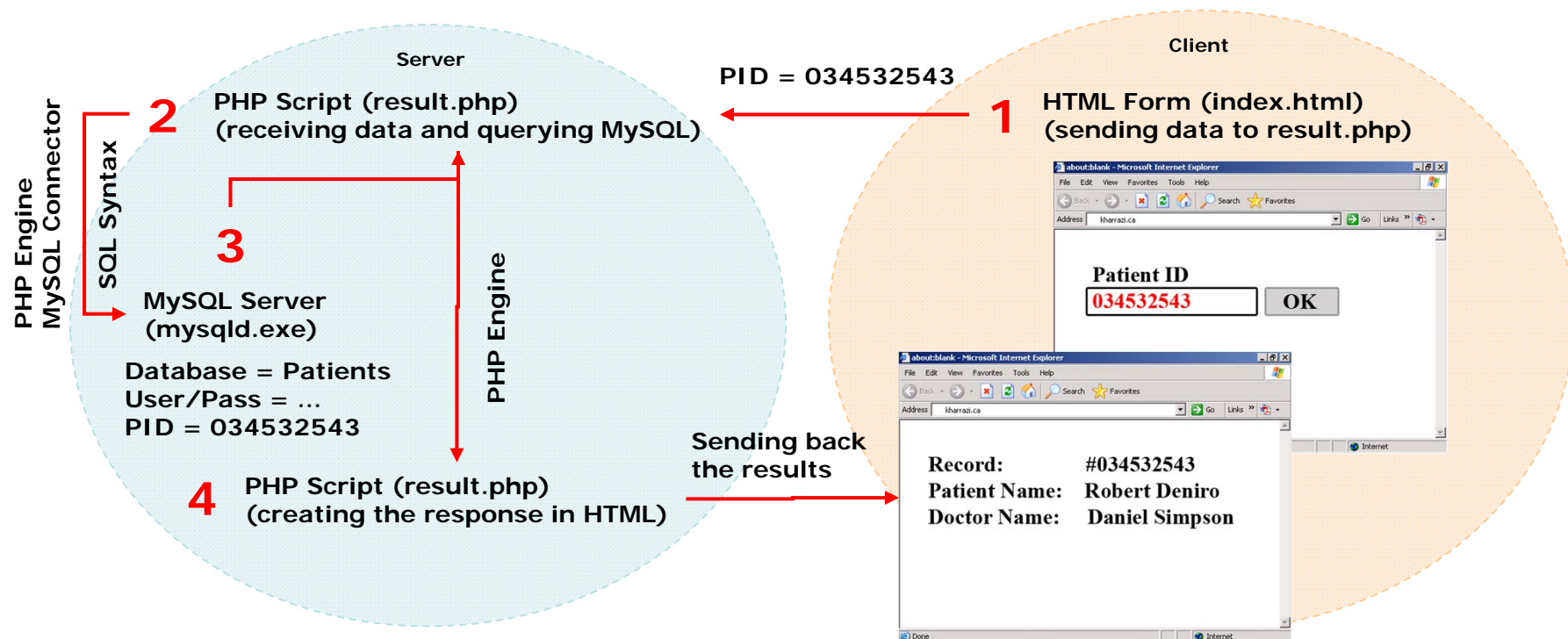
- MySQL is an open source relational database management system (RDBMS) that uses Structured Query Language (SQL), the most popular language for adding, accessing, and processing data in a database.





6. HTML/PHP/MySQL Integration

- MySQL and PHP are integrated very well and therefore it is currently the most popular combination of a server side language and a database engine to work on web.



7. Course Project

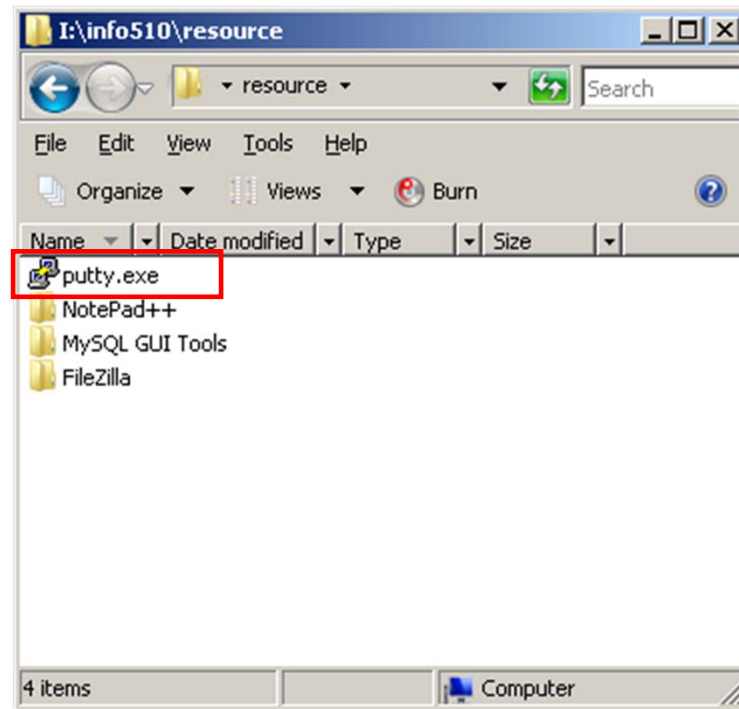
- Creating a sample working HTML/PHP/MySQL integration that will include the following items:
 1. Design and creation of a relational database within MySQL.
 2. Design and creation of several web based forms with HTML/PHP technology to query the available database and show the end results.
 3. A short report about phase 1 and 2 which includes the schema of the MySQL database and the HTML/PHP code.
 4. Finally student should email the final project (MySQL dump + HTML/PHP code + Report) to the instructor.

Sample projects can be found on the course website.

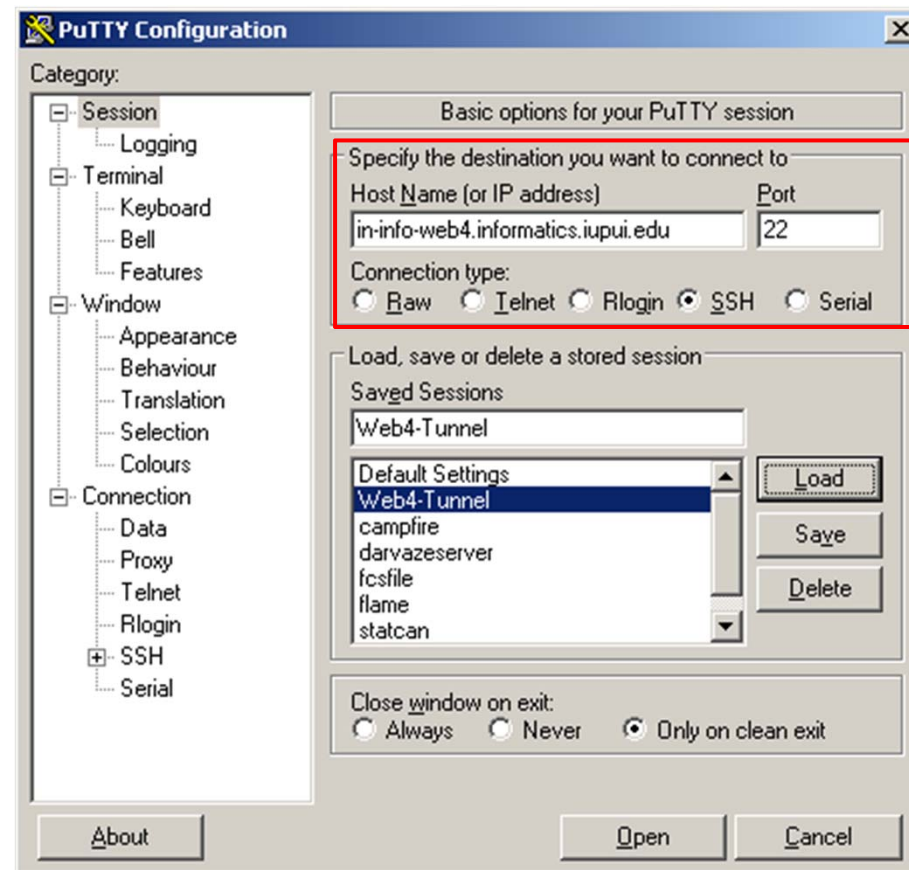
8. Applications

- Download all apps from the following link and unzip them on a memory stick or your desktop:
http://info510.com/core/public_page.php?page_name=resources
- **PuTTY**
 - Settings (Hostname, SSH 22, Tunneling 3306)
 - Changing MySQL Password
- **FileZilla**
 - SFTP (Secure FTP under SSH)
- **NotePad++**
- **MySQL GUI Tools**
 - Connect to Localhost

Applications (cont.) - PuTTY

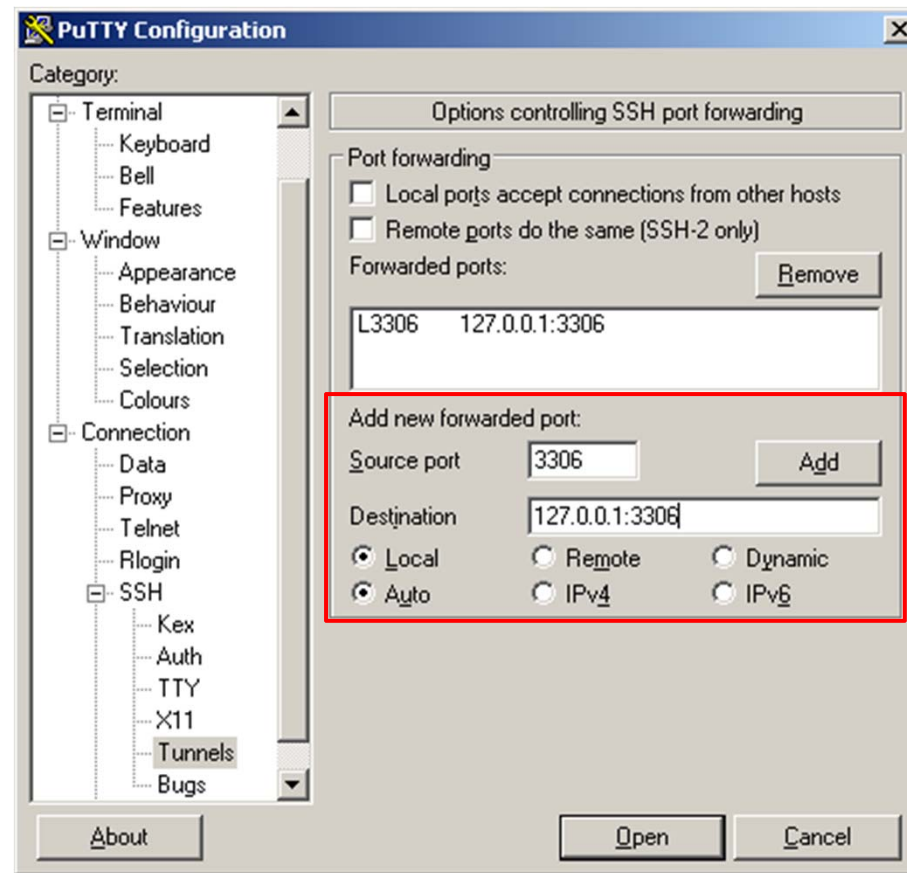


Applications (cont.) - PuTTY



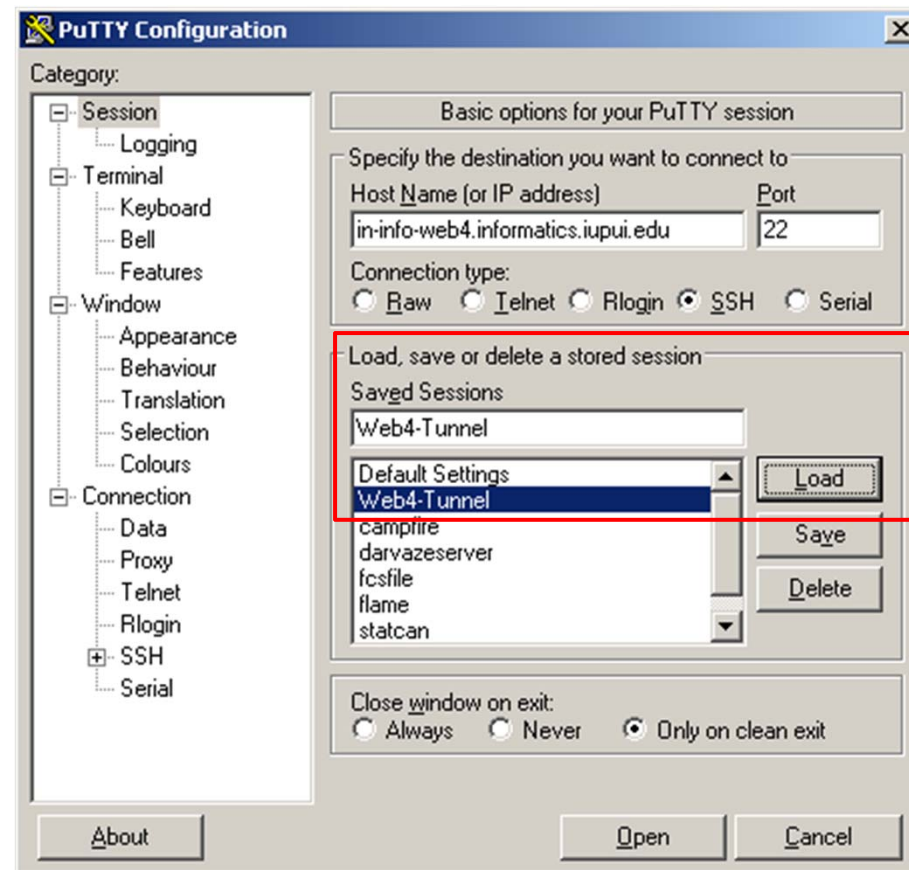
in-info-web4.informatics.iupui.edu

Applications (cont.) - PuTTY



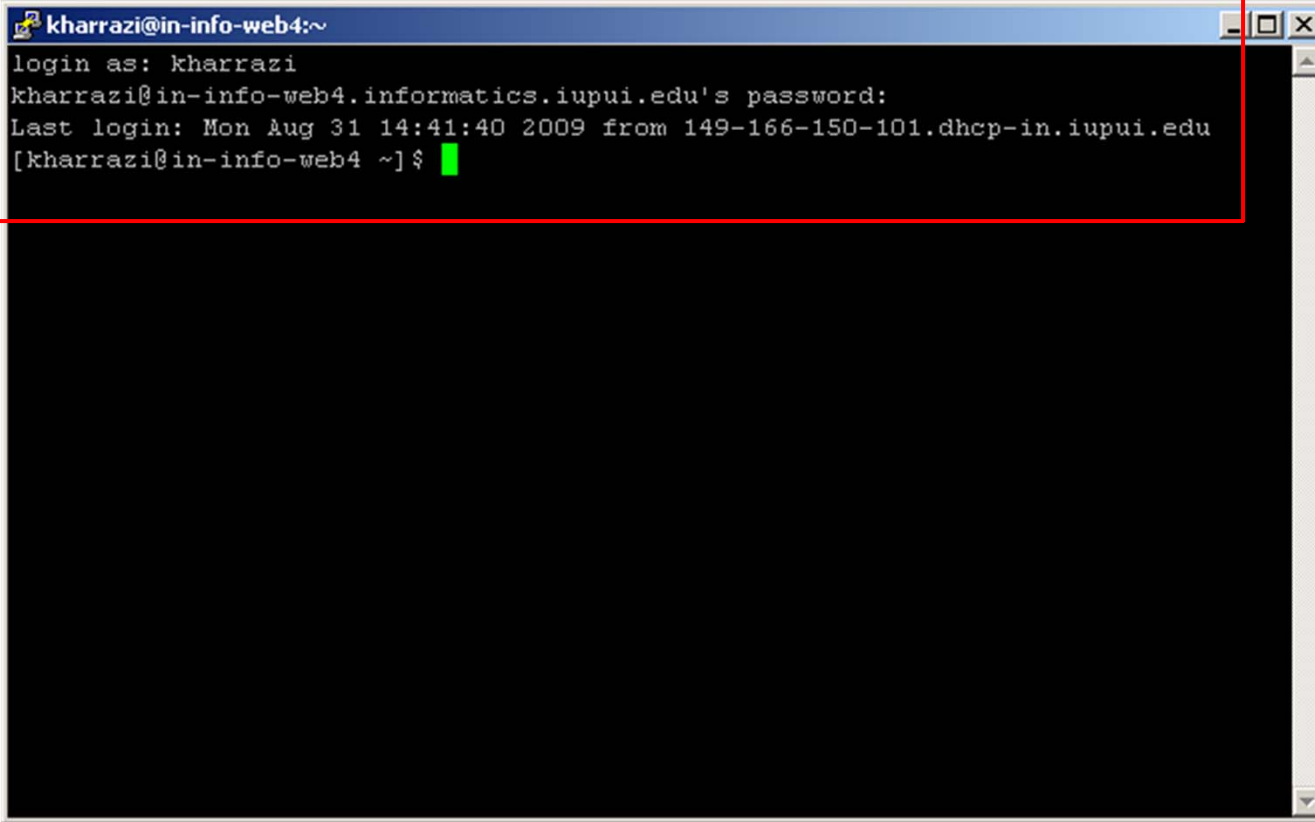
3306 / 127.0.0.1:3306 > Add

Applications (cont.) - PuTTY



Save Session (name...) > Save

Applications (cont.) - PuTTY

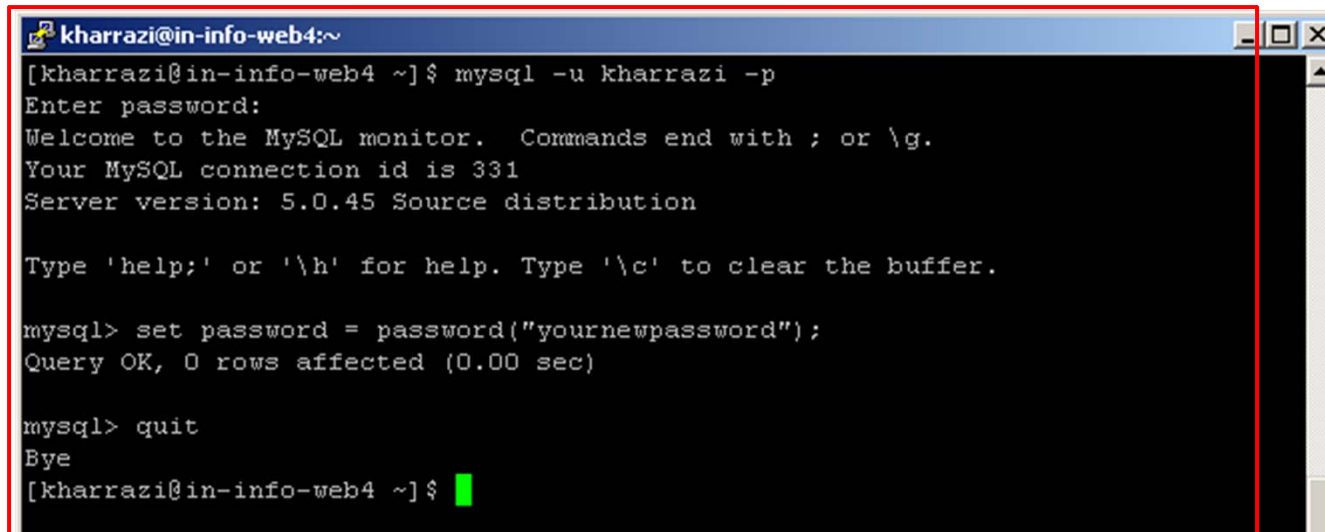
A screenshot of a PuTTY terminal window. The window title bar shows 'kharrazi@in-info-web4:~'. The terminal output is as follows:

```
login as: kharrazi
kharrazi@in-info-web4.informatics.iupui.edu's password:
Last login: Mon Aug 31 14:41:40 2009 from 149-166-150-101.dhcp-in.iupui.edu
[kharrazi@in-info-web4 ~]$
```

A red rectangular box highlights the first four lines of the terminal output, which correspond to the login process. A green cursor is visible at the end of the prompt line.

Enter username and then your OnCourse account password
You will not see the password while typing...

Applications (cont.) - PuTTY



```

kharrazi@in-info-web4:~
[kharrazi@in-info-web4 ~]$ mysql -u kharrazi -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 331
Server version: 5.0.45 Source distribution

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

mysql> set password = password("yournewpassword");
Query OK, 0 rows affected (0.00 sec)

mysql> quit
Bye
[kharrazi@in-info-web4 ~]$ █

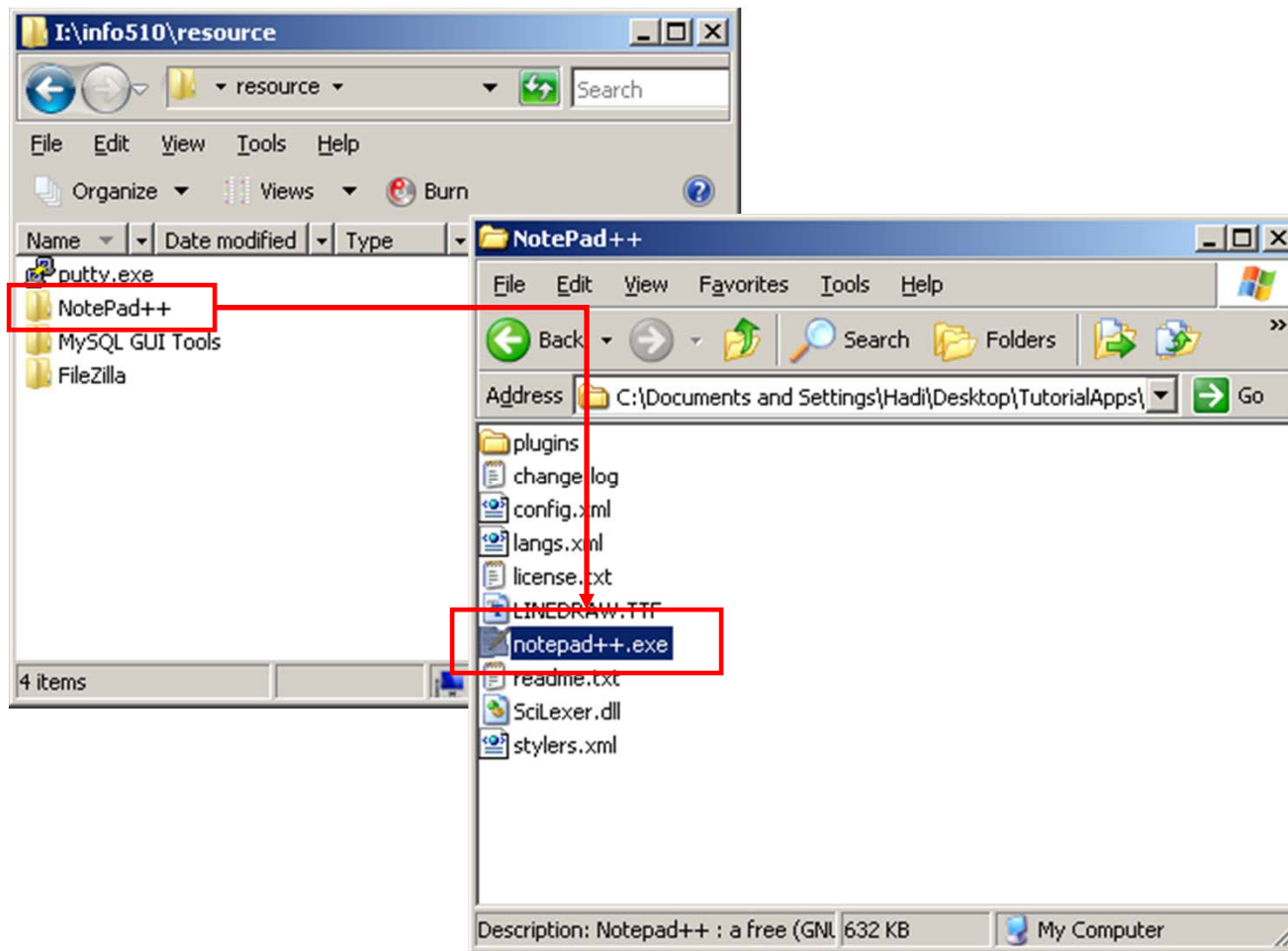
```

1. `mysql -u yourusername -p`
2. Type your password (you won't see it) – first time users type yourusername
3. "mysql >" will show up
4. `mysql > set password = password("yournewpassword");`
5. You will see the confirmation ('Query OK') – don't forget your new password
6. `mysql > quit`
7. You will see 'Bye' and no more "mysql >"
8. Type 'exit' to exit from PuTTY *(Not for now so we can use the tunnel!)*

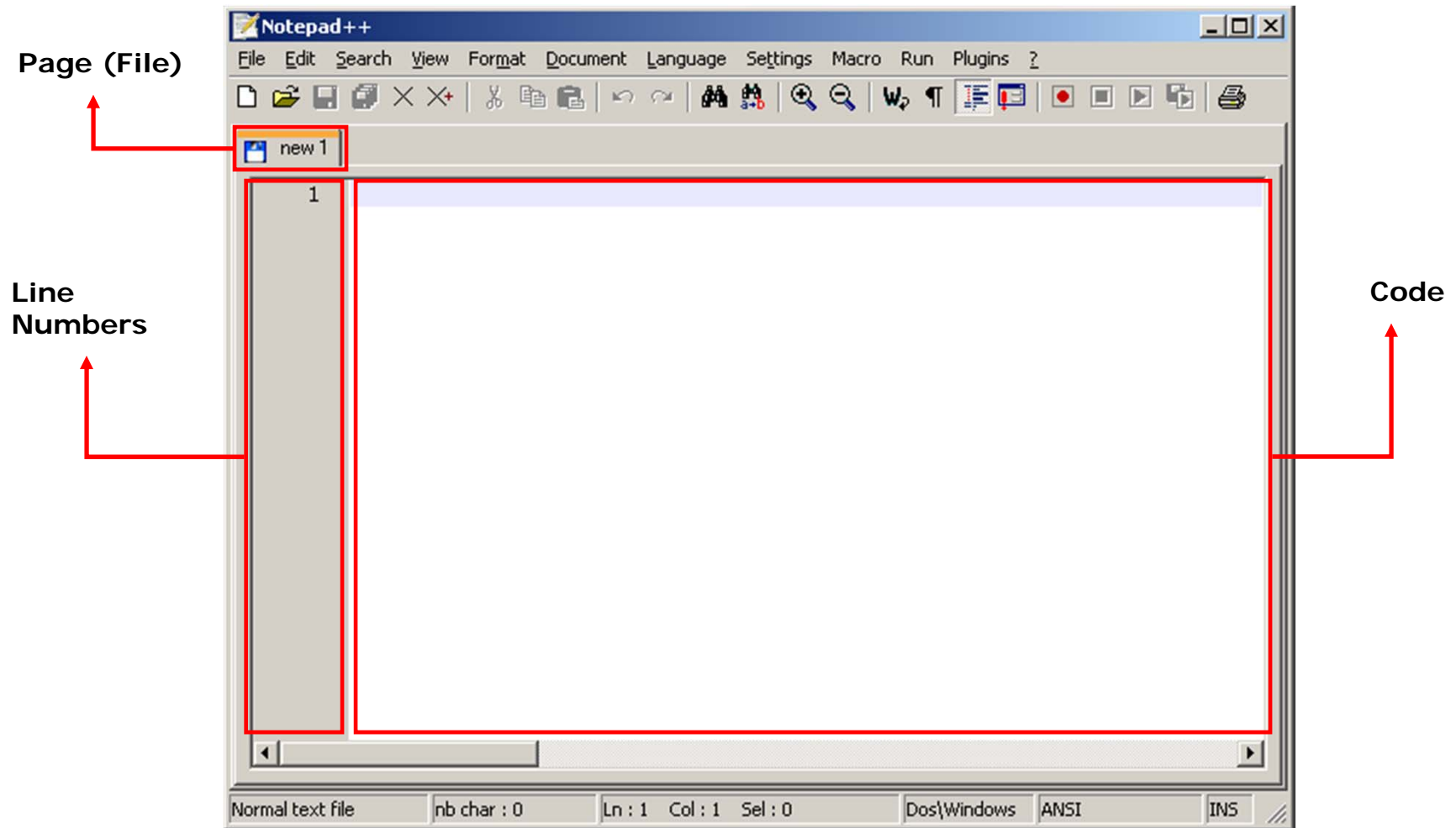
Applications (cont.) – NotePad++

- An IDE (integrated development environment) is an application or set of tools that allows a programmer to write, compile, edit, and in some cases test and debug within an integrated, interactive environment.
- NotePad++ is NOT a full feature IDE, but it is a simple and useful code editor which will help us writing codes in many languages such as HTML, PHP and etc. Some of the features for NotePad++ is:
 - Syntax Highlighting (Colored Coding)
 - Tabbed Navigation
 - Code Completion
 - Code Folding
 - Free (Open Source)

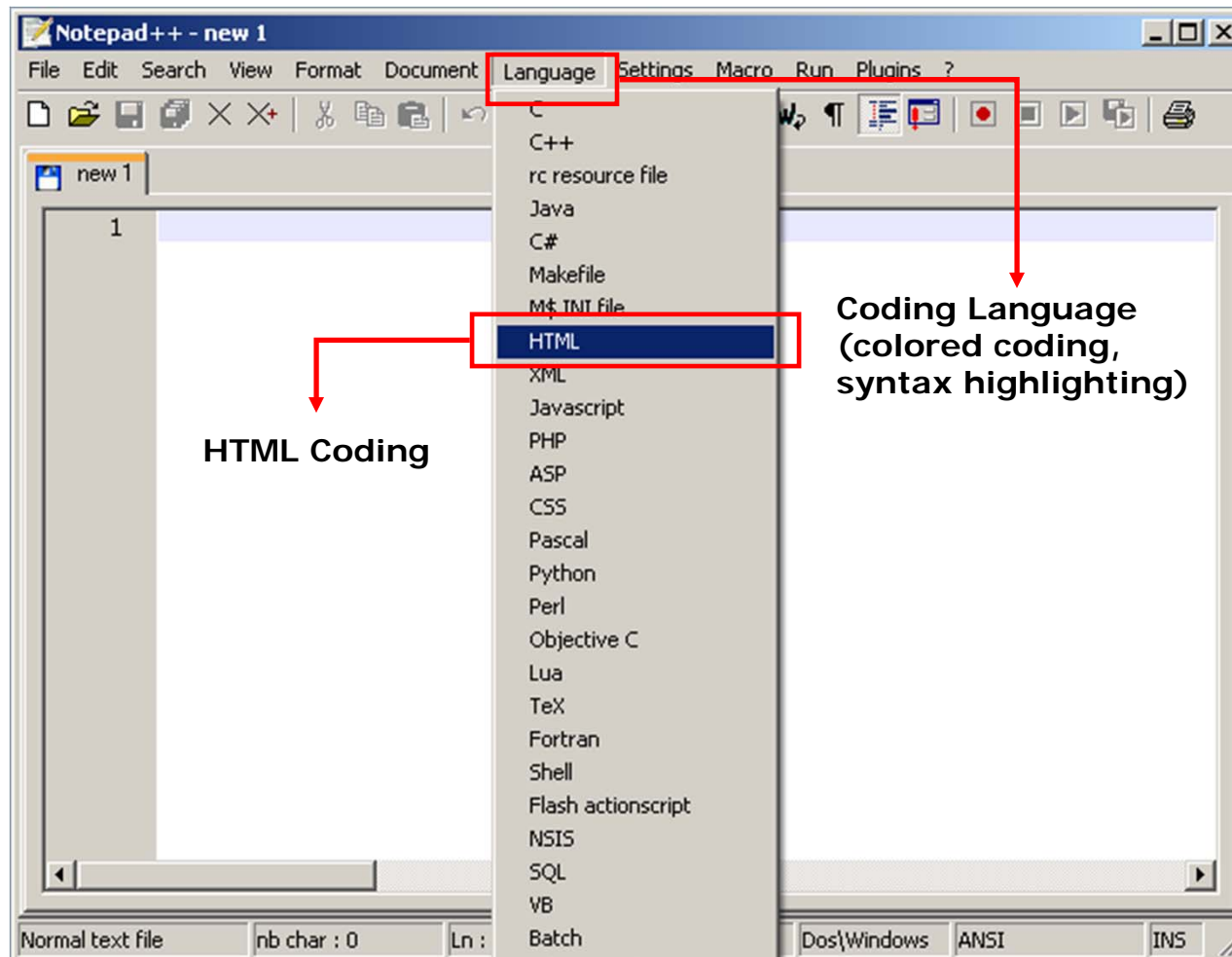
Applications (cont.) – NotePad++



Applications (cont.) – NotePad++



Applications (cont.) – NotePad++



Applications (cont.) – NotePad++

Sample HTML Code:

```
<html>  
<body>
```

Hello World!

```
</body>  
</html>
```


Applications (cont.) – NotePad++

The image shows a Notepad++ window titled "Notepad++ - new 1". The window contains a single tab labeled "new 1" with a red icon, indicating it has not been saved. The text editor displays the following HTML code:

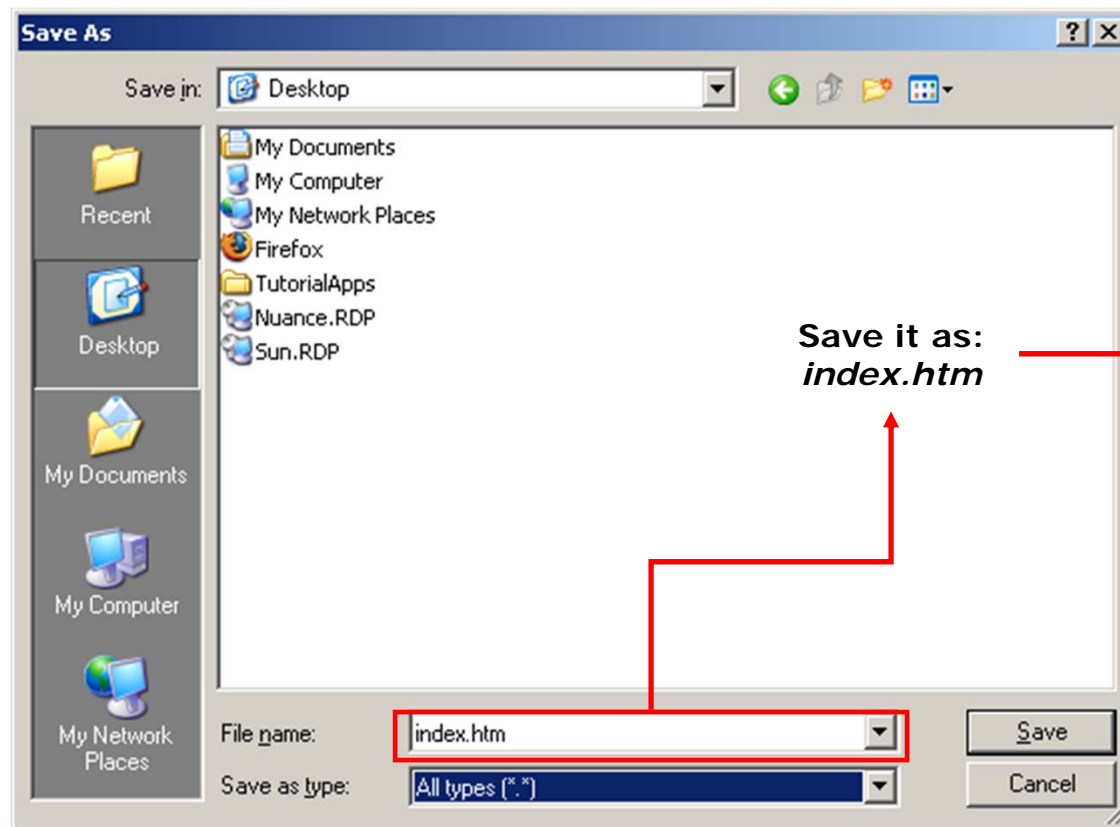
```
1 <html>
2 <body>
3
4     Hello World!
5
6 </body>
7 </html>
```

Annotations with red arrows point to specific features:

- Saving:** Points to the Save icon (floppy disk) in the toolbar.
- Tabbed Browsing (Red = Not Saved):** Points to the "new 1" tab icon.
- Folded Code:** Points to the collapse/expand icons (minus and plus signs) next to the HTML tags in the code.
- Sample HTML Code:** Points to the HTML code content in the editor.

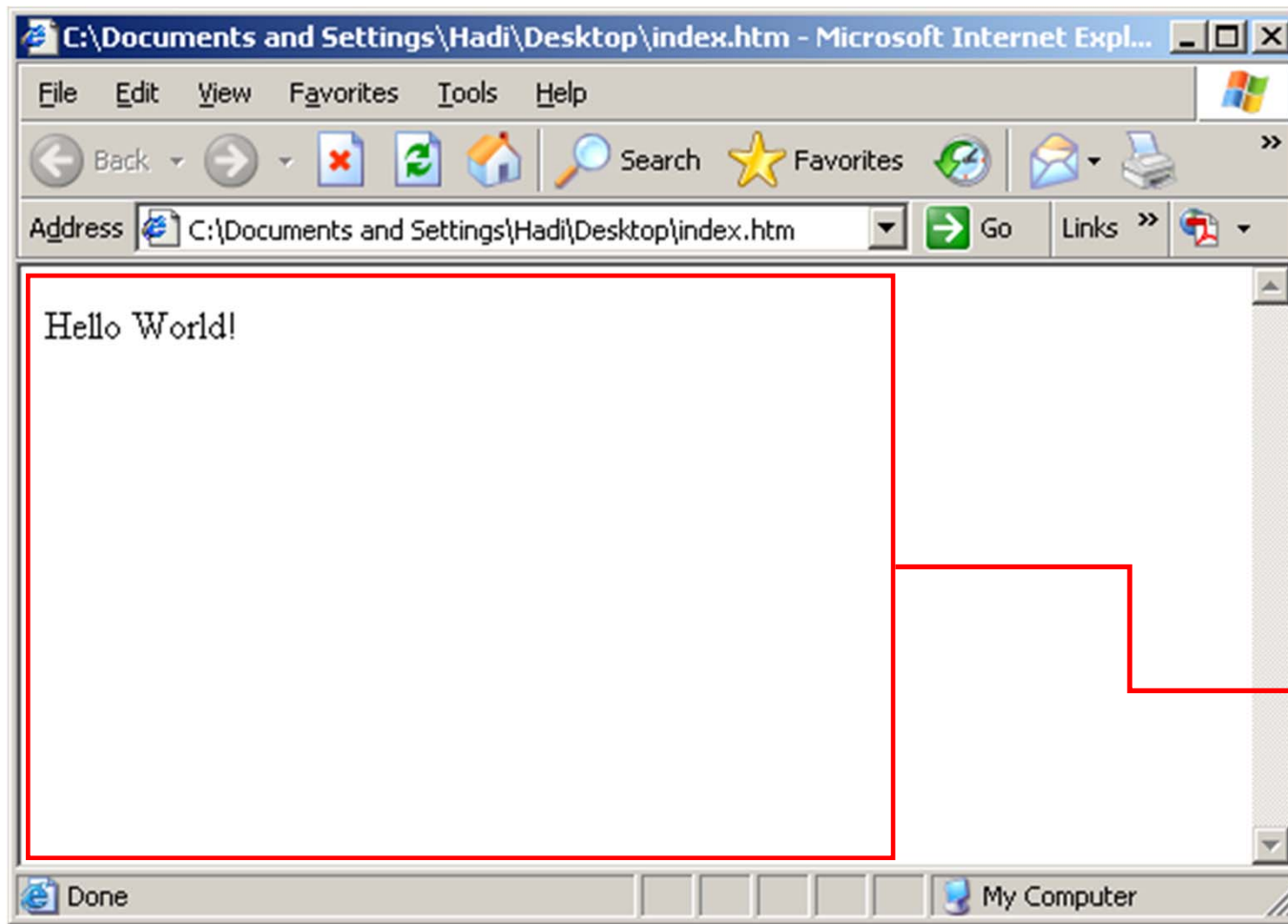
The status bar at the bottom shows: "Hyper Text Markup Language", "nb char : 51", "Ln : 7 Col : 8 Sel : 0", "Dos\Windows", "ANSI", and "INS".

Applications (cont.) – NotePad++



Double Click on:
index.htm

Applications (cont.) – NotePad++

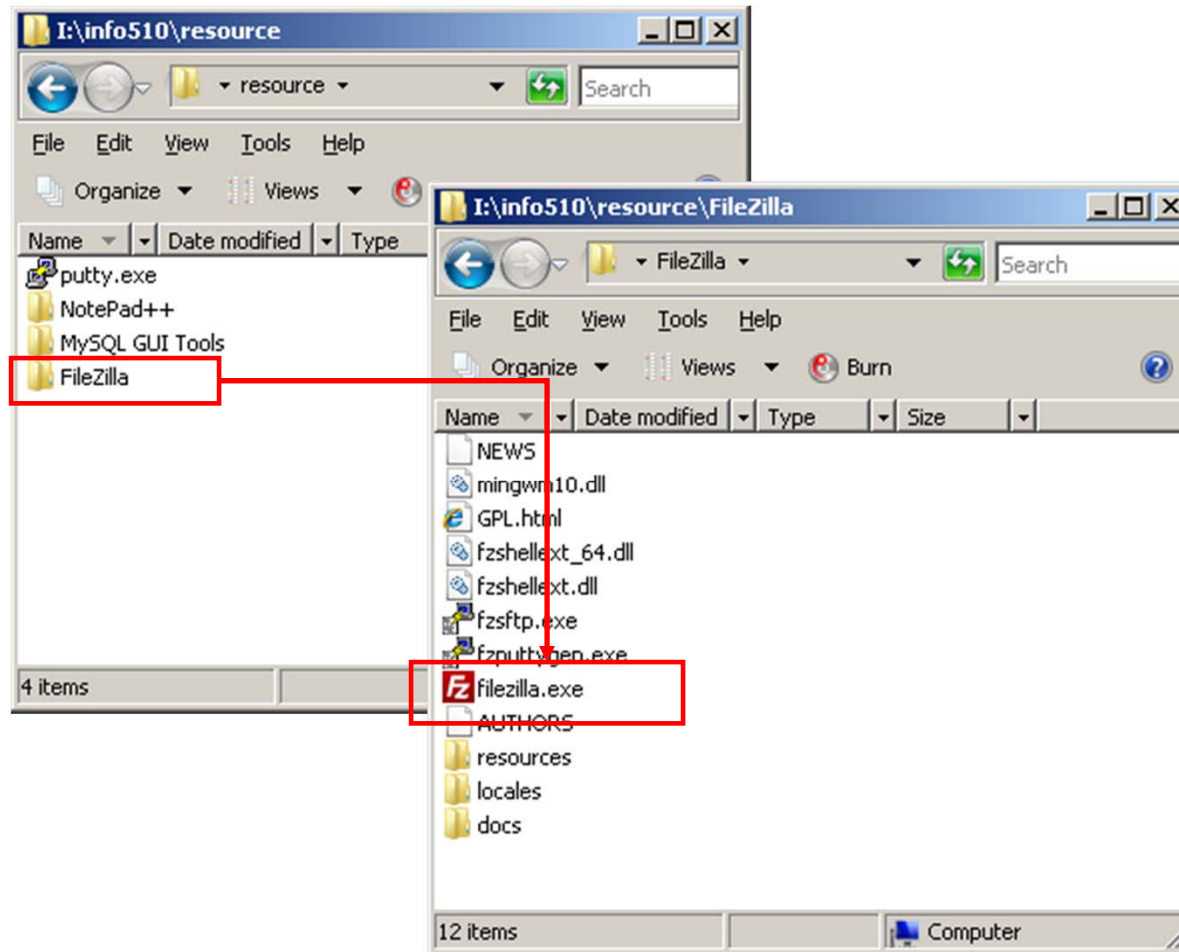


**Internet Explorer
or Mozilla FireFox
can translate
(decode) your
html file**

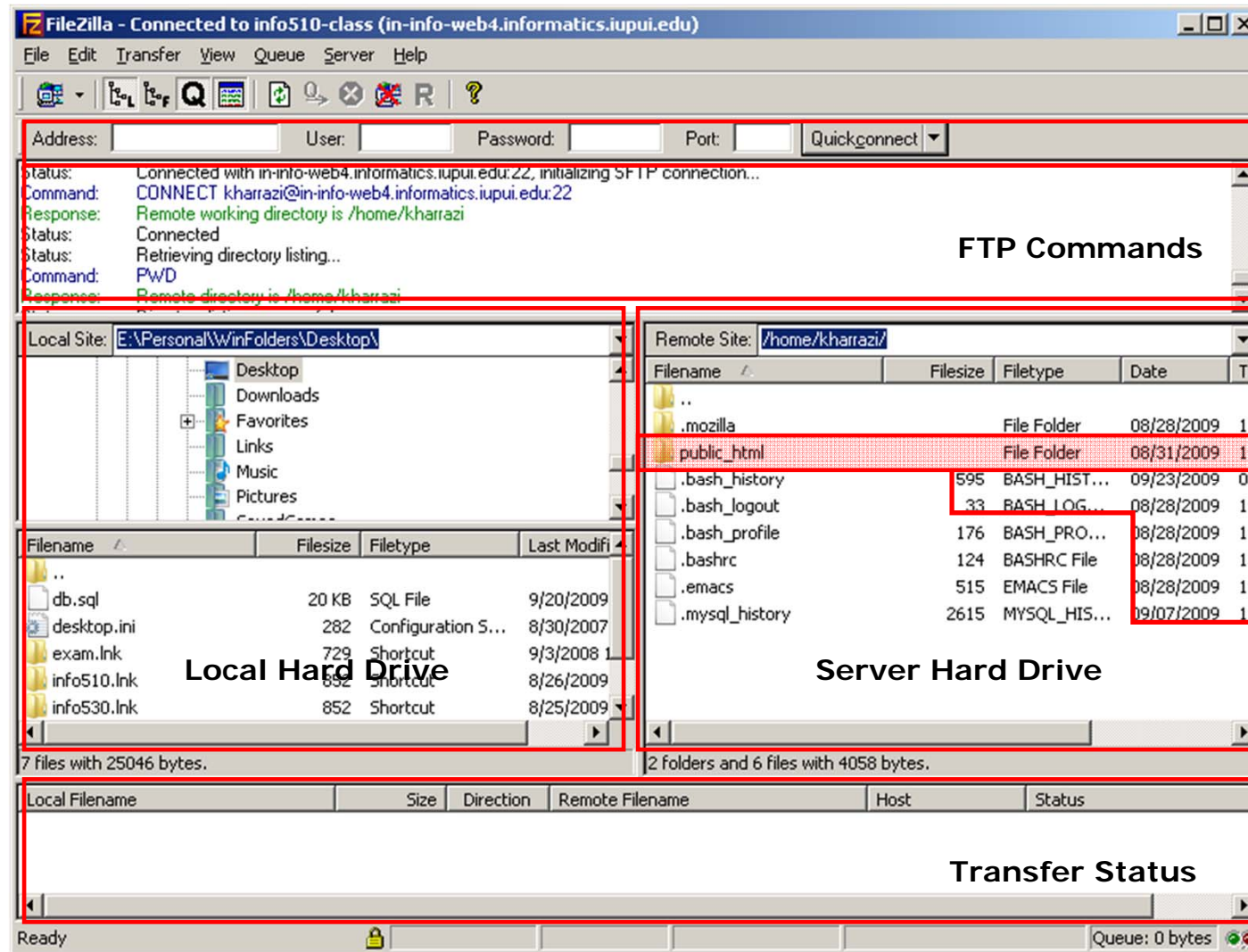
Applications (cont.) – FileZilla

- **FTP SERVER:** A server that a user can contact in order to transfer files by means of the File Transfer Protocol (FTP) over a TCP/IP network. Our server is running an FTP server on its Apache web server.
- **FTP CLIENT:** An FTP client uses the FTP protocol to connect to an FTP server to transfer files. FileZilla is an open source (free) ftp client. You will use FileZilla to upload your HTML or PHP files, which you created by NotePad++, to the server.

Applications (cont.) – FileZilla



Applications (cont.) – FileZilla



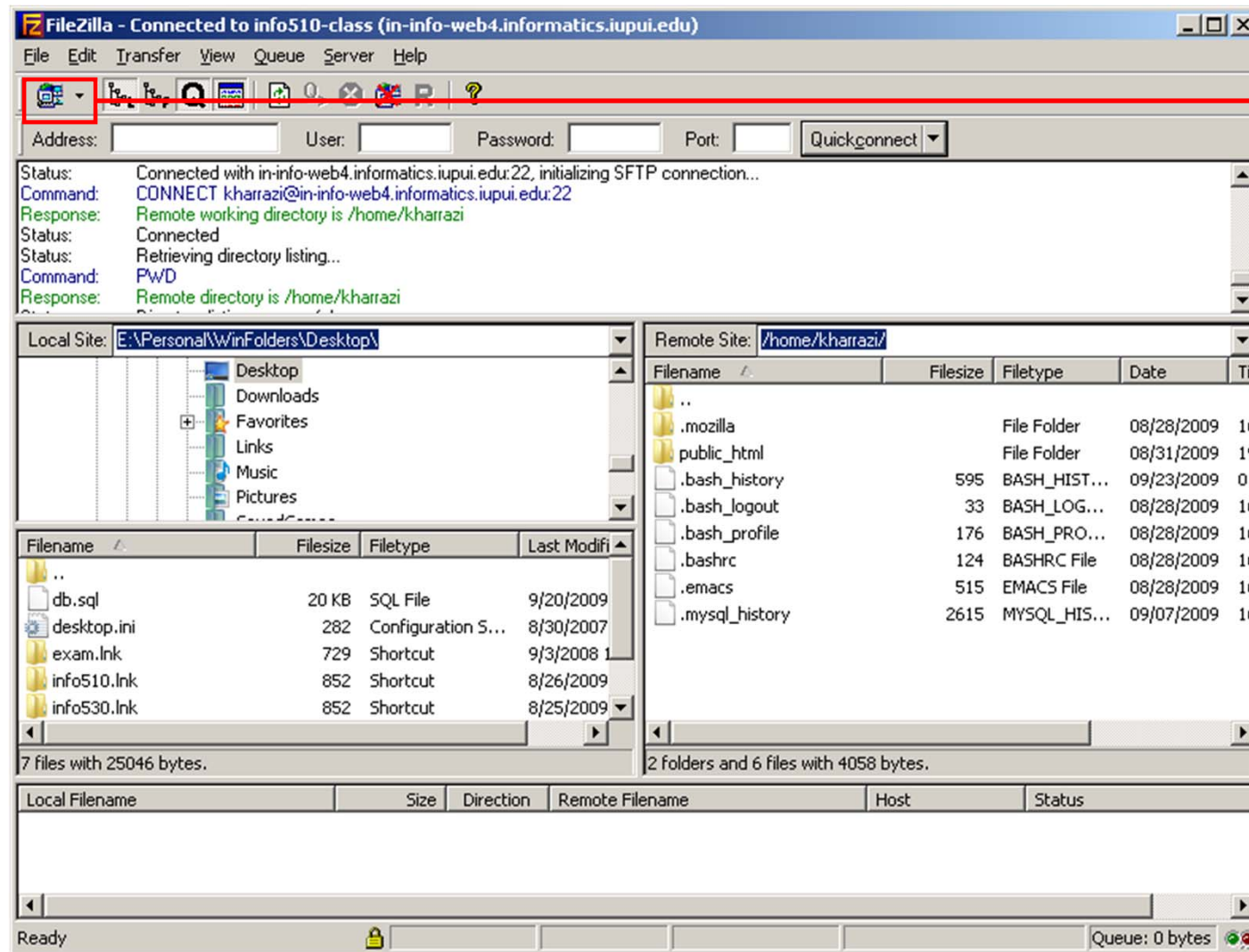
Server Name:
in-info-web4.informatics.iupui.edu

User/Pass?

Port: **21** (FTP)
Port: **22** (SFTP)

The folder that is open to internet (port 80) is:
public_html

Applications (cont.) – FileZilla



New Site

Applications (cont.) – FileZilla

The screenshot shows the FileZilla Site Manager dialog box. The 'File' list on the left contains a folder named 'info510-class', which is highlighted with a red box and labeled '2'. Below the file list, the 'New Site' button is highlighted with a red box and labeled '1'. The 'Site details' section on the right is also highlighted with a red box and labeled '3'. This section contains the following fields:

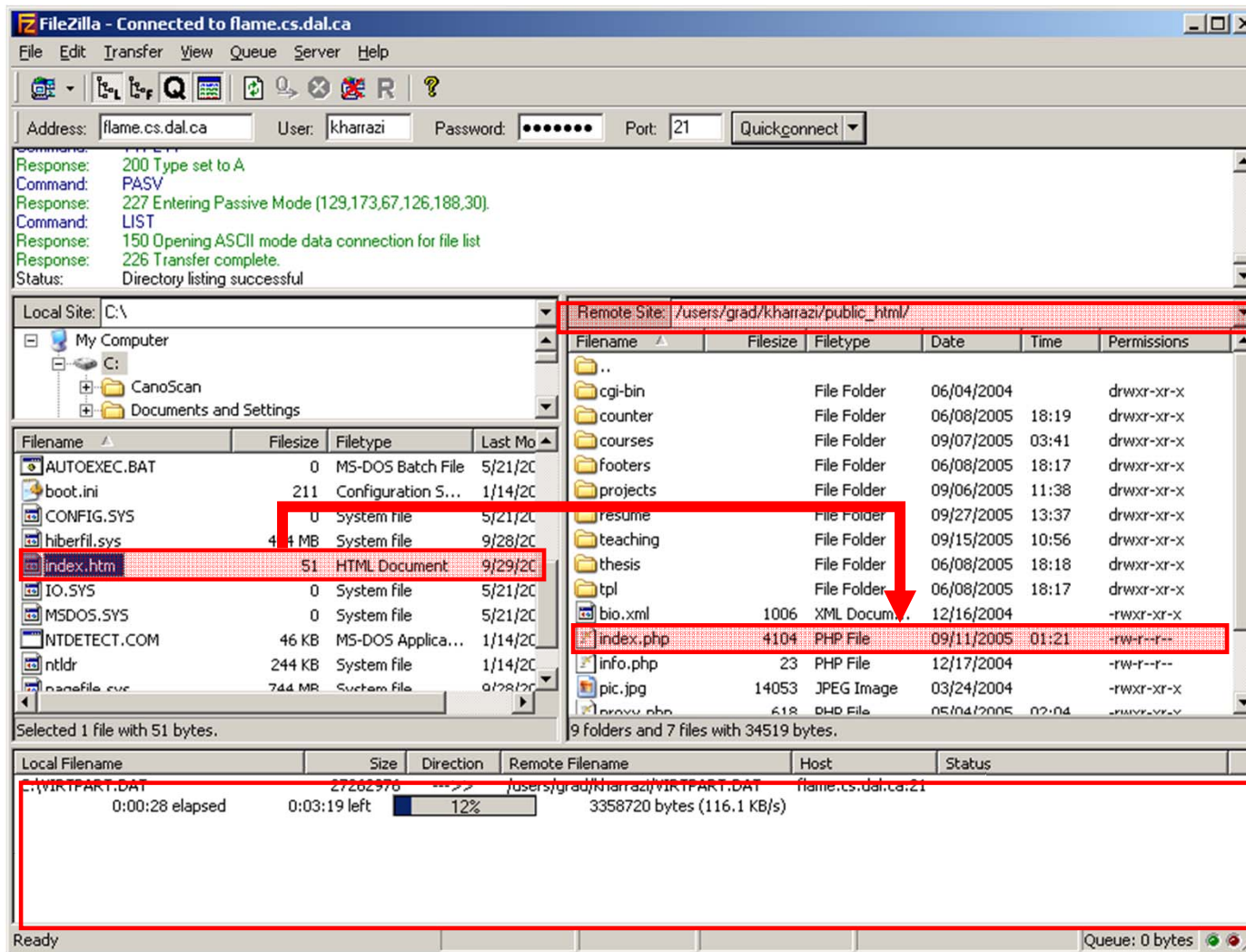
- Host:** in-info-web4.informatics.iupui.edu
- Port:** 22
- Servertype:** SFTP using SSH2
- Logontype:** Anonymous, Normal, Account
- Bypass proxy settings
- User:** kharrazi
- Account:** (empty)
- Password:** (masked with dots)
- Don't save password.
- Comments:** (empty text area)
- Default site

Below the 'Site details' section, the 'Save and Exit' button is highlighted with a red box and labeled '4'. To the right of the dialog box, the server name and port are summarized:

Server Name:
in-info-web4.informatics.iupui.edu

Port: 22 (SFTP)

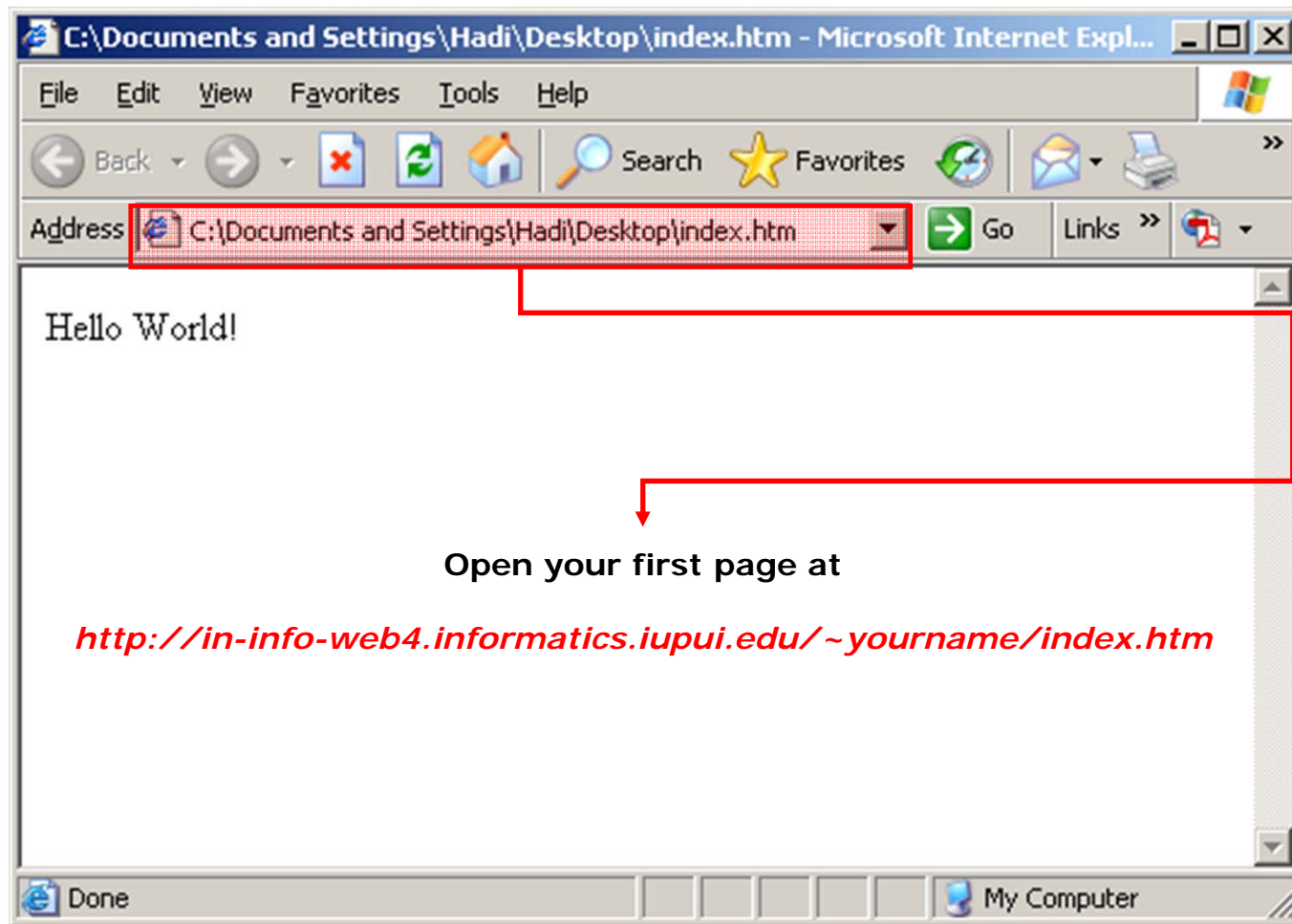
Applications (cont.) – FileZilla



The folder that is open to internet (port 80) is: **public_html**

Applications (cont.) – FileZilla

Internet Explorer or FireFox



Applications (cont.) – FileZilla

The screenshot shows the FileZilla interface connected to flame.cs.dal.ca. The remote site is /users/grad/kharrazi/public_html/. The interface displays a local site (C:\) and a remote site with a directory listing. A red box highlights the 'Permissions' column in the remote site listing.

Filename	Filesize	Filetype	Date	Time	Permissions
..					drwxr-xr-x
cgi-bin		File Folder	06/04/2004		drwxr-xr-x
counter		File Folder	06/08/2005	18:19	drwxr-xr-x
courses		File Folder	09/07/2005	03:41	drwxr-xr-x
footers		File Folder	06/08/2005	18:17	drwxr-xr-x
projects		File Folder	09/06/2005	11:38	drwxr-xr-x
resume		File Folder	09/27/2005	13:37	drwxr-xr-x
teaching		File Folder	09/15/2005	10:56	drwxr-xr-x
thesis		File Folder	06/08/2005	18:18	drwxr-xr-x
tpl		File Folder	06/08/2005	18:17	drwxr-xr-x
bio.xml	1006	XML Docum...	12/16/2004		-rwxr-xr-x
index.php	4104	PHP File	09/11/2005	01:21	-rwxr-xr-x
info.php	23	PHP File	12/17/2004		-rwxr-xr-x
pic.jpg	14053	JPEG Image	03/24/2004		-rwxr-xr-x
proxy.php	618	PHP File	05/04/2005	02:04	-rwxr-xr-x

Permissions
UNIX/Apache

Applications (cont.) – FileZilla

- **File Permissions in UNIX:** Unix files and folders are protected on three different levels: User (Yourself), Group and Other (Public).
- These settings are called *CHMOD* which should be defined for all files and folders in your account.

Please refer to the following link for more information regarding setting the UNIX file permissions:

<http://www.akamarketing.com/unix-files-permissions.html>

Applications (cont.) – FileZilla

- File Permissions in UNIX:

Permissions
UNIX/Apache

	r	w	x
Value	Read	Write	Execute
0	N	N	N
1	N	N	Y
2	N	Y	N
3	N	Y	Y
4	Y	N	N
5	Y	N	Y
6	Y	Y	N
7	Y	Y	Y

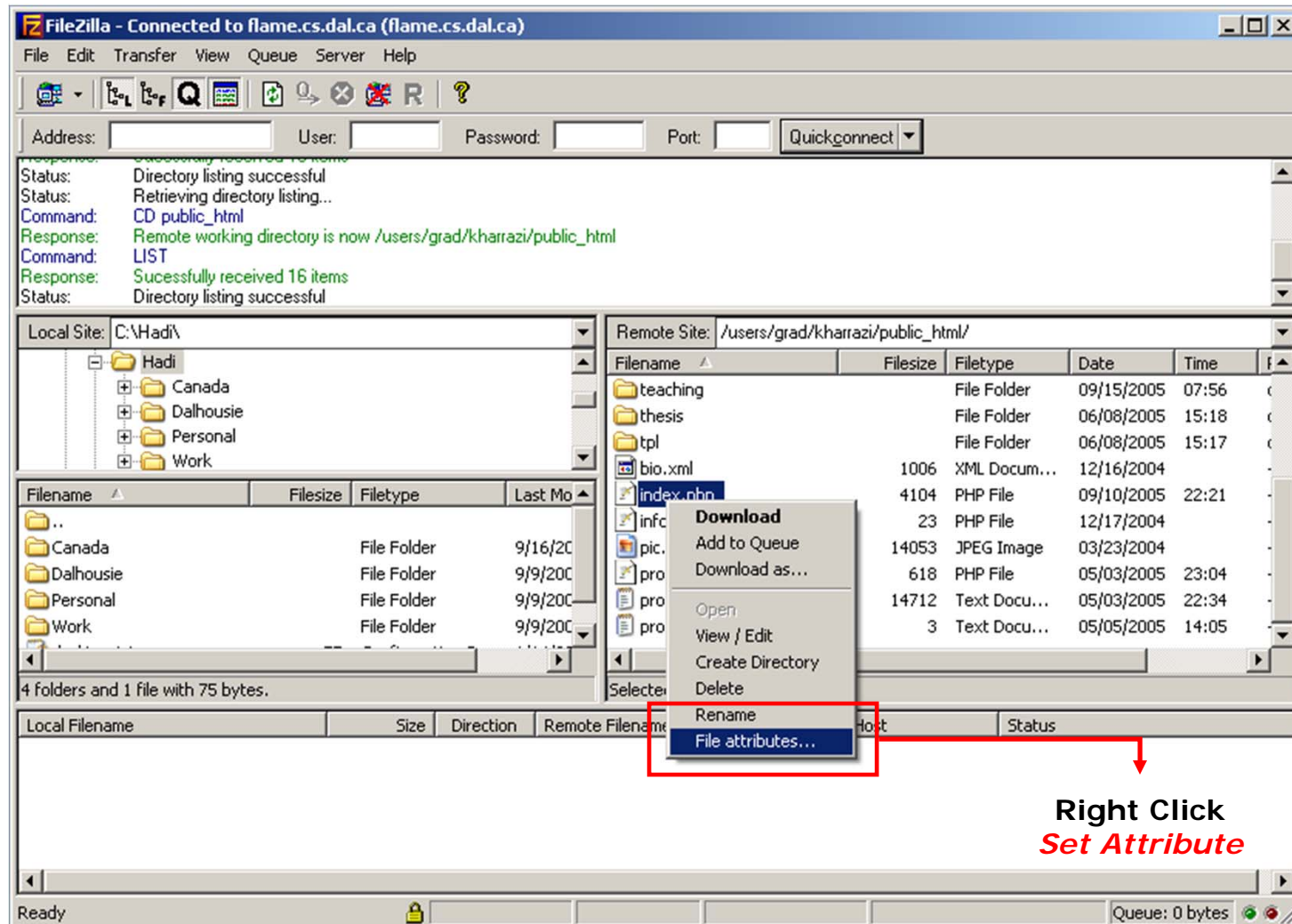
	Read	Write	Execute
Permission value	4	2	1

4 = 4x1 + 2x0 + 1x0

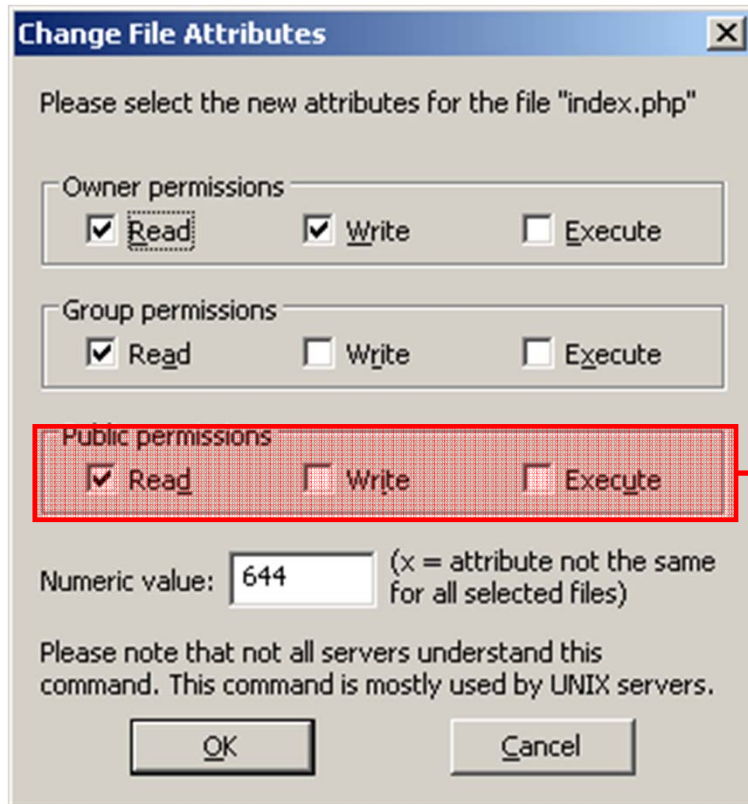
	User	Group	Other
Attribute	6	4	4

r w - r - - r - -

Applications (cont.) – FileZilla



Applications (cont.) – FileZilla

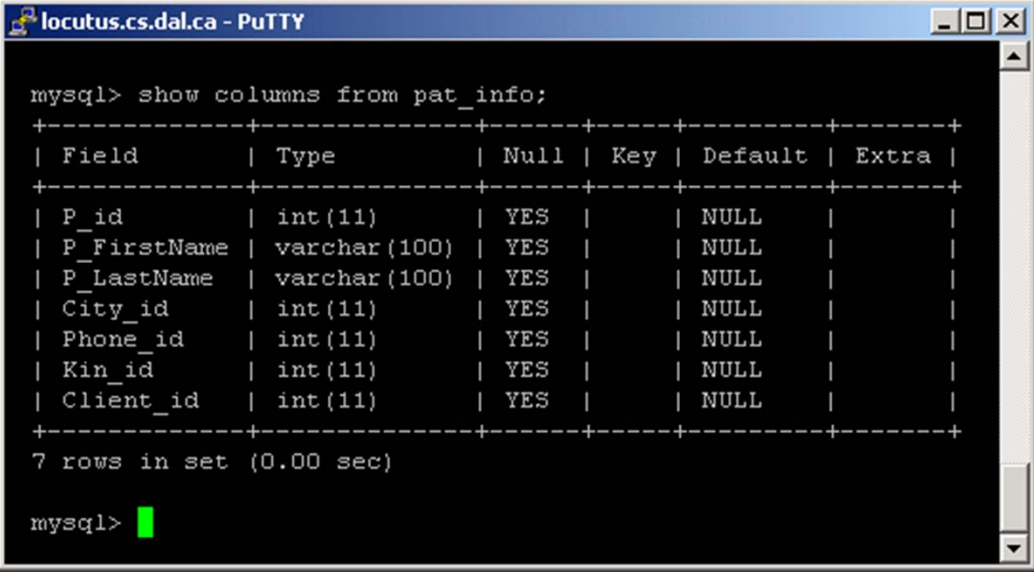


You have to give the read access to public (other) in order to give permission to public to see your site (html file)

In case of PHP you need to give 'Execute' as well, thus give 755 for now.

Applications (cont.) – MySQL Query Browser

- There are 2 ways to communicate with the available MySQL server on the web server:
 - Through a telnet (SSH) client such as PuTTY which will show everything in a command line style.



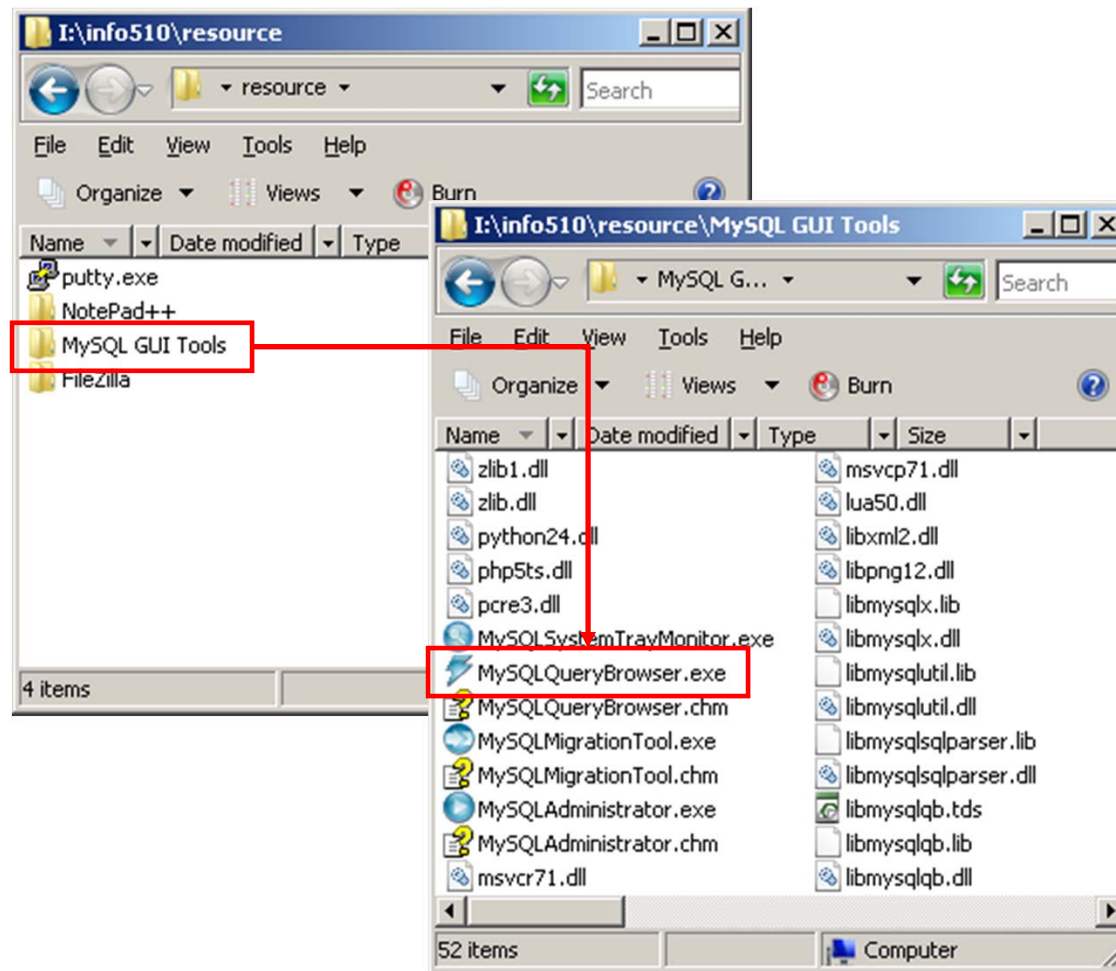
```
locutus.cs.dal.ca - PuTTY

mysql> show columns from pat_info;
+-----+-----+-----+-----+-----+-----+
| Field          | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| P_id           | int(11)       | YES  |     | NULL    |      |
| P_FirstName    | varchar(100)  | YES  |     | NULL    |      |
| P_LastName     | varchar(100)  | YES  |     | NULL    |      |
| City_id        | int(11)       | YES  |     | NULL    |      |
| Phone_id       | int(11)       | YES  |     | NULL    |      |
| Kin_id         | int(11)       | YES  |     | NULL    |      |
| Client_id      | int(11)       | YES  |     | NULL    |      |
+-----+-----+-----+-----+-----+-----+
7 rows in set (0.00 sec)

mysql> █
```

- Through one of the available Graphical User Interfaces made by MySQL (Query Browser or Workbench).

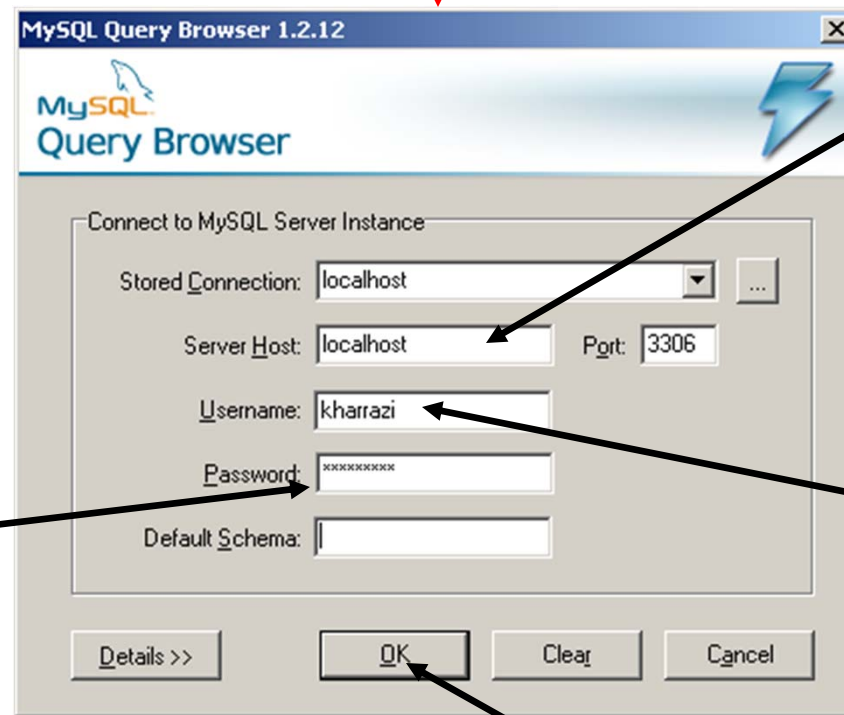
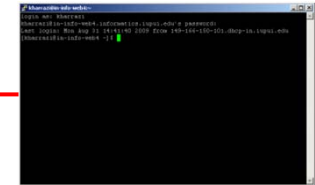
Applications (cont.) – MySQL Query Browser



Applications (cont.) – MySQL Query Browser

- Connecting to MySQL server:

0 Browser requires a live Putty connection



1 Server's Domain Name (IP Address) for example 'localhost'

2 MySQL Username (Should be the same as your OnCourse account)

3 MySQL Password (The one that you just set by PuTTY)

4 Connecting to the Server

Applications (cont.) – MySQL Query Browser

- Connection Errors:



**Your MySQL database is old
(less than version 4.1)**



**Connection failure
(User/Pass wrong,
Web Server is down,
MySQL is down, ...)**

Applications (cont.) – MySQL Query Browser

Browsing

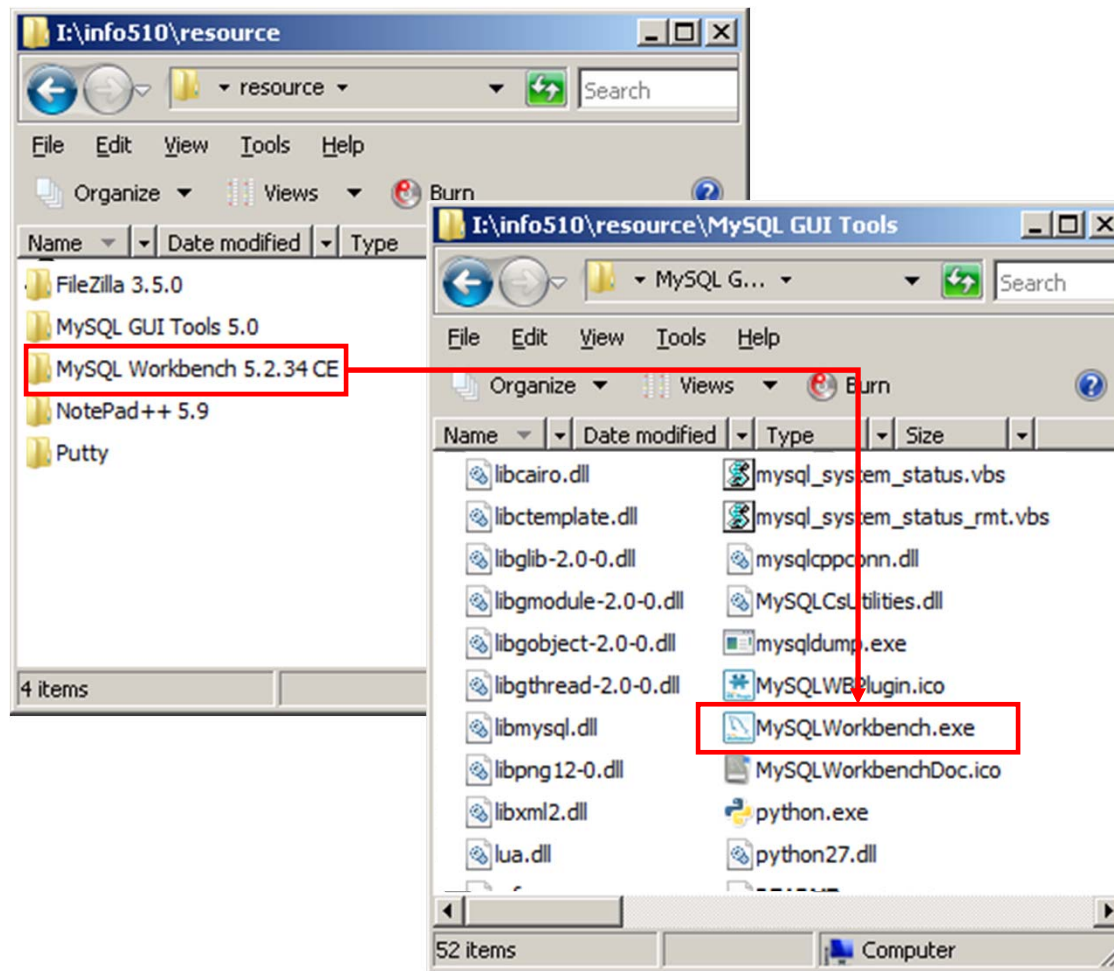
The screenshot shows the MySQL Query Browser interface. The window title is "MySQL Query Browser - kharrazi@locutus.cs.dal.ca:3306". The menu bar includes File, Edit, View, Query, Script, Tools, Window, and Help. The toolbar contains buttons for Go back, Next, Refresh, Execute, and Stop. The main area is divided into three sections: a Query Window at the top, a Results window below it, and a Schemata panel on the right. The Schemata panel lists databases: ishtiaq, igregory, jiampoja, jiantao, jiye, joanne, izhang, kangl, kapra, kharrazi, ili, lye, mchen, melanie, mingxiu, and mnair. The Syntax panel is also visible, showing categories like Data Manipulation, Data Definition, MySQL Utility, and Transactional and Locking. Red arrows point from the text labels to the corresponding parts of the interface.

Query Window

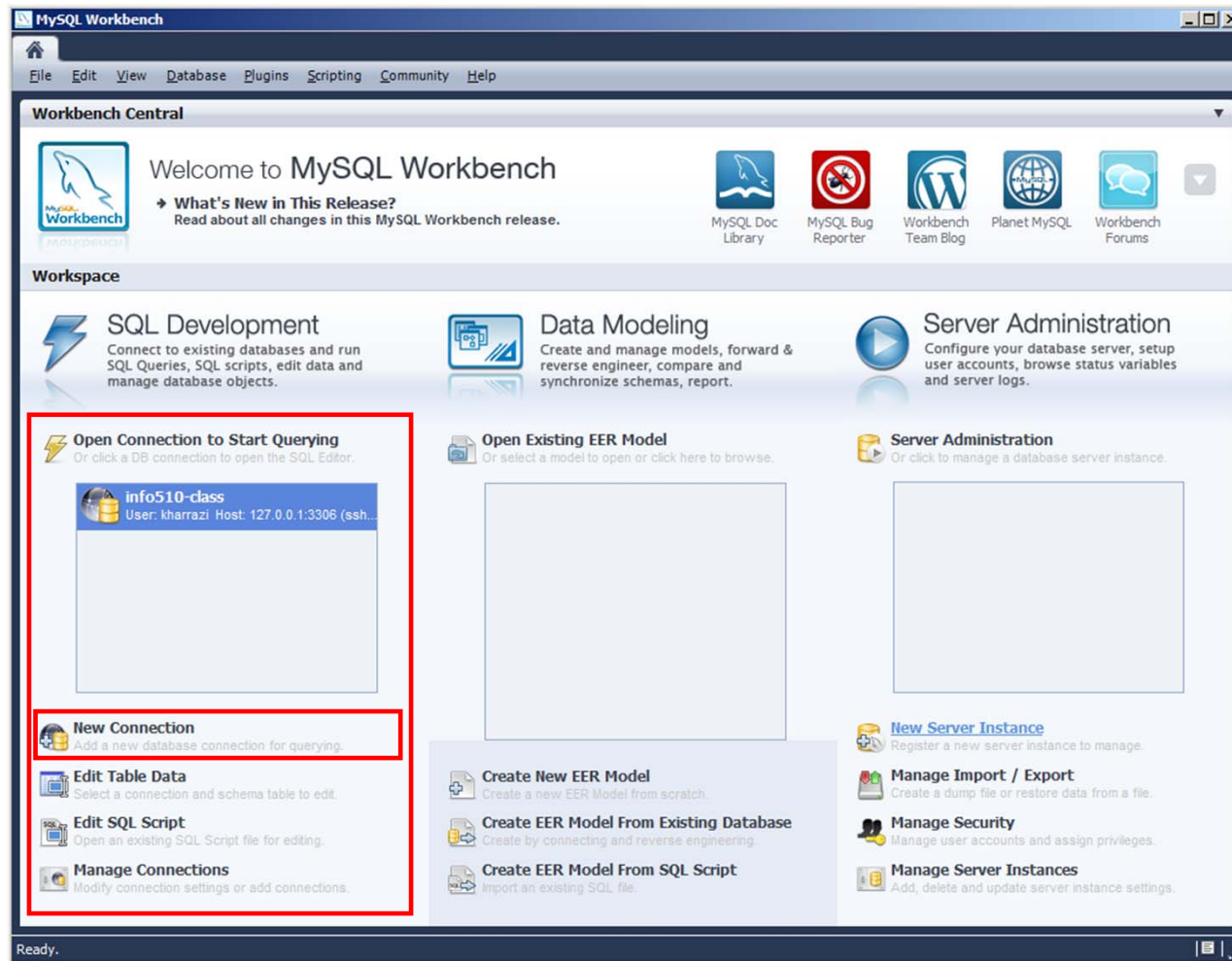
Results

List of Databases Find your name...

Applications (cont.) – MySQL Workbench

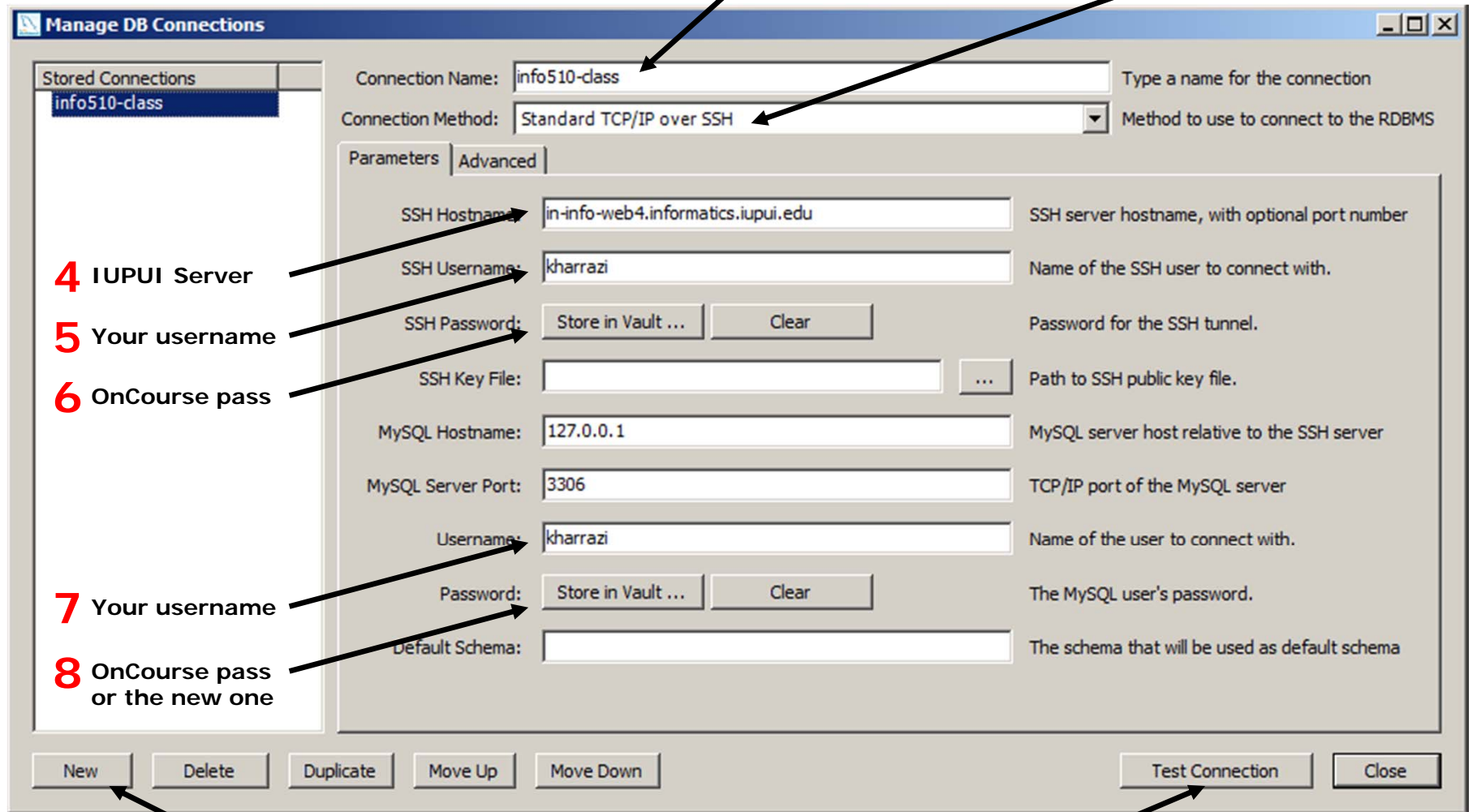


Applications (cont.) – MySQL Workbench



Applications (cont.) – MySQL Workbench

2 Name your connection **3** Set to TCP/IP over SSH



4 IUPUI Server

5 Your username

6 OnCourse pass

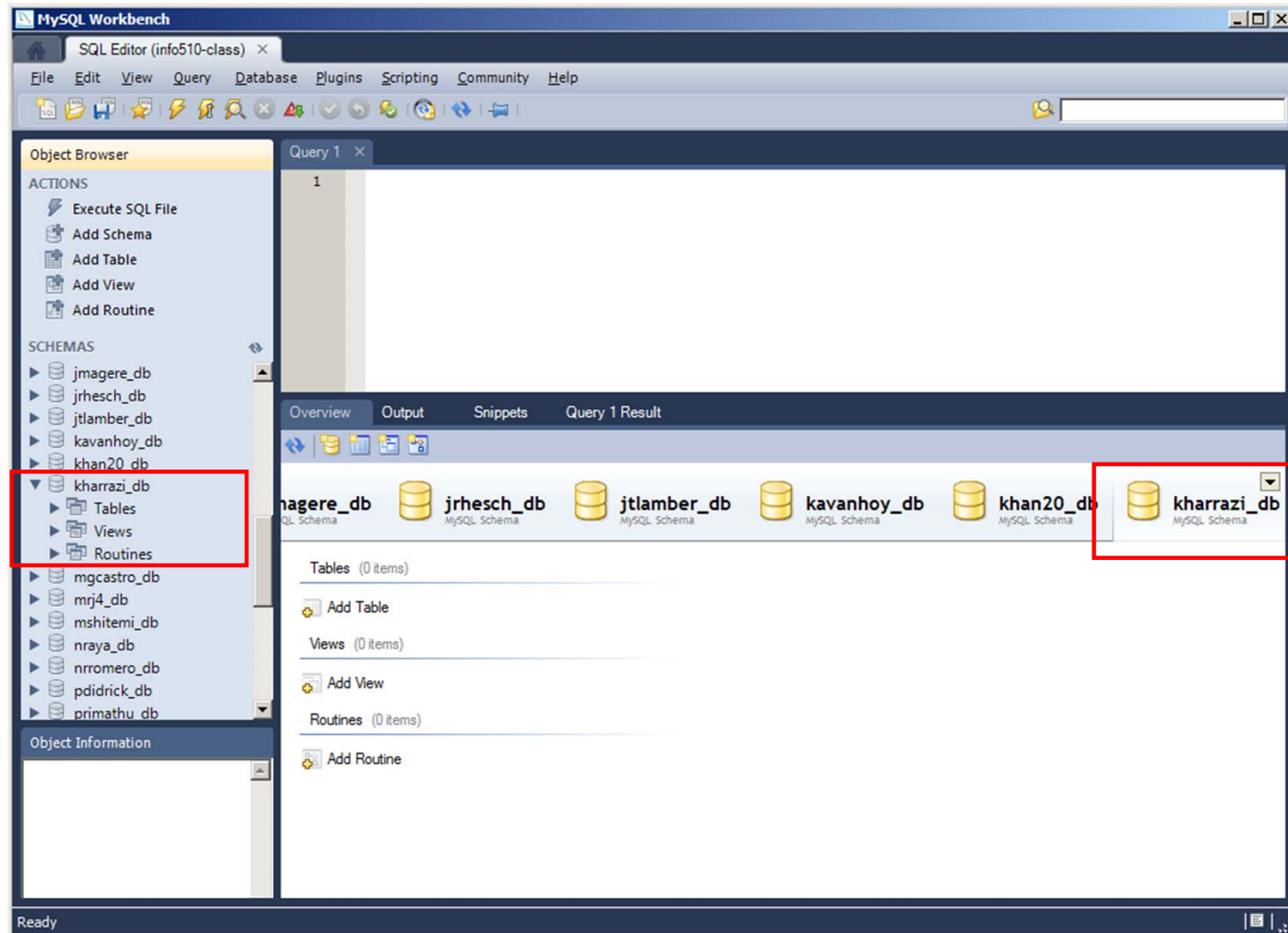
7 Your username

8 OnCourse pass or the new one

1 Create a new connection (e.g., info510-class)

9 Test the connection

Applications (cont.) – MySQL Workbench



Applications (cont.) – MySQL Workbench

The screenshot displays the MySQL Workbench interface. The SQL Editor window shows a query: `SELECT * FROM `kharrazi_db`.`pat_info`;`. The Object Browser on the left shows the database schema, with the `pat_info` table highlighted in red. The Query 1 Result window shows the output of the query, which is a table with 15 rows and 7 columns. The table structure is as follows:

P_id	P_FirstName	P_LastName	City_id	Phone_id	Kin_id	Client_id
1	Peter	Johnsons	1	4	6	14
2	Mike	Jackson	1	13	6	15
3	Sara	Henson	3	6	2	16
4	John	McDonnald	5	8	3	17
5	Michael	Robinson	1	13	6	18
6	William	Jordan	4	10	4	19
7	Susan	McKinsy	1	2	5	20
8	Mehdi	Kharrazi	2	1	9	21
9	John	McKinsy	1	9	10	22
10	John	McDonnald	3	18	7	23
11	Pat	Bentatar	7	25	8	24
12	Abraham	Lincoln	3	26	27	25
13	Brian	Adam	5	27	13	26
14	Catherin	Catholcy	7	28	15	33
15	Demi	Moore	12	29	23	24

The Object Information window at the bottom left shows the structure of the `pat_info` table:

```

Table pat_info
=====
P_id, P_FirstName,
P_LastName, City_id, Phone_id,
Kin_id, Client_id
=====
P_id      int(8) unsigned PK
  
```

The status bar at the bottom indicates "Query Completed".

Summary

- Networking Overview
- Web Server
- Static Languages - HTML
- Server Side Languages – PHP
- Databases - MySQL
- HTML/PHP/MySQL Integration
- Course Project
- Applications

Next Session

- Database Overview
- Relational Databases
- Installing MySQL
- Command line MySQL
- MySQL GUI Tools
- SQL Introduction
- SQL: SELECT
- SQL: WHERE