Web Technology

We need to answer…

…How is the Internet organised?

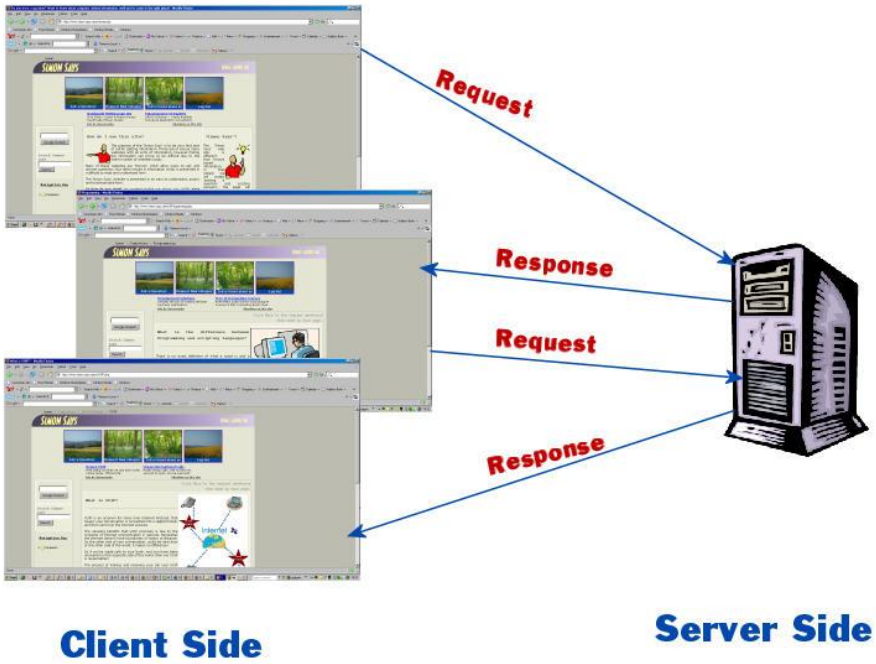
…How do we find and retrieve pages on the Internet?

…How is this data (web pages, etc) transmitted over the Internet?

…How is what we see in the browser window defined as a collection of data?

Clients and Servers

The Web is a client/server application: Web browsers are clients which send requests to Web servers, which send responses back.



Fetching Pages over the Internet

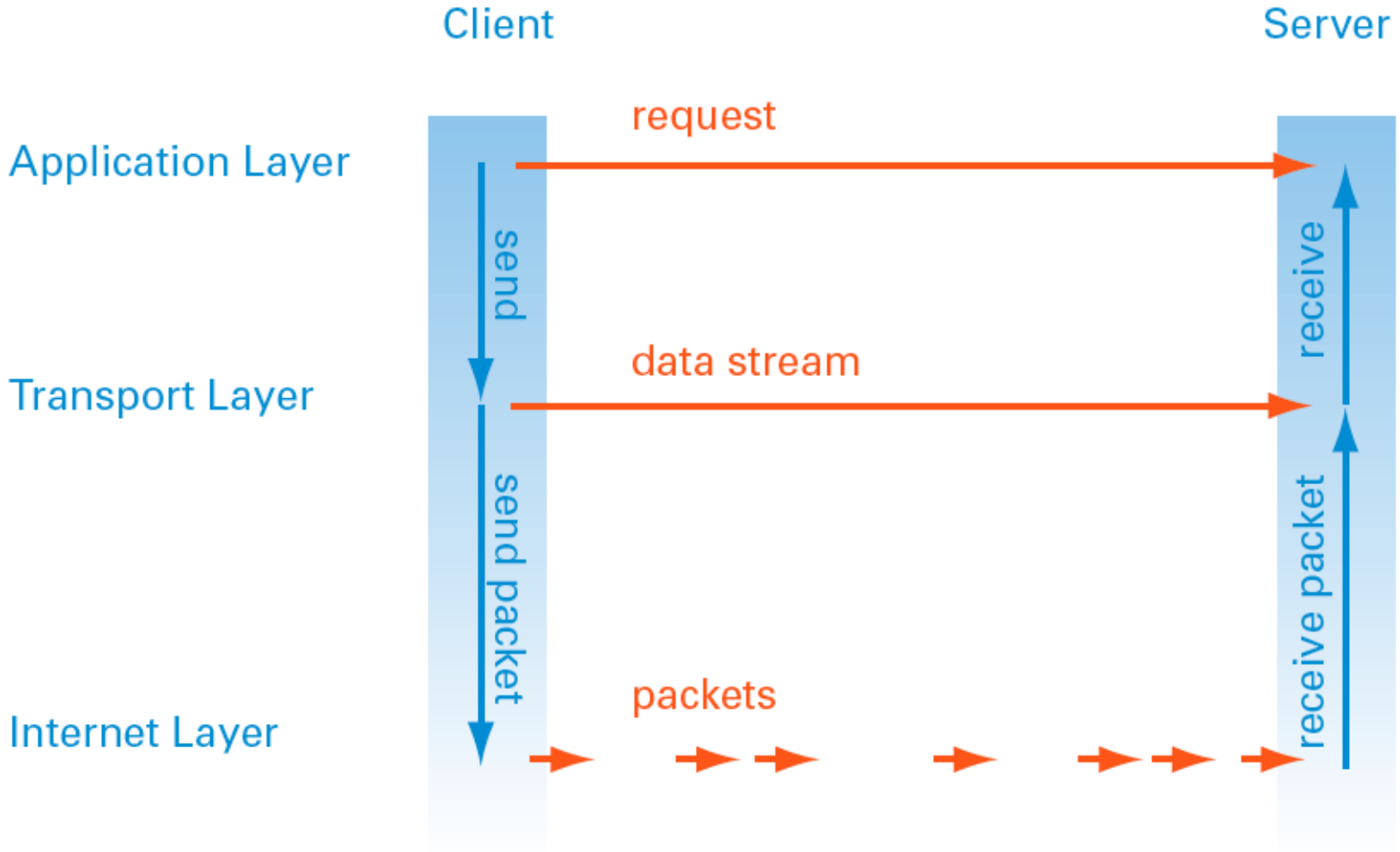
Architecturally, the Internet consists of a collection of layers, each one providing services for the one above it:

The Internet Layer gets packets to their destinations;

The Transport Layer sends streams of data;

The Application Layer provides high-level services to applications such as Web browsers.

Fetching Pages over the Internet



Internet Protocol Layers

HTTP

HTTP makes use of TCP to open connections between clients and servers and to pass the requests and responses between them.

When a user clicks a link or types a web address:

1. *A TCP connection is opened between browser and server*
2. *Then requests and responses are sent back and forth using HTTP*

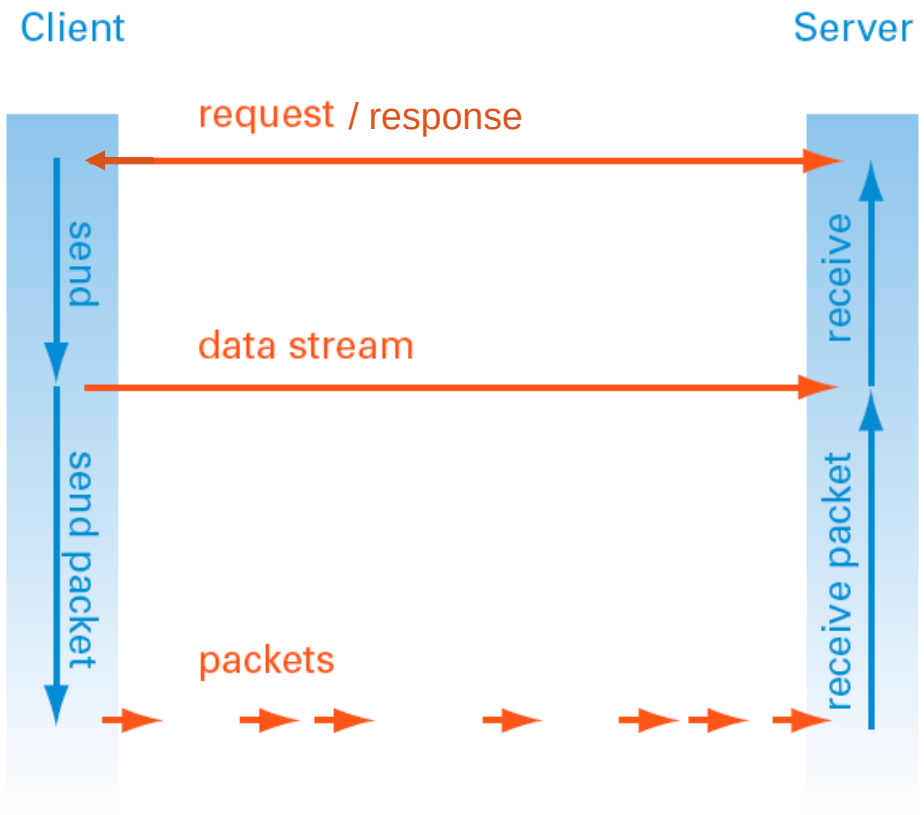
HTTP is a stateless protocol, meaning each request for data is dealt with in isolation; once the server sends the response, it forgets everything about the original request.

Fetching Pages over the Internet: HTTP

HTTP → Application Layer
Hypertext Transfer Protocol

TCP → Transport Layer
Transmission Control Protocol

IP → Internet Layer
Internet Protocol



Uniform Resource Locators (URLs)

Without a universal addressing mechanism, it would be impossible to navigate to a site, and page linking would not be feasible

Uniform Resource Locators (URLs) are used to identify Web pages — basically a URL is a web address

URLs have 3 components:

- *A **Prefix** (usually http://)*
- *A **Hostname:** (such as www.cityu.edu.hk)*
- *A **Path:** (such as /scm/index.htm)*

Uniform Resource Locators (URLs)

Example:

Prefix

The transfer protocol required to request data from the server

Host name

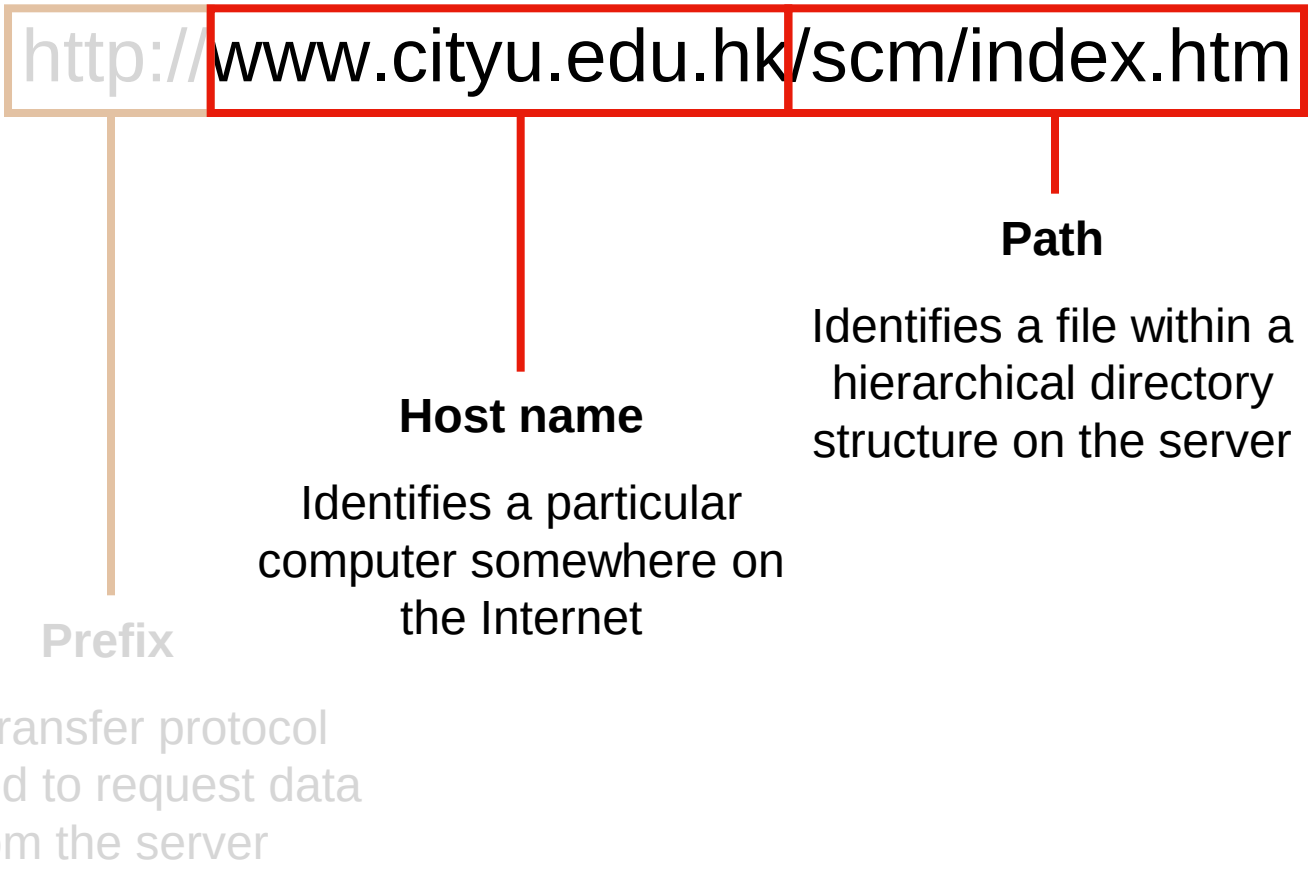
Identifies a particular computer somewhere on the Internet

Path

Identifies a file within a hierarchical directory structure on the server

Uniform Resource Locators (URLs)

Example:



IP Addresses and DNS

Every computer connected to the Internet must have a unique IP address, no matter whether it's a client or a server (or both)

An IP address is just a number that identifies a host on the Internet. Example:

212.171.218.34 or 144.214.5.218

The Domain Name System (DNS) is a database that matches IP addresses to host names

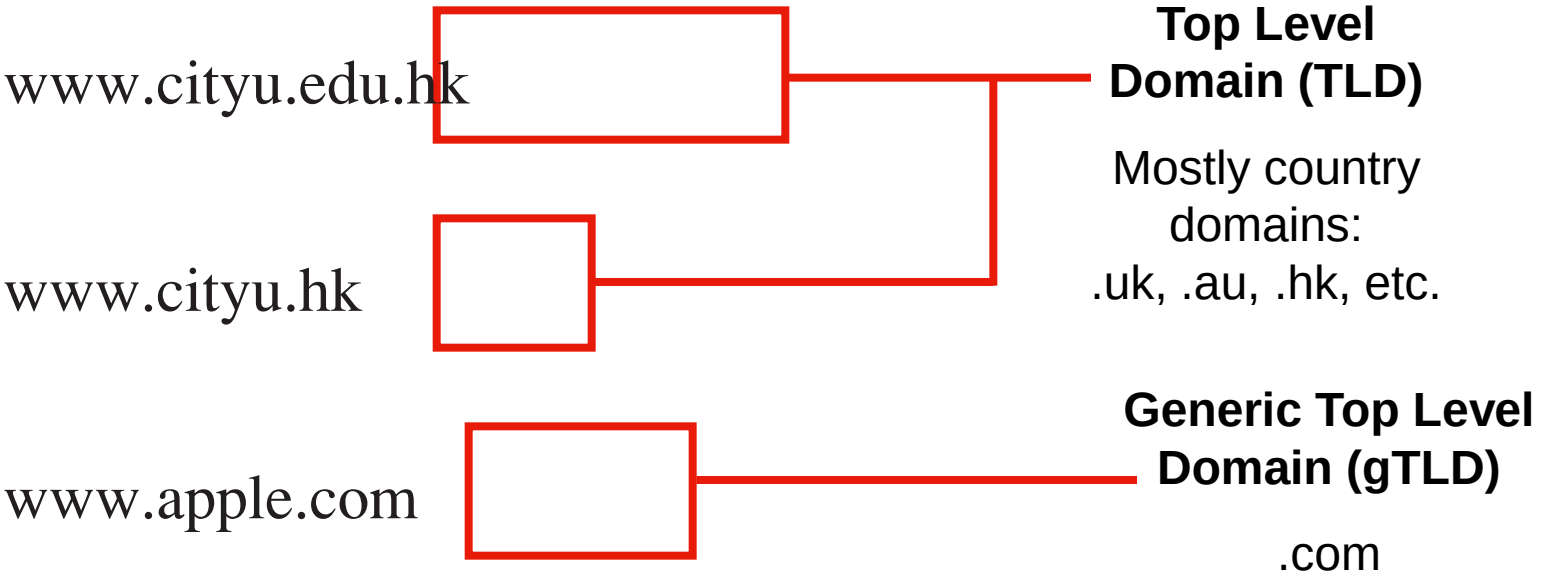
Domain Names

And the Domain Name System (DNS) translates host names into IP addresses, which are then used by TCP to establish connections between HTTP clients and servers.

Domain names are administered in such a way that they are guaranteed to be unique.

Domain names are organised in a hierarchical structure….

Top Level Domains



Second Level Domains

The actual name of the organisation or service.

Can contain letters (a to z), numbers (0 to 9), dashes (-)

Third Level, or Sub Domains

www.cityu.edu.hk

sweb.cityu.edu.hk

www.apple.com

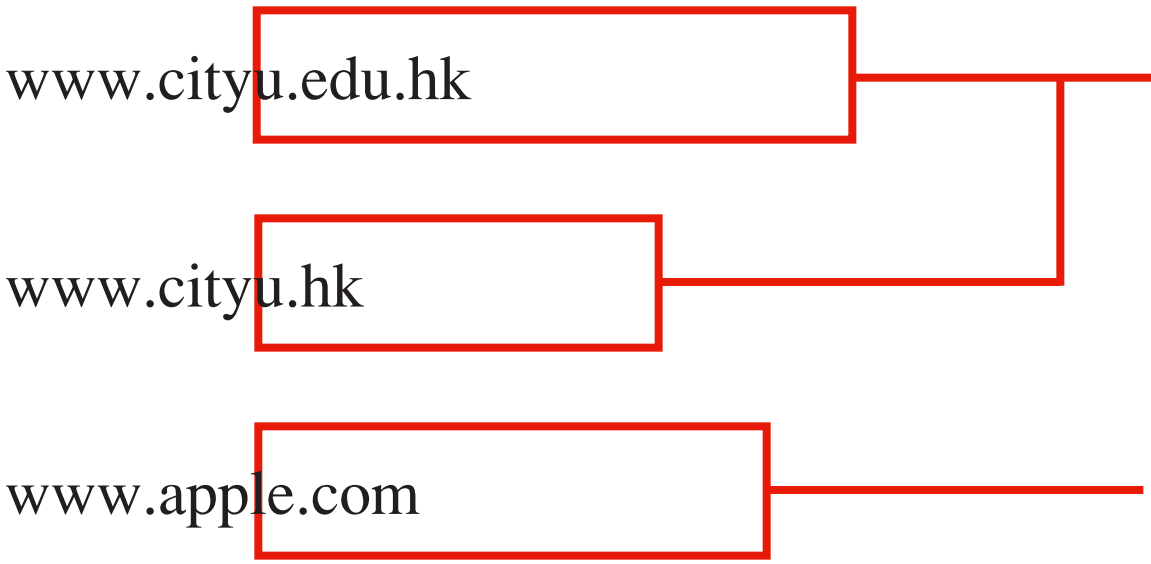
store.apple.com

seminars.apple.com

Strings of characters that designate different services, or hosts within the second level domain.

E.G. “www” for the core or main website, “sweb” for SCM’s sub-network within CityU.

Registering Domain Names



Registered with the HKDNR in Hong Kong

www.hkdnr.hk

Registered with any global registration service

networksolutions.com
register.com
directNIC.com

etc.

Chinese character domain names now also available

Registering Domain Names

Registering a domain name can either be done directly with a registration service, such as HKDNR, or through a website hosting service.

Either way, you have to pay a fee for domain registration that is separate from any site hosting fees you may pay.

gTLD domains (.com, .org, .net): US$12 - 15 per year

Country domains in Hong Kong:

.com.hk, .org.hk, .net.hk: HK$200 per year

.hk: HK$250 per year

Linking Domain Names and IP Addresses

A domain name, once registered, needs to be associated with a fixed IP address of a web server on the Internet. When you register and setup a new domain name, you need to enter details of at least 2 nameservers.

These nameservers are special internet servers that implement a name service protocol.

They may be provided by a web hosting service, or a domain registration service.

They link a domain name to the specific IP address assigned for a website. Examples:

ns0.directnic.com
ns1.directnic.com

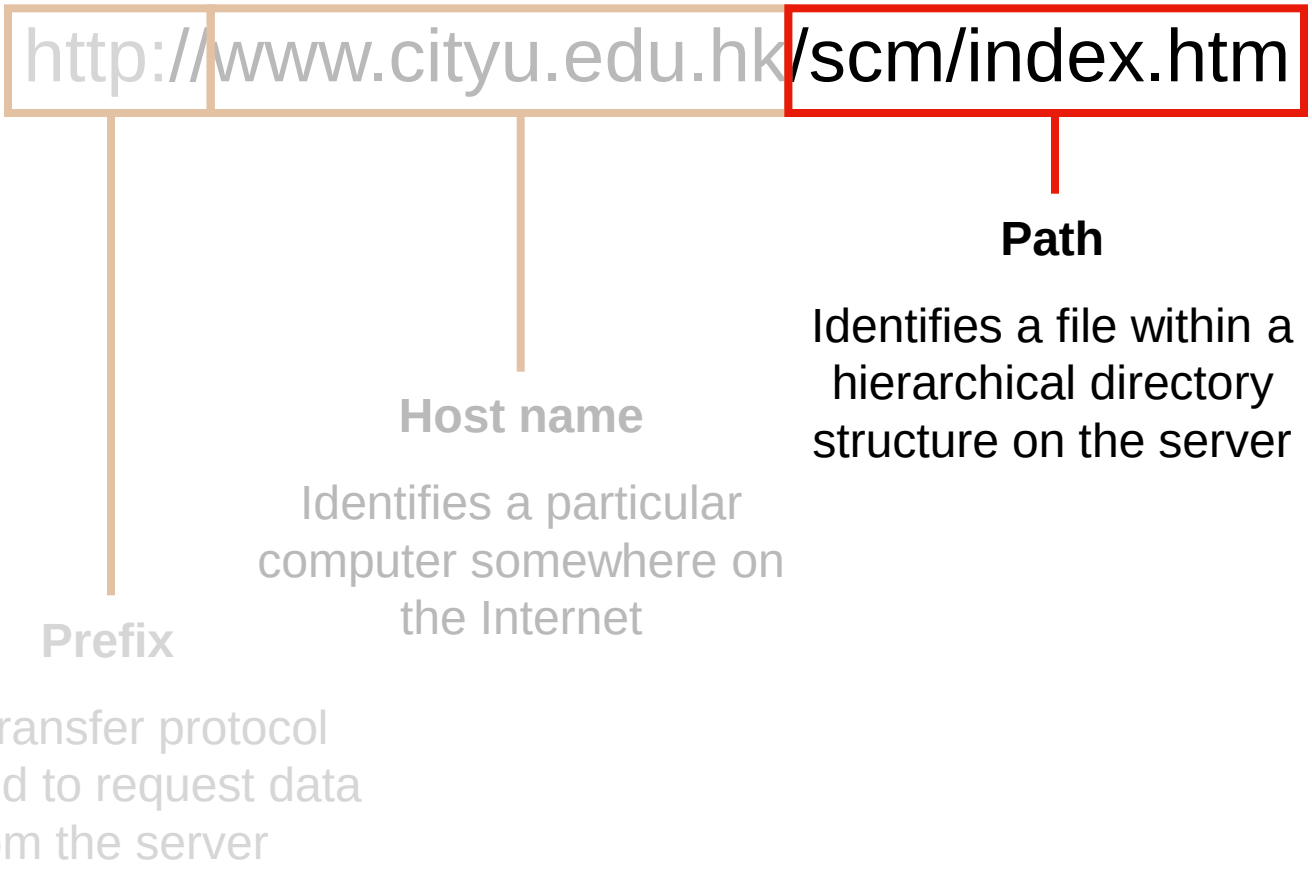
Note: Most commercial hosting services provide a form of virtual hosting, placing many websites on a single server, so special software is used to route domains names to assigned IP address.

Domain Names… not just websites

Once your domain name is assigned a specific IP host you can:

- Set up and run a website (www.cityu.edu.hk)
- Set up e-mail accounts (nick.foxall@cityu.edu.hk)
- Set up file transfer capabilties (ftp.cityu.edu.hk)

Paths


http://www.cityu.edu.hk/scm/index.htm
Path
Identifies a file within a hierarchical directory structure on the server
Host name
Identifies a particular computer somewhere on the Internet
Prefix
The transfer protocol required to request data from the server

Paths and Pathnames

A pathname shows the hierarchical directory structure and location of a specific file or resource on a server.

A directory is represented visually these days as a folder

Absolute and Relative Paths

An **absolute path** is a path that points to the same location on one file system. It is usually written in reference to a root directory.

The root directory is the first or top most directory in a hierarchy, indicated with a single slash / or backslash \ .

Example:

C:\Documents and Settings\mnfoxall\My Documents\My Files

Absolute and Relative Paths

A **relative path** is a path relative to the current working directory, so the full absolute path may not need to be shown or referred to.

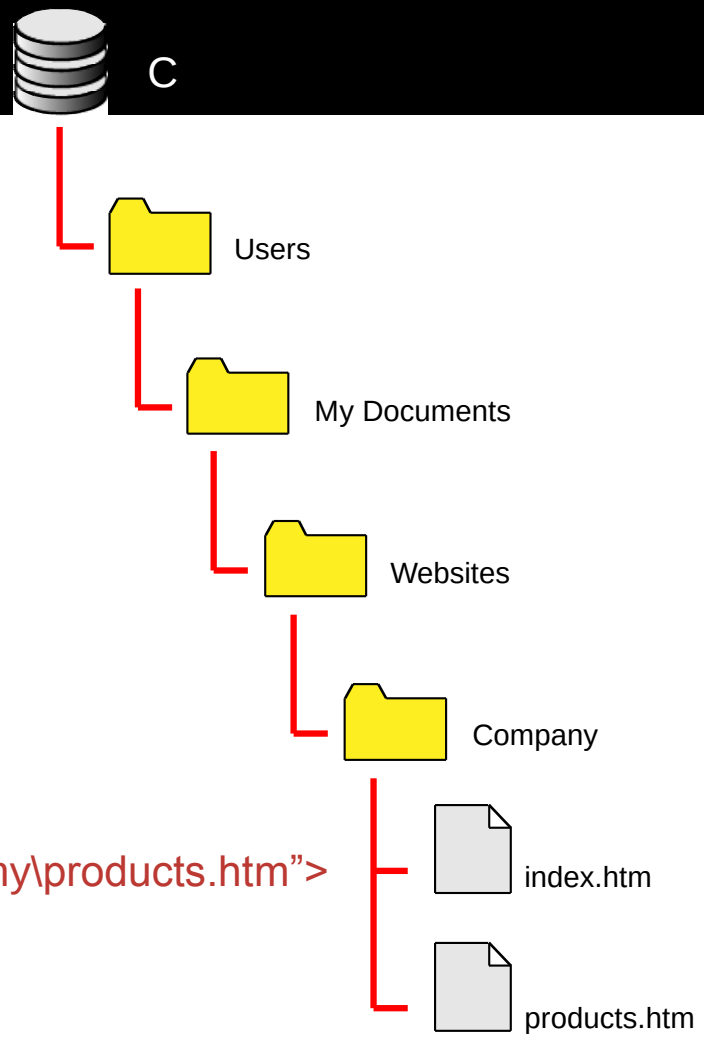
This works for creating websites, because it allows hypertext links to be made between files relative to a pre-defined working directory.

That is, they do not have to always reference the root directory or top most directory on a server (or computer).

Absolute Paths

Example: to hyperlink from index.htm to products.htm

If an absolute pathname:

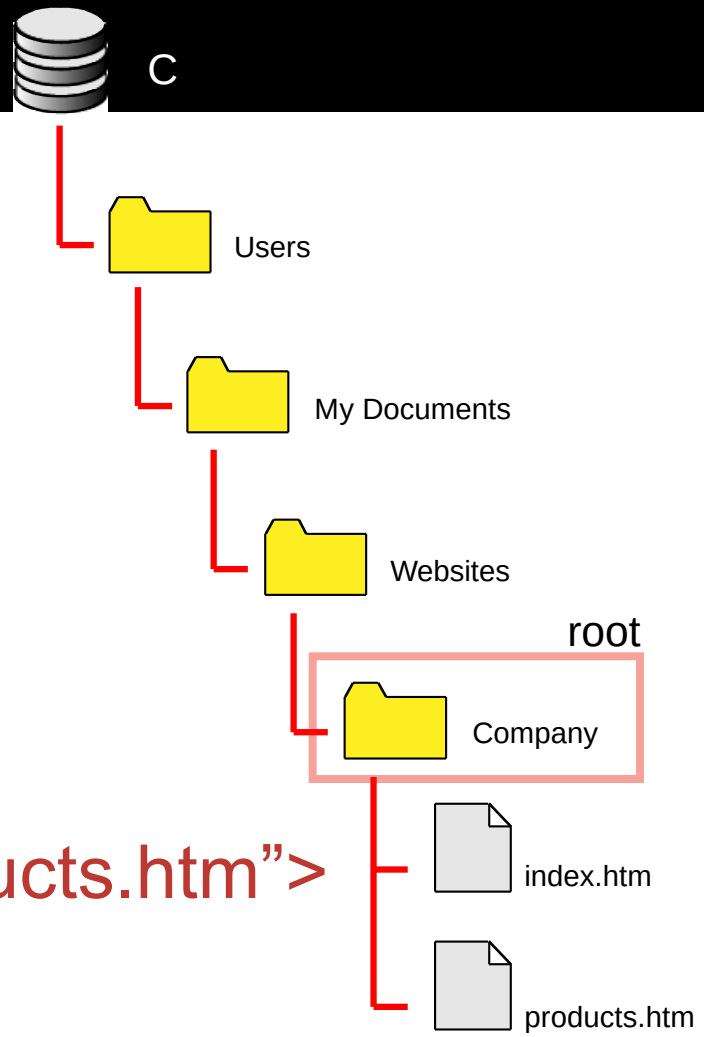


<a href="C:\\Users\My%20Documents\Websites\Company\products.htm">

Relative Paths

Example: to hyperlink from index.htm to products.htm

If a relative pathname, with /Company defined as the working or site root directory



<a href="products.htm">

Relative Paths

To hyperlink from index.htm to logo.jpg

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<a href="images/logo.jpg">
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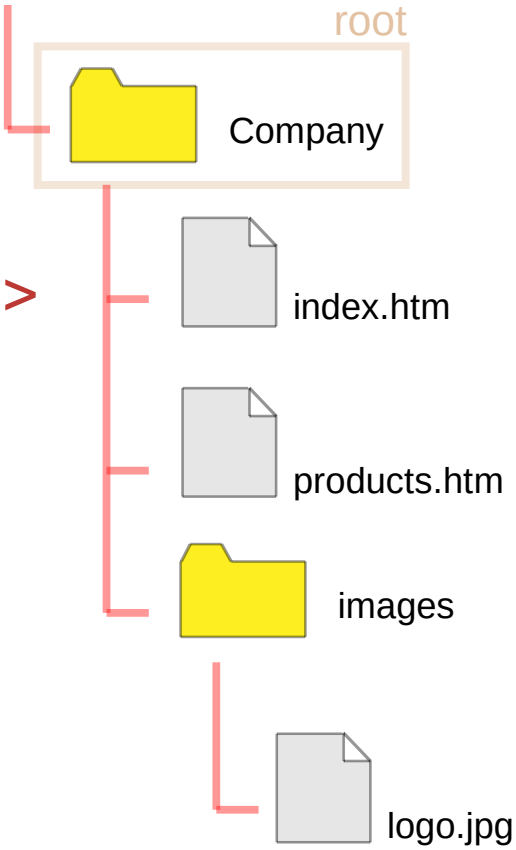
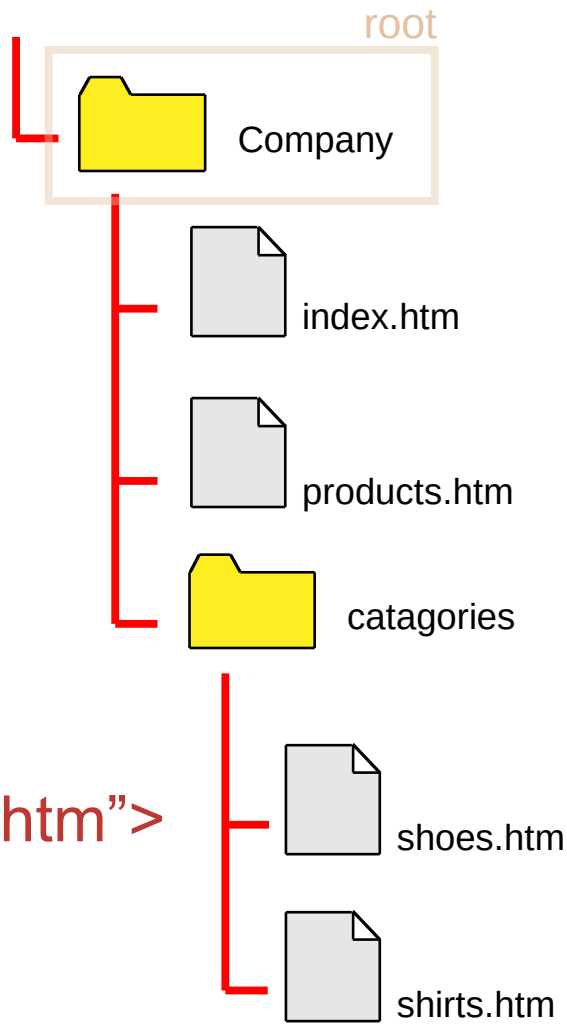


Relative Paths

To hyperlink from shoes.htm to index.htm (i.e. back up one level in the directory hierarchy)



2 dots and a slash

<a href="../index.htm">

Relative Paths for Websites

In website development, it's much easier to use relative paths.

A site developed locally on one computer (under an assigned site root directory or folder), is much easier to transfer and manage on the final web server using relative paths.

> *In Dreamweaver, the first thing to do is set up a new site using the 'Site Definition' interface. This way, a local 'site root' folder can be created to gather and manage all files related to the site.*

Home Page Naming

For…

http://www.cityu.edu.hk

…there must be a default HTML page that is displaying as the home page. In the case of CityU, it is…

http://www.cityu.edu.hk/index.html

…meaning index.html is the default HTML page in the root directory of the server.

Home Page Naming

Web servers will automatically serve up pages file-named

index.html
index.htm
default.htm
default.html

…as long as ONE page by those filenames resides in the root directory of your site.

If you want to use a page by another name as the home page of the site, you will have to configure the server software to point to that page.

Web Page Naming (HTML naming Conventions)

All lower-case, no spaces, no special characters [other than dash (-) or underscore (_)].

products.html  recommended

Products.html  ok, but not recommended (esp. in XHTML)

products_sept07.html  recommended

products sept/07.html  not recommended

The same applies to the name of folders and sub-folders within your site.

Server Software

Just connecting a computer to the Internet and giving it an IP address does not make it a web server. Server computers have to run special web server software to open TCP connections and respond to HTTP requests.

The two most common web server applications are:

Apache (UNIX-based, open source) 50%*

IIS - Internet Information Services (Microsoft) 36%*

* Percent of all websites served on the Internet: Sept, 2007

Summary: URLs, HTTP, domains, paths

Uniform Resource Locator (URL)

The common addressing mechanism used to navigate the web

Prefix

The transfer protocol at the **application layer:** Hypertext Transfer Protocol (HTTP) is used to request web pages and related data from a server

Host name, domain name

Identifies a particular computer or server somewhere on the Internet.

The Domain Name System translates Internet Protocol (IP) addresses into unique recognisable names that have to be registered with assigned domain registration services.

Second- or sub-level domains can identify different servers or services within the same domain.

Path, pathname

Identifies a file within a hierarchical directory structure on the server.

Paths can be **Absolute** (that is, hierarchical from the top of the file system or volume), or **Relative** (that is, hierarchical from the top of a designated working directory / root directory).

Relative paths are much preferred for creating and managing groups of web pages and resources within a site.