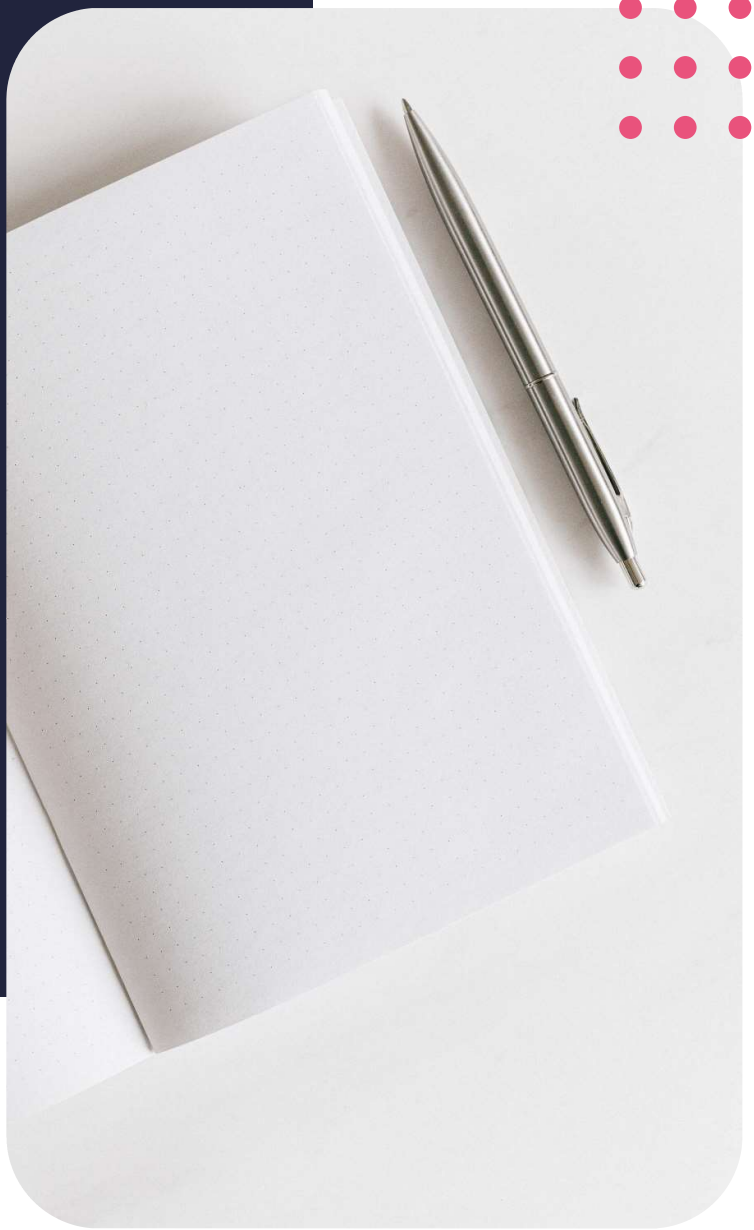
Diploma in Web Development

Introduction to the web

Contents



Lesson outcomes

In this lesson, we briefly discuss the architecture of the web. This allows you to solidify your understanding of the client/server architecture before we begin scripting. First, we delve into better understand the internet and the world wide web, then we move onto networking basics, followed by a very important topic, web server basics. Lastly, we wrap this session up with languages of the web, which includes HTML and CSS.

Internet and the world wide web

Overview

The internet consists of multiple computers over a network that communicate with one another using a specific set of rules. The internet originated from ARPANET.

(Vidal, 1999)

New uses for the internet

As the internet evolved, the potential for various other activities have also come about in earlier days:

- E-mailing
- Browsing
- Newsgroups
- Ecommerce
- Blogs
- Cloud computing

The internet of things (IoT)

A subset of the Internet that includes computers and sensors connected to each other for communication and automatic transaction processing.

- Autonomous devices connected to each other.
- Includes the use of sensors and scanners.
- Often located in houses or offices.
- Requires little to no human intervention.

Networking

Packet-switched networks

In a packet switched network, files are broken down into smaller pieces called packets, that are labelled electronically with their origins, sequences, and destination addresses.

Common network types

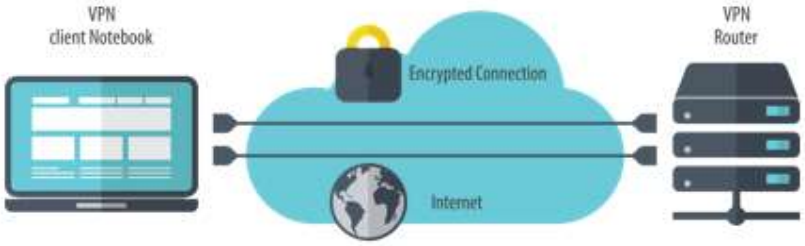
Network type	Description
Local area network (LAN)	• Devices are usually located close together. • Ideal for office setup. • Restricted by geographical location.
Wide area network (WAN)	• Connects multiple LANs. • Extends beyond the boundaries of an office. • Ideal for enterprise scale network. • Extends to larger geographical areas, including the globe.

Public and private networks

Network	Description
Public	• A computer network available to the public. • Often less secure than private networks
Private	• A connection between two companies which connects networks together. • Can be quite expensive. • More secure than a public network.

Virtual private networks (VPNs)

A connection that uses public networks and their protocols to send data in a way that protects the data much like that of a private network.



Advantages of using a VPN

- Uses software to encrypt data transmission.
- IP Tunneling creates private pathway over public Internet.
- Less expensive than private network.
- Hides internet activity from entities such as ISP's.

Intranets and extranets

As networking technologies became less expensive and easier to deploy, organisations started building more and more interconnected networks.

Intranet/Extranet	Description
Intranet	• Does not extend beyond the organization that created it. • Forums within organisations to foster new ideas.
Extranet	• Much like intranet, but also extended to entities outside the boundaries of an organisation. • Such as business partners, customers, and suppliers.

Web server basics

Web servers

A web server is a computer that hosts web content or files that make up the structure of websites.

Responds to client requests by:

- Transferring files and scripts to the web client (browser).
- Generating a response by invoking scripts and querying a database

Two-tier client/server architecture

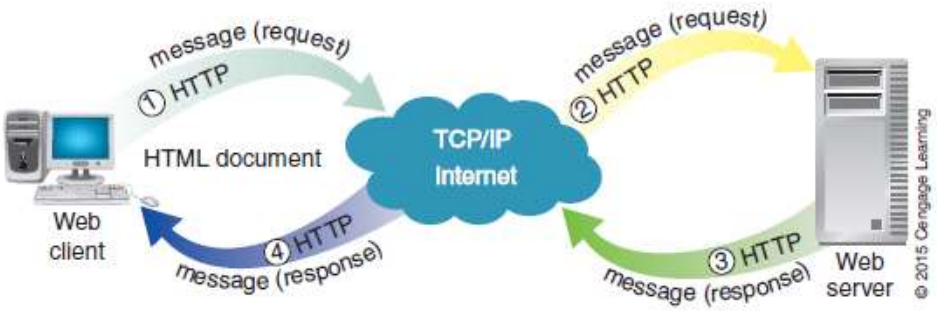


FIGURE 8-2 Message flows in a two-tier client/server network

(Source: Schneider, 2016)

The message that a Web client sends to request a file or files from a Web server is called a request message. A typical request message from a client to a server consists of three major parts:

- **Request line** – filename and a description of the path to that file on the server
- **Optional request headers** - information about the types of files that the client will accept in response to this request
- **Optional entity body** - used to pass bulk information to the server.

Two-tier client/server architecture

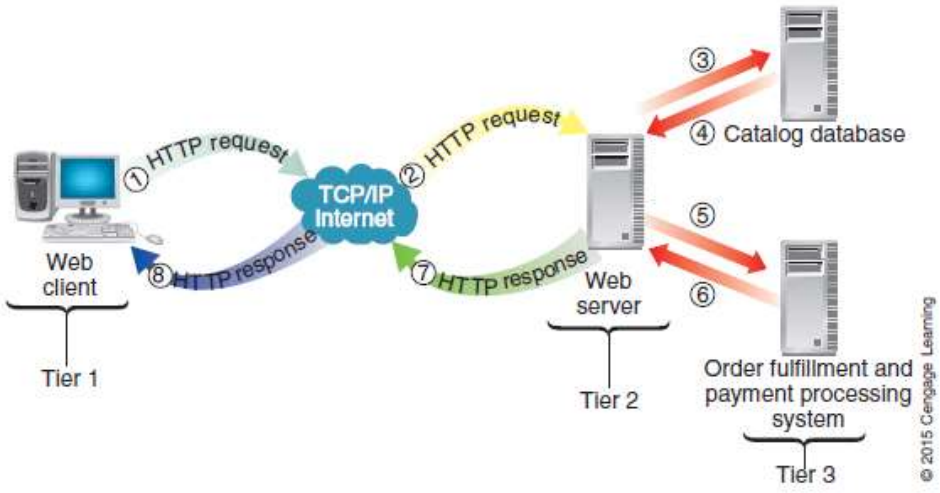


FIGURE 8-3 Message flows in a three-tier client/server network

(Source: Schneider, 2016)

A three-tier architecture extends the two-tier architecture to allow additional processing (for example, collecting the information from a database needed to generate a dynamic Web page) to occur before the Web server responds to the Web client's request.

The third tier often includes databases and related software applications that supply information to the Web server. The Web server can then use the output of these software applications when responding to client requests, instead of just delivering a Web page.

Client-side scripting

- Script is run by the client software (browser).
- Code instructs the client to request the script from server.
- Processing occurs on local machine (the user's device).
- Scripting languages include HTML, CSS, JavaScript.

Server-side scripting

- Script is run by the server software (backend).
- Server responds to the client's request.
- Server response is shaped based on client request.
- Ideal for hosting a database.
- Scripting languages include PHP, NodeJS, Python.

Platform neutrality

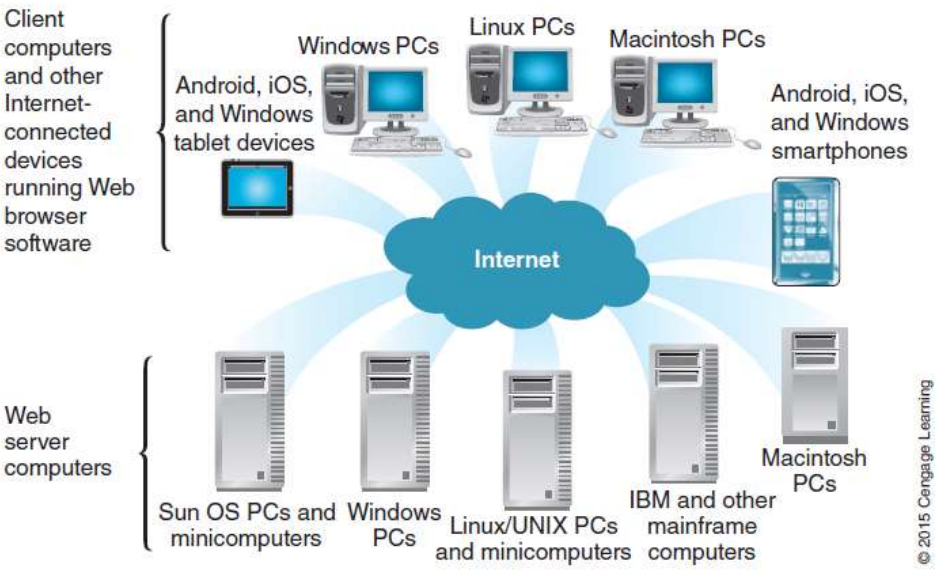


FIGURE 8-1 Platform neutrality of the Web

(Source: Schneider, 2016)

The ability of a network to connect devices that use different operating systems is called platform neutrality. Web applications should remain responsive across various devices regardless of the platform.

Web languages

Key technologies of the web

- Hypertext
- Styling
- Graphical user interface (GUI)

Hypertext

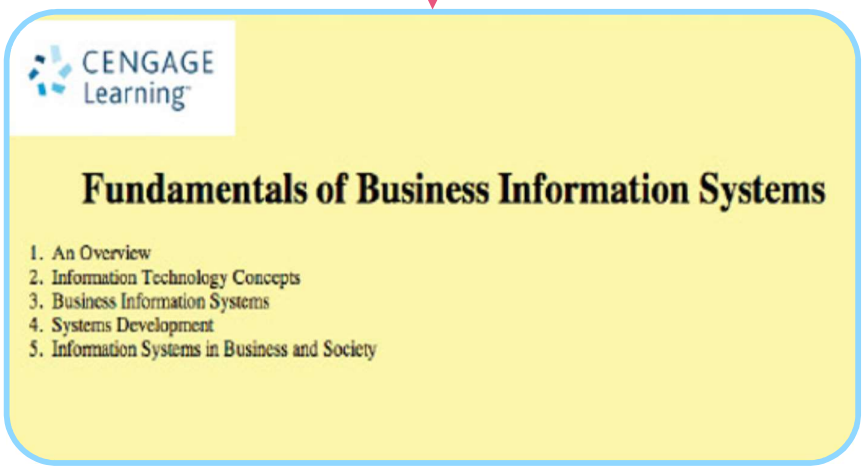
Described as a page linking system in which text on one-page links to text on another page.

- Hypertext Markup Language (HTML)
- Includes a set of tags which describe the relationships among text elements
- Tags provide formatting instructions
- Most tags have an opening and closing tag <> </>

HTML

Below is an example of a HTML script being interpreted by the client.

```
<html>
<head>
<title>Table of Contents</title>
<link href='style.css' rel='stylesheet' type='text/css' />
</head>
<body style='background-colour:#333333'>
<div id='container'>
<p><img src='header.png' width='602' height='78' /></p>
<h1 align=center>Fundamentals of Business Information Systems</h1>
<ol>
<li>An Overview</li>
<li>Information Technology Concepts</li>
<li>Business Information Systems</li>
<li>Systems Development</li>
<li>Information Systems in Business and Society</li>
</ol>
</div>
</body>
</html>
```



Styling

Style sheets are sets of instructions that give web developers more control over the format of displayed pages.

- The most commonly used style sheet is cascading style sheet (CSS)
- Can be included in HTML document, but is not considered best practice
- Single style sheet allows formatting to applied to across multiple web pages

CSS

Below is an example of a CSS script being interpreted by the client.

```
<!DOCTYPE html>
<html>
    <head>
        <title>Arduino SD Card Web Page</title>
        <style type="text/css">
            h1 {
                font-family: courier, courier-new, serif;
                font-size: 20pt;
                color: blue;
                border-bottom: 2px solid blue;
            }
            p {
                font-family: arial, verdana, sans-serif;
                font-size: 12pt;
                color: #6B6BD7;
            }
            .red_txt {
                color: red;
            }
        </style>
    </head>
    <body>
        <h1>Arduino SD Card Page with CSS</h1>
        <p>Welcome to the Arduino web page with CSS styling.</p>
        <p class="red_txt">This text is red.</p>
        <p>This paragraph has one word that uses <span class="red_txt">red</span> text.</p>
    </body>
</html>
```

A Web Page Styled with CSS

Graphical user interface (GUI)

Using a combination of HTML and CSS developers can easily design beautiful and appealing graphical user interfaces such as the one below. Graphical user interfaces (GUI) is a way of presenting program control functions output to users and accepting input.

- Allows users to interface with system.
- Strong focus on UI/UX.
- Determines user acceptance.
- Uses pictures, icons, and other graphical elements instead of plain text.

References

Schneider, G. (2016). *Electronic Commerce*. Cengage Learning. https://books.google.co.za/books?id=Sl-QCgAAQBAJ

Vidal, J. J. (1999). Chapter 11 - Cyberspace Bionics. In J. P. Marsh, B. Gorayska, & J. L. Mey (Eds.), *Human Interfaces* (Vol. 13, pp. 203–218). North-Holland. https://doi.org/https://doi.org/10.1016/S0923-8433(99)80016-1