

# 9. INTERNET TECHNOLOGIES



# Copyright Notice

2

- This presentation is presented as is. This presentation was assembled using information from various websites or sources across the web.
- This presentation uses Creative Commons Attribution 4.0 International (CC BY 4.0). © 2021 BilimEdtech

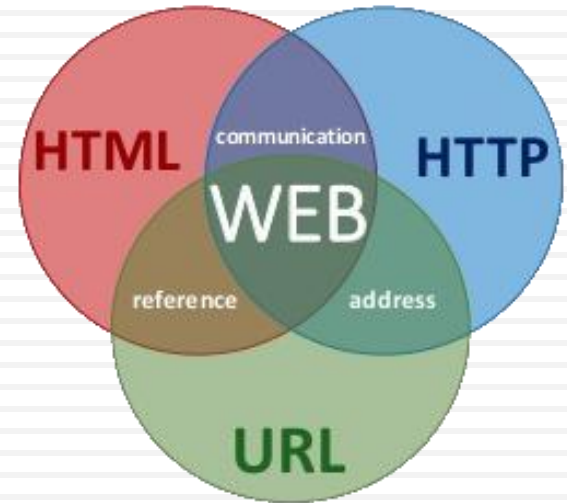


## 9.1: Web Components

### 9.1: Web Components

### 9.2: Web Data Delivery

### 9.3: Web Languages



# 9.1: Learning Objectives

- Know how clients and servers interact
- Understand the role of Internet Service Providers
- Explain the function website hosting services
- Describe domain names, URLs, and IP Addresses
- State the process of launching a website

# World Wide Web Introduction

5

- The World Wide Web (commonly shortened to the Web) is a system of interlinked documents accessed via the internet
- The WWW uses a protocol and language called hypertext
- Hypertext is the interlinking of documents



# World Wide Web Introduction (2)

6

- Web pages are text files written in a language called hypertext
  - ▣ We call these HTML files
- Files are linked using hyperlinks
- HTML files and other web data are transferred over the internet using the Hypertext Transfer Protocol (HTTP)



# World Wide Web Introduction (3)

7

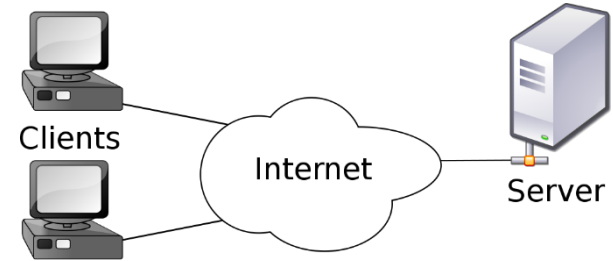
- A web browser is a software program which **interprets** the HTML documents and **displays** it on the user's screen



# Web Components

8

- ❑ **Clients and Servers**
- ❑ Internet Service Providers
- ❑ Website Hosting Services
- ❑ Domain Names, URLs, and IP Addresses
- ❑ Domain Registrars

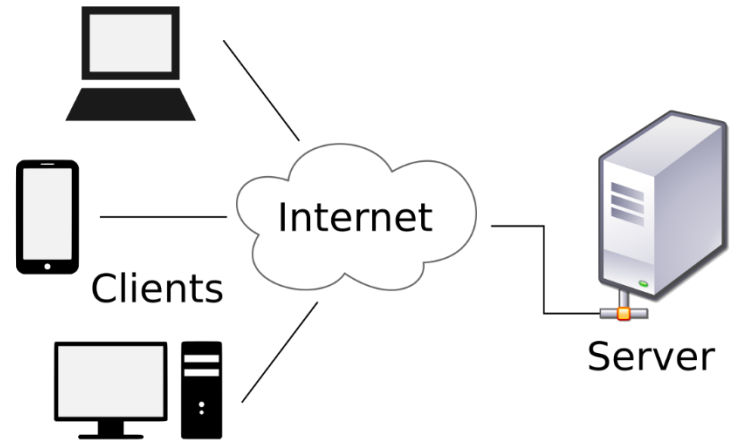




# Clients & Servers

9

- An essential part of the internet are clients are servers
- Client-Server model
  - ▣ Clients request information from a server
  - ▣ The server responds to the request



# Clients & Servers (3)

10

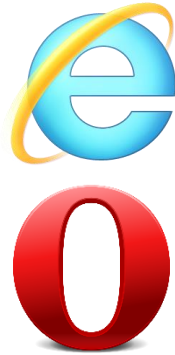
## □ Clients (Browser)

□ Internet Explorer

□ Chrome

□ Firefox

□ Opera



## □ Servers

□ Apache

□ Microsoft IIS

□ Tomcat

□ Nginx



APACHE  
HTTP SERVER

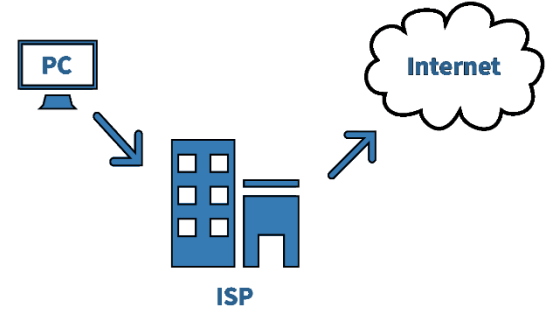


NGINX

# Web Components

11

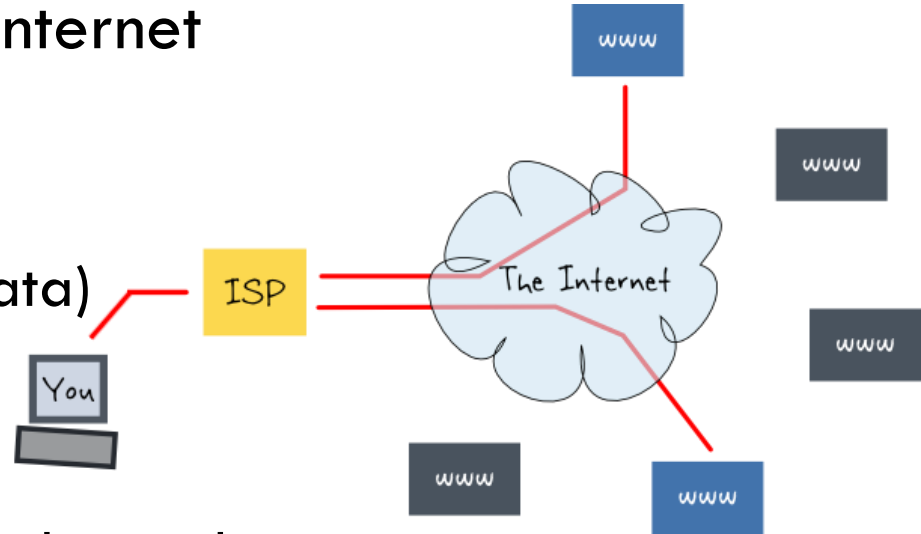
- Clients and Servers
- **Internet Service Providers**
- Website Hosting Services
- Domain Names, URLs, and IP Addresses
- Domain Registrars



# Internet Service Providers (ISP)

12

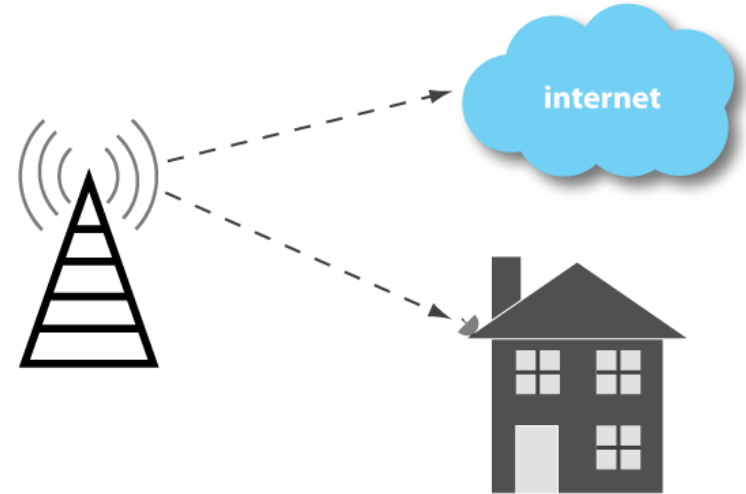
- **Connects clients to the internet**
  - ▣ Businesses (Fiber optic)
  - ▣ Home users (DSL line)
  - ▣ Personal users (mobile data)
- **Good ISPs**
  - ▣ high uptime
  - ▣ fast download and upload speeds
  - ▣ charge a fair price



# Internet Service Providers (ISP) (2)

13

- Wired ISPs
  - ▣ KazakhTelecom
  - ▣ AlmaTV
- Wireless ISPs
  - ▣ Kcell / Activ
  - ▣ Beeline



# Web Components

14

- Clients and Servers
- Internet Service Providers
- **Website Hosting Services**
- Domain Names, URLs, and IP Addresses
- Domain Registrars



# Web Hosting Services

15

- **Connects websites** to the internet
- Provides a wide range of services required to host a website
  - ▣ Simple web hosting
  - ▣ Web hosting + other services



# Web Hosting Services (2)

16

- Networking services
  - ▣ Routers
  - ▣ Bandwidth / connection to internet
  - ▣ Firewall hardware and software
- Web server
- Email server
- Disk space
- IT services
  - ▣ (Backups, maintenance)



# Web Hosting Services (3)

17

## □ Simple Web Hosting

- HostGator
- 1&1 Web Hosting
- GoDaddy

## □ Infrastructure Hosting

- Amazon Web Services
- Google Cloud Platform
- Microsoft Azure

# Web Components

18

- Clients and Servers 127.0.0.1
- Internet Service Providers 172.16.0.9
- Website Hosting Services 192.0.0.7
- **Domain Names, URLs, and IP Addresses**
- Domain Registrars

# Domains, URLs, and IP Addresses

19

- **Domain name:** The unique name of a computer on the internet
  - microsoft.com
- **Uniform Resource Locator (URL):**
  - <http://www.microsoft.com/faq.html>
- **Internet protocol (IP) address:** Unique address of a computer on a network
  - 192.168.1.1

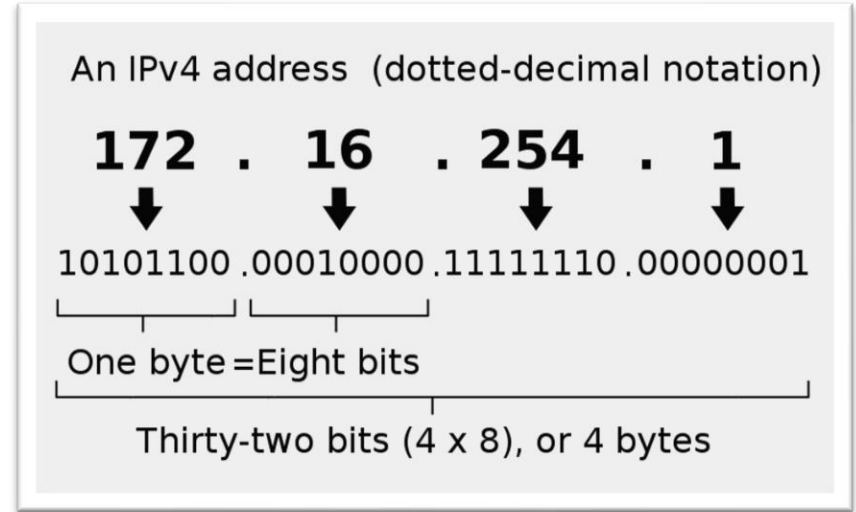
# IP Addresses

- The internet needs addresses to identify different nodes
  - ▣ Similar to how every building in the city has an address
- An address used by the Internet Protocol is called an **IP address**
- Every host on the internet has a unique IP address, made up of four numbers
  - ▣ E.g.. 192.168.10.254, each number is between 0 and 255

# IP Addresses version 4

21

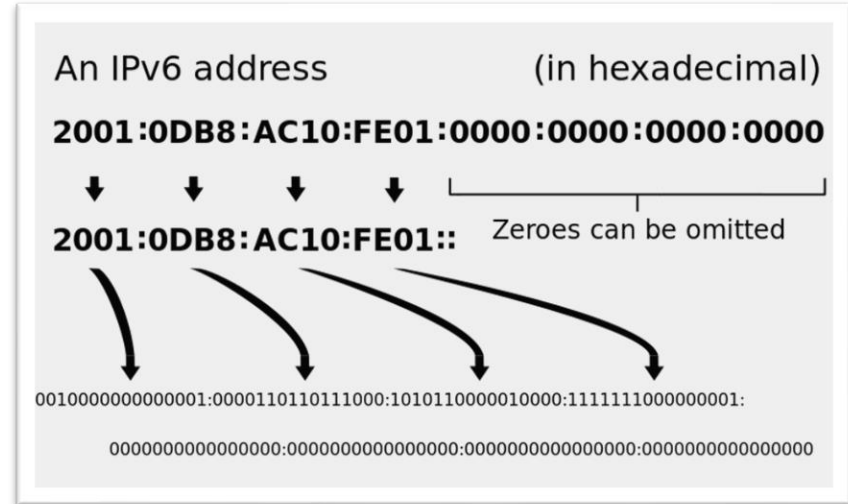
- Approximately 4.3 billion IPv4 addresses
- IPv4 ran out of addresses in 2015
- Limited connecting new clients



# IP Addresses version 6

22

- IPv6 uses hexadecimal
- $2^{128}$ , or 340 undecillion addresses
- 69,000 years to scan all the IPv6 addresses scanning one million addresses per second



# Domain Names

23

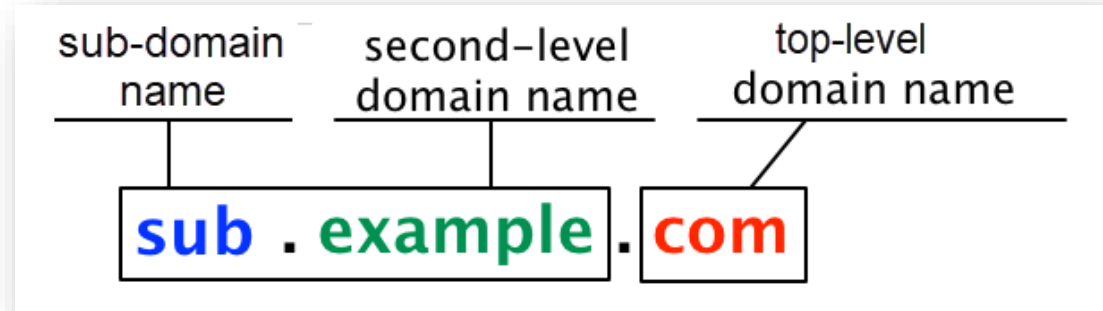
- ❑ The numbers in an IP address are hard to remember, while names are easier to remember
- ❑ A domain name is a unique name that identifies a website
- ❑ Domain Name System (DNS)
  - ▣ a mapping between the human-readable name of a host and its IP address



# Domain Names (2)

24

- A domain name consists of two or more parts
  - ▣ google.com
  - ▣ do.ektu.kz

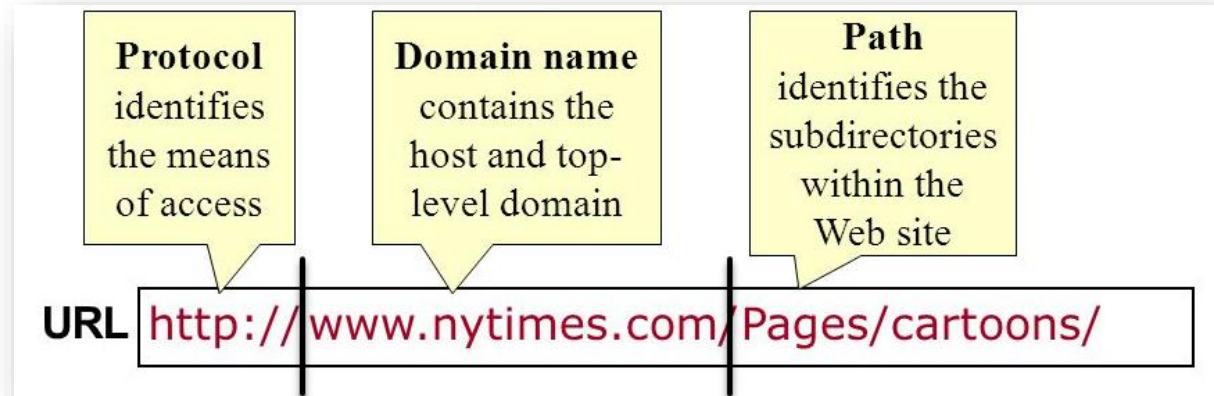




# URL

25

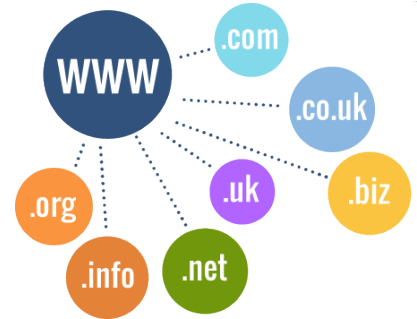
- A URL is the complete address of a web page
- Every page has a unique URL



# Web Components

26

- ❑ Clients and Servers
- ❑ Internet Service Providers
- ❑ Website Hosting Services
- ❑ Domain Names, URLs, and IP Addresses
- ❑ **Domain Registrars**



# Domain Registrar

27

- A company that provides domain name registration services for a fee
- Maintain databases that map domain names to IP addresses
- Send the domain information to DNS for lookup



namecheap



# Launching a Website

28

- ❑ Choose a domain name
- ❑ Register with a domain registrar
- ❑ Choose a hosting service
- ❑ Tell the registrar the IP address
- ❑ Upload the web content to the web server



# Web Components Summary

29

- ❑ The web uses a **client-server architecture**
- ❑ Internet Service Providers **connect clients** to the internet
- ❑ Web hosting services **connect websites** to the internet
- ❑ A domain name is the **unique name** of a computer on the internet
- ❑ A URL provides the **exact address** of a specific web page
- ❑ An IP address is the **unique address** of a computer on a network
- ❑ Domain registrars allow users to **acquire domain names**



## 9.2: Learning Objectives

- ❑ Describe what happens when you access a web page
- ❑ List the protocols used to move web data
- ❑ State the limitation of IP
- ❑ Describe the importance of TCP
- ❑ Explain how TCP/IP moves data across the internet

# How does the internet work?

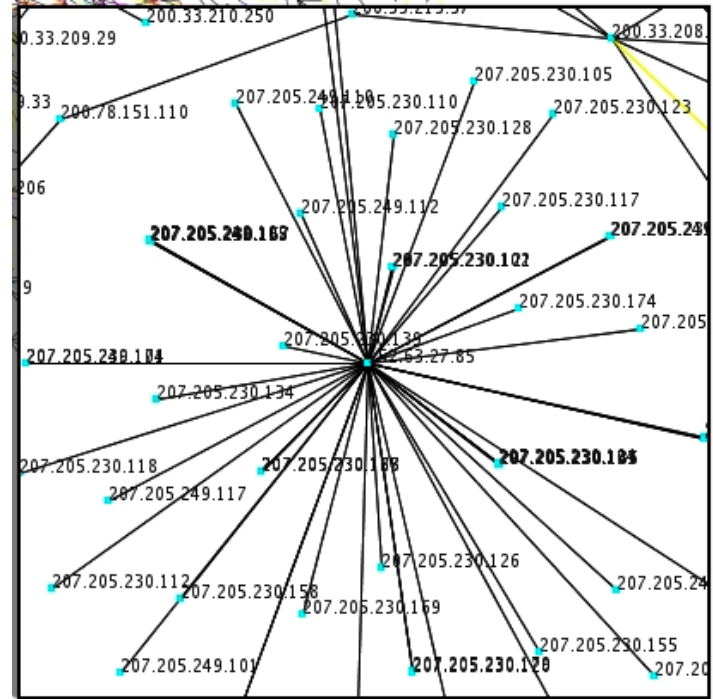
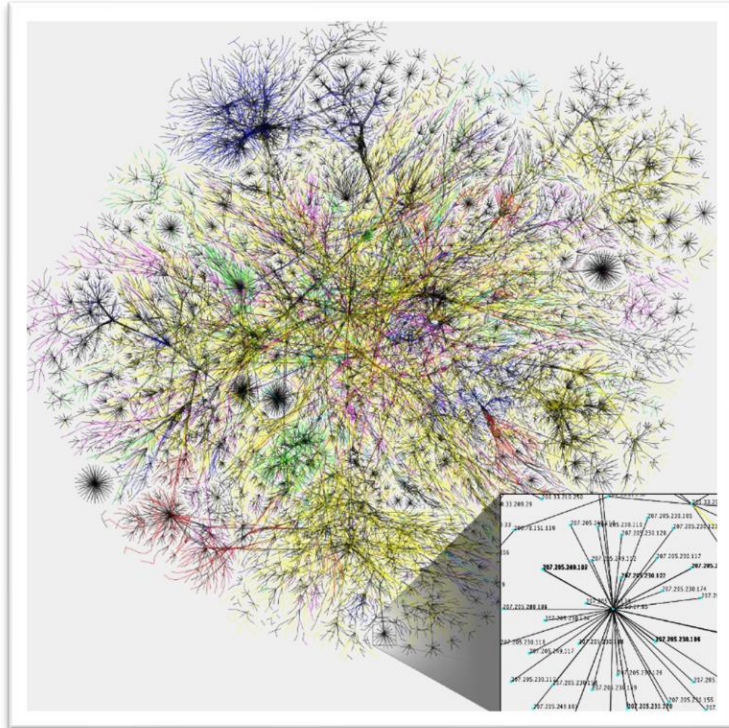
32

- What happens when you visit a web page?
- Or send an email?
- How does the data know to get from your computer to the server or from the server to your computer?





# A Visualization of Internet from 2006



# Internet, Packets, and Routing

34

- **Internet** - is a network of computer networks
- **Routers** - transmit data in packets using the Internet Protocol (IP)
- **Packet** – a unit of packaged information
- **Routing** – process of moving packets from one node (computer device) to another

# Sending/Receiving Data: HTTP

35

- A client initiates an **HTTP request**
- The server sends a **response** along with data



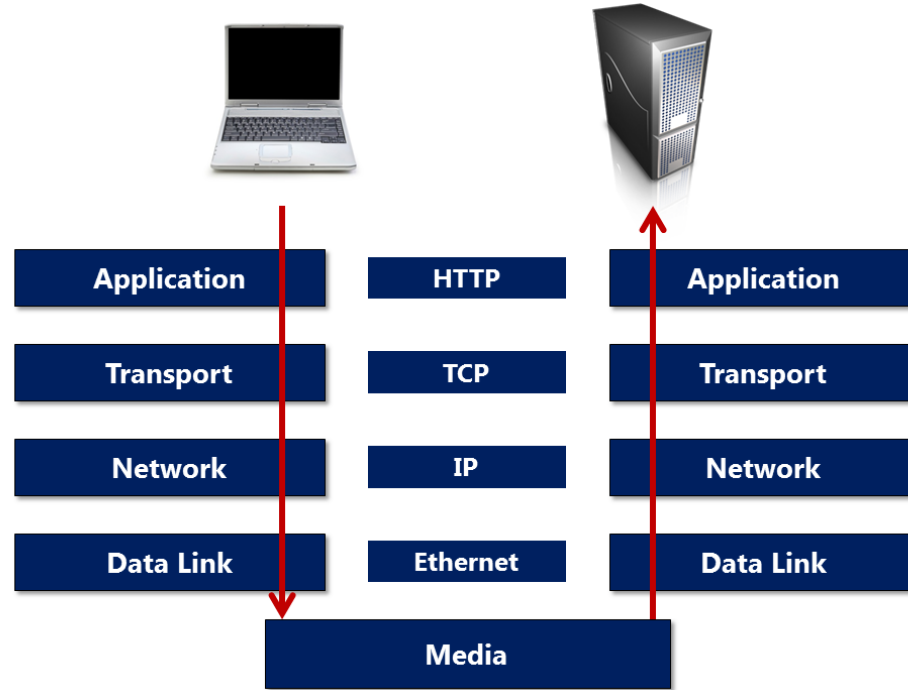
HTTP Request

HTTP Response



# Sending/Receiving Data: HTTP (2)

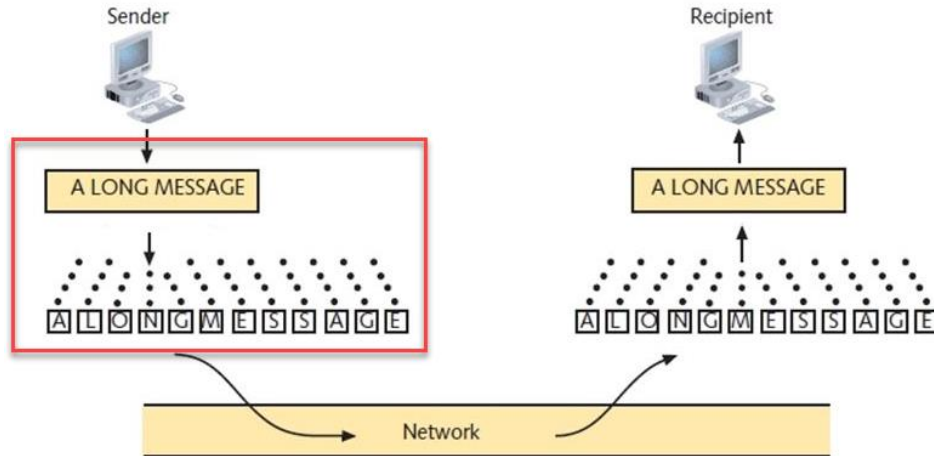
36



# Sending/Receiving Data: TCP

37

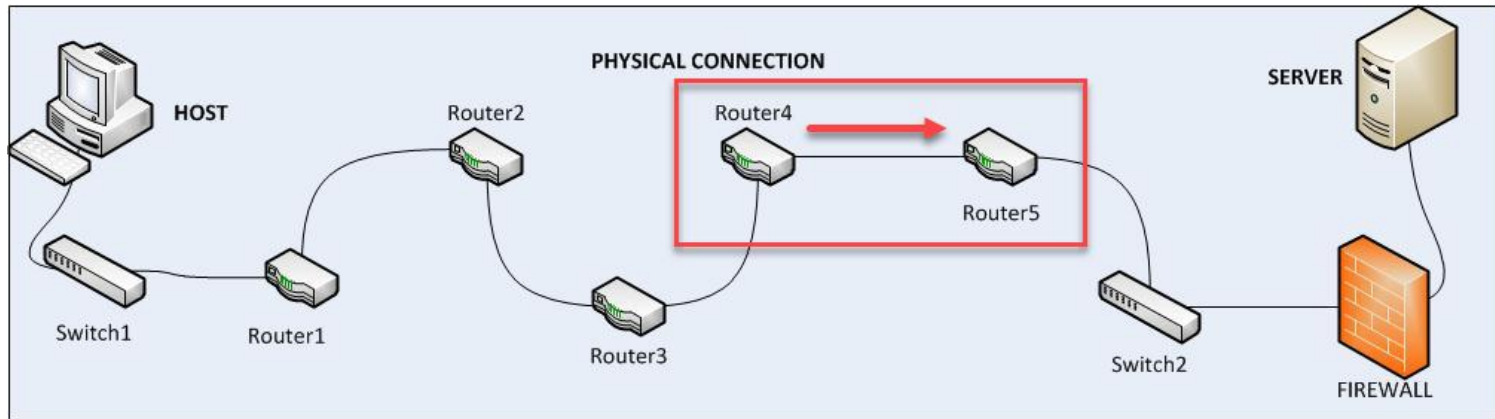
- At the sender, TCP divides data into packets and sent to the nearest node (router)



# Sending/Receiving Data: IP

38

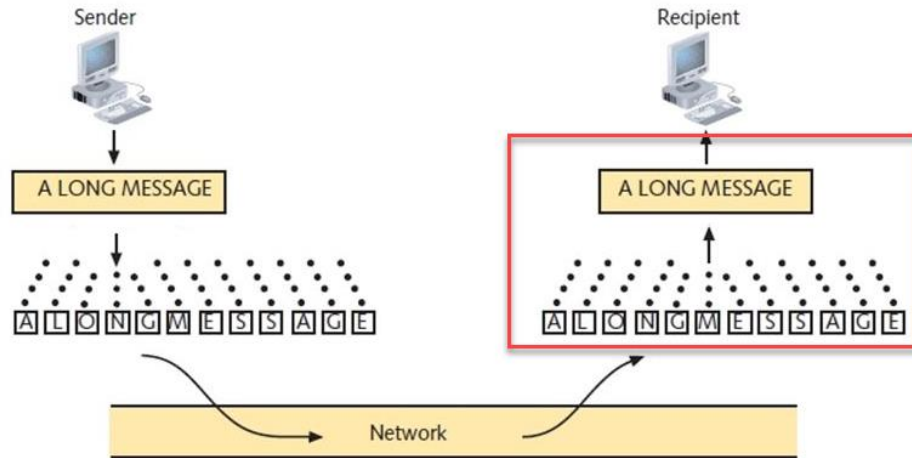
- Each router sends the packet to another router that is closer to the final destination



# Sending/Receiving Data: TCP (2)

39

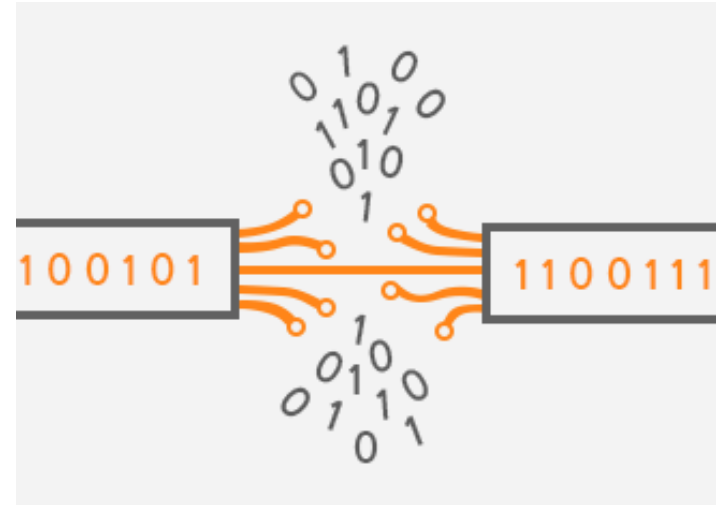
- At the receiver, TCP reassembles the packets to get the original data



# IP Limitations

40

- IP moves packets from one router to another
- IP doesn't check whether packets are delivered successfully





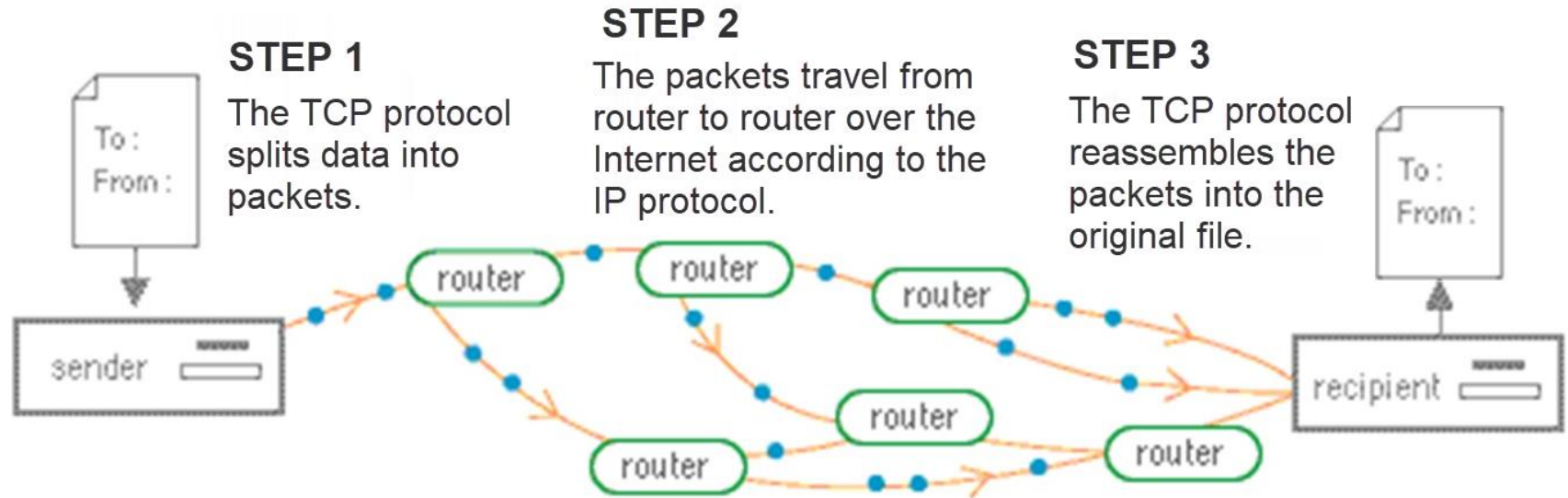
# TCP/IP

41

- TCP/IP = Transmission Control Protocol / Internet Protocol
- A method of moving data across the internet with **guaranteed delivery** of the data
  - IP **moves** the data **across** the internet
  - TCP **ensures** that all of the data **arrives intact**

# TCP/IP (2)

42

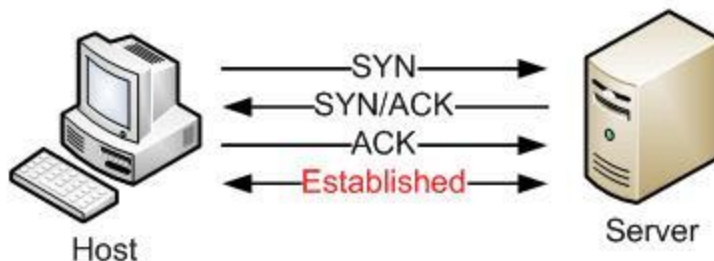


# TCP/IP Process

43

- **Creates** end-to-end virtual connections
- **Uses** a three-step handshake to establish connection
- **Sends** the data using IP

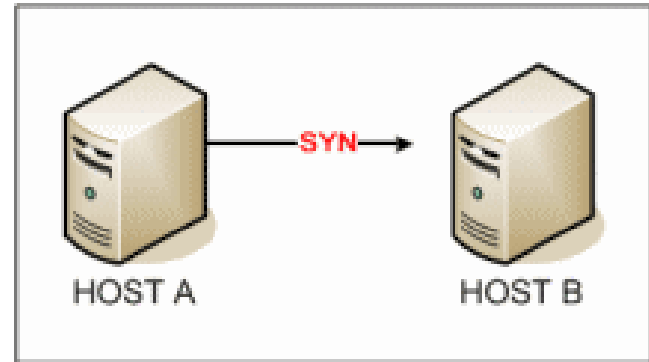
TCP Three-Step Handshake



# TCP/IP Process (2)

44

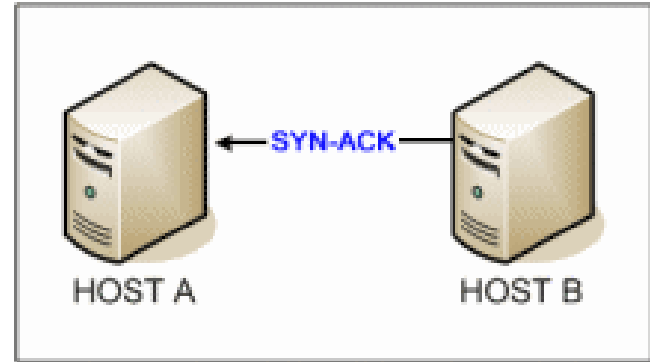
- First: The client **sends** a **request** to the server to establish a connection



# TCP/IP Process (3)

45

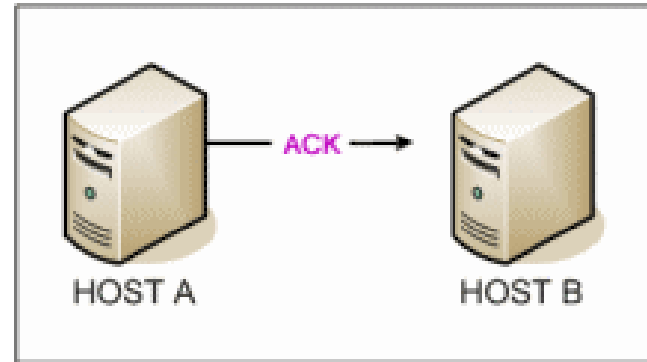
- Second: The server **receives** the request and **responds** back with **acknowledgment** to the request



# TCP/IP Process (4)

46

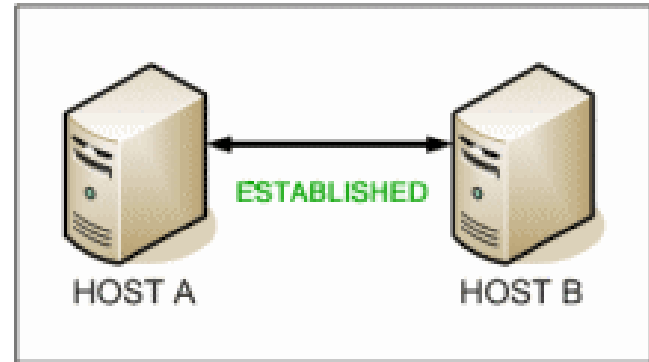
- Third: The client knows the server accepted it, so it **sends** an **acknowledgment** back to the server



# TCP/IP Process (5)

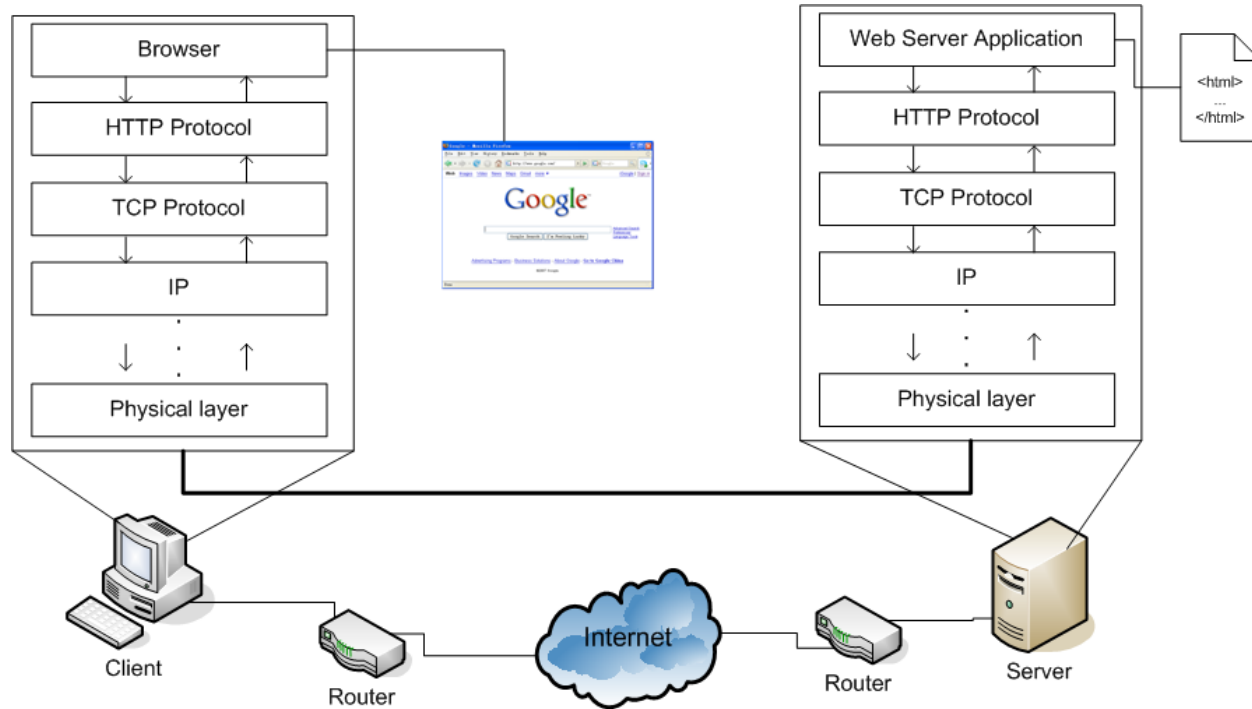
47

- Finally: The connection is established
- The client can send the data to the server



# Putting it All Together

48





# Data Delivery Summary

- Web browser makes an HTTP request
- The TCP/IP internet protocol stack delivers the data
  - ▣ TCP creates a virtual connection
  - ▣ TCP splits the data into small packets and guarantees data delivery.
  - ▣ IP carry the data to the final destination
  - ▣ TCP reassembles the data to create a replica of the file

## 9.3: Web Languages

9.1: Web Components

9.2: Web Data Delivery

**9.3: Web Languages**



## 9.3: Learning Objectives

- ❑ List the three main web language
- ❑ State the primary purpose of the web languages
- ❑ Describe the purpose HTML
- ❑ Describe the purpose of CSS
- ❑ Describe the purpose of JavaScript

# Web Languages

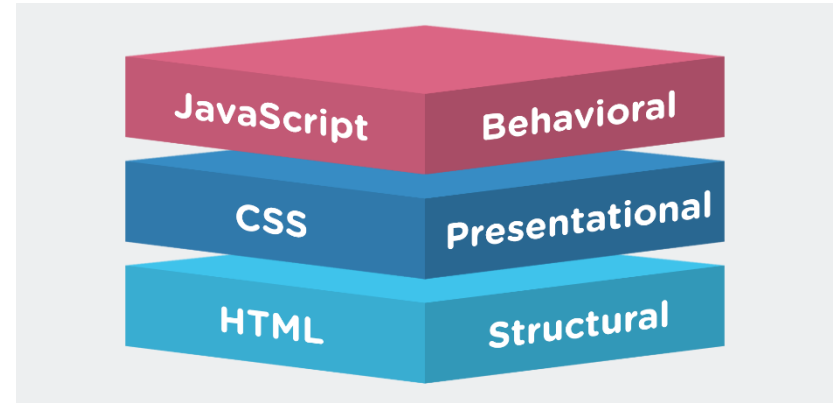
52

- The web uses many languages
  - ▣ Main languages are HTML, CSS, and JavaScript
- Two primary purposes
  - ▣ Displays content to the user
  - ▣ Allows the user to interact with web data

# Web Page Components

53

- Content and structure
  - ▣ **HTML**
- Presentation
  - ▣ **CSS**
- Behavior
  - ▣ **JavaScript**



# What is HTML?

54

- **Purpose:** HTML contains the **content** of a web page
- An HTML file is a file that **contains HTML** content
- HTML is the most **widely used language** to write web pages



```
Page.html x
<html>
<head>
<title> My First Webpage </title>
</head>
<body>
<h1> Hello World! </h1>
<p> This is a test page. </p>
</img>
</body>
</html>
```

wikiHow to Create a Simple Web Page

# What is HTML? (2)

55

- HTML stands for **H**ypertext **M**arkup **L**anguage
  - Hypertext
  - Markup language



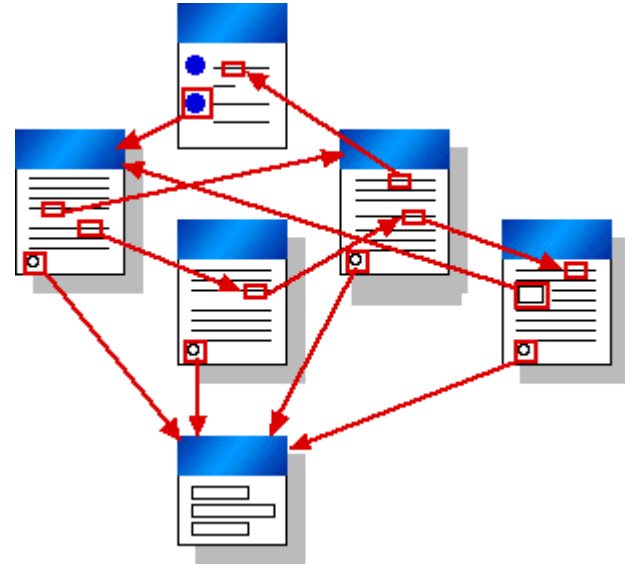
```
Page.html x
<html>
  <head>
    <title> My First Webpage </title>
  </head>
  <body>
    <h1> Hello World! </h1>
    <p> This is a test page. </p>
    </img>
  </body>
</html>
```

wikiHow to Create a Simple Web Page

# What is HTML? (3)

56

- **Hypertext** is text that **links** to other information, or to other web pages
  - ▣ The links available on a web page are called **hyperlinks**





# What is HTML? (4)

57

- HTML is a **Markup Language**
  - ▣ A developer uses HTML to "markup" a text document with tags that tells a web browser how to **structure** the page and **display** the **content**



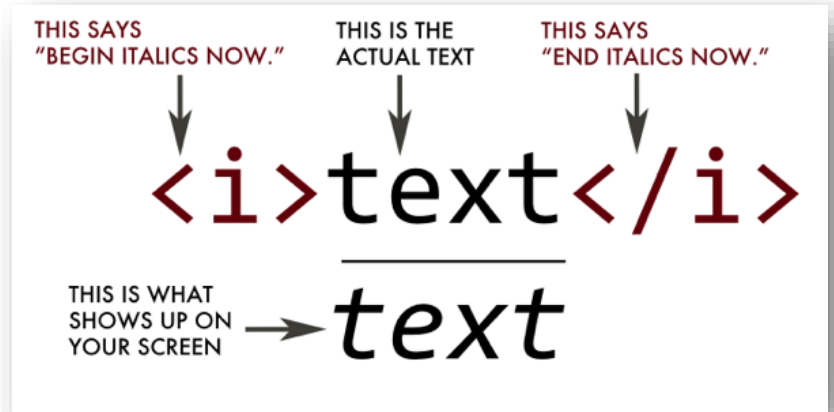
```
Page.html x
<html>
  <head>
    <title> My First Webpage </title>
  </head>
  <body>
    <h1> Hello World! </h1>
    <p> This is a test page. </p>
    </img>
  </body>
</html>
```

wikiHow to Create a Simple Web Page

# HTML Tags

58

- HTML uses tags to define the **structure** of the web page
  - ▣ The **content** goes **inside** of the tags
- HTML tags are enclosed within angle brackets



# HTML Example

59

## HTML

```
<!DOCTYPE html>
<html>

  <head>
    <title>This is document title</title>
  </head>

  <body>
    <h1>This is a heading</h1>
    <p>Document content goes here.....</p>
  </body>

</html>
```

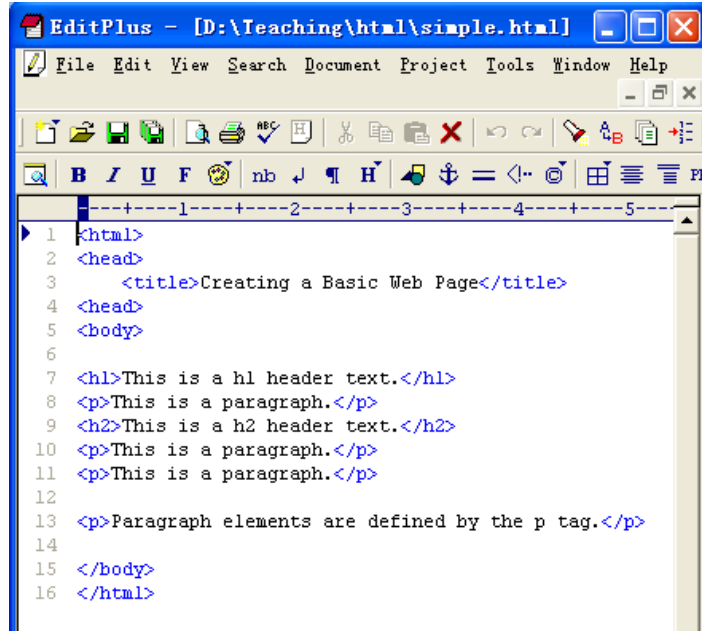
Display in  
a web  
page

## **This is a heading**

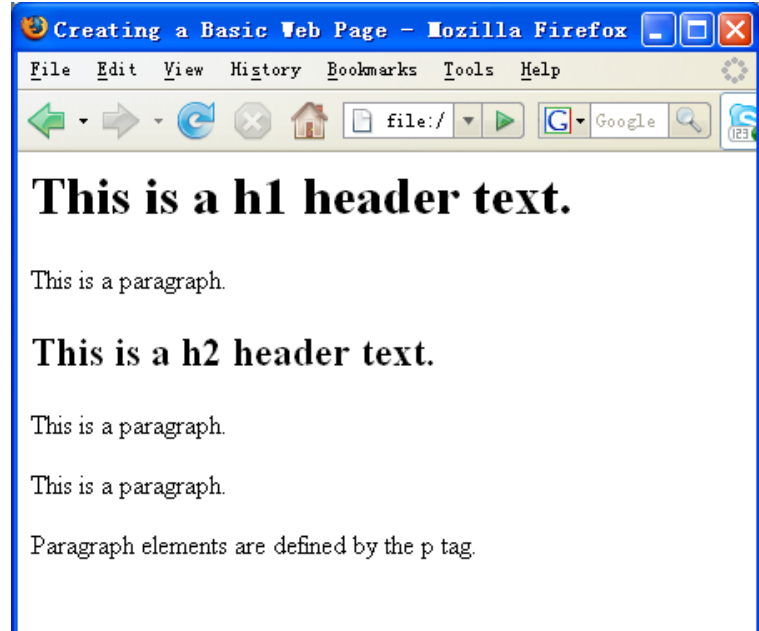
Document content goes here.....

# HTML Example (2)

60



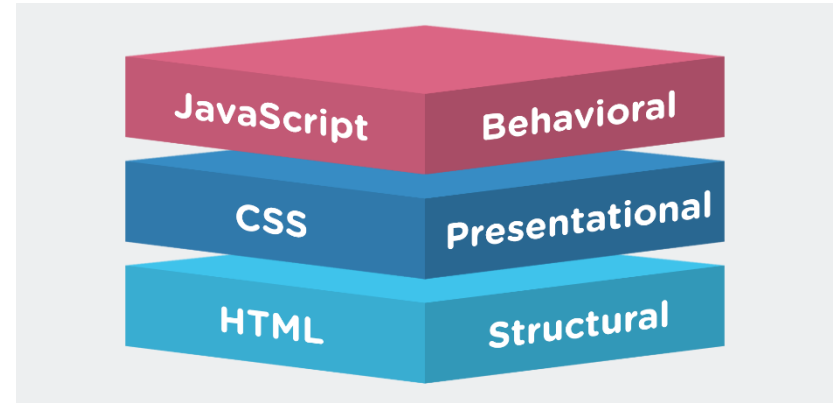
```
1 <html>
2 <head>
3   <title>Creating a Basic Web Page</title>
4 </head>
5 <body>
6
7 <h1>This is a h1 header text.</h1>
8 <p>This is a paragraph.</p>
9 <h2>This is a h2 header text.</h2>
10 <p>This is a paragraph.</p>
11 <p>This is a paragraph.</p>
12
13 <p>Paragraph elements are defined by the p tag.</p>
14
15 </body>
16 </html>
```



# Web Page Components

61

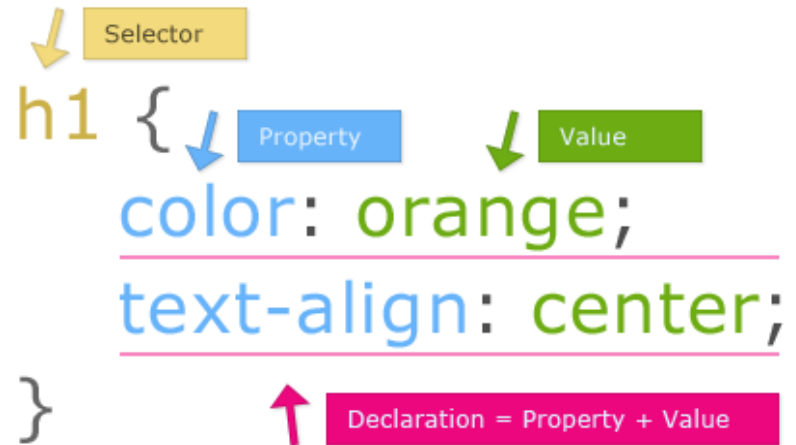
- Content and structure
  - ▣ HTML
- Presentation
  - ▣ **CSS**
- Behavior
  - ▣ JavaScript



# What is CSS?

62

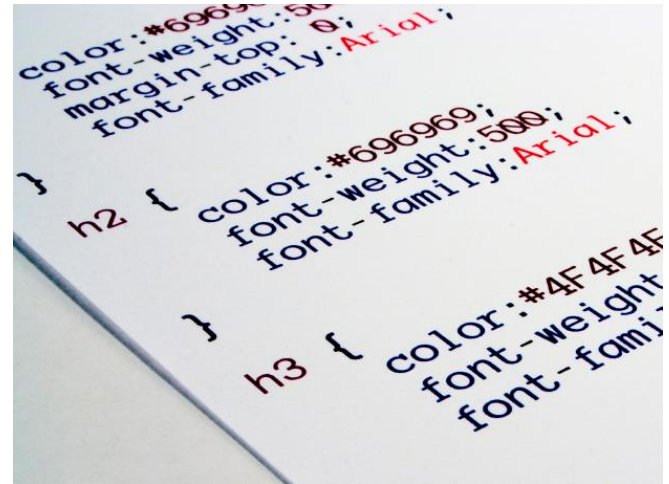
- **Purpose:** Cascading Style Sheets (CSS) is used to control the style of a web document simply and quickly



# What is CSS? (2)

63

- CSS defines the **look** and **feel** part of a web page
  - ▣ HTML provides the **content** and **structure**
  - ▣ CSS adds **styles** to HTML tags, such as **color**, text decoration, **FONT STYLES AND SIZE**, and many more features



# How does CSS Work?

64

- CSS styles provide powerful control over the presentation of web pages by styling individual tags
- One style can apply to all tags!
  - ▣ `h1 { color: red; }`
  - ▣ By adding the above style, the web browser displays all `<h1>` (heading 1) tags as red



# Basic CSS Syntax

- CSS Syntax

- ▣ selector { property: value; }



- **Selector:** The HTML tag to style (i.e. `<p>`)

- **Declaration:** The properties and values

- ▣ **Property:** The type of style to apply (i.e. `color`)

- ▣ **Value:** The value to assign to the property (i.e. `blue`)

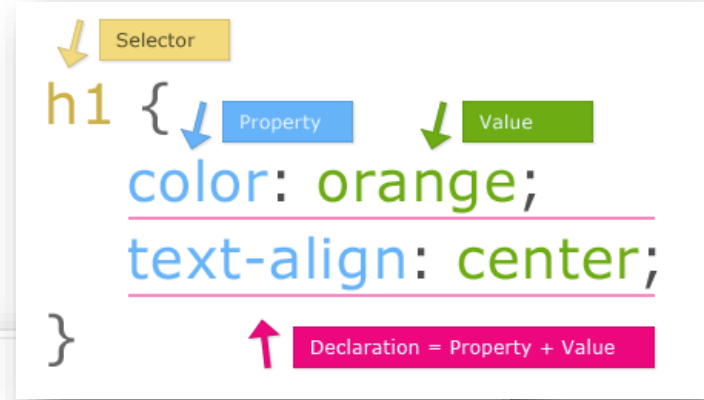
# Style Sheet Syntax

66

- This rule styles the `<h1>` tag in orange and centered
- Result:

**This is a Default Heading**

**This is an Orange Heading**



# Style Sheet Syntax (2)

67

*selector*

*property*

*value*

*rule*

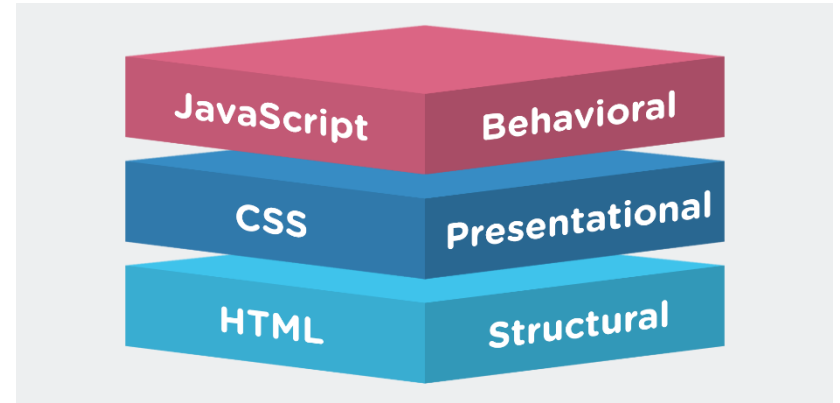
```
<style type="text/css">
{
  body {
    background-color: #000000;
  }
  h1 {
    font-family: Georgia, "Times New Roman", Times, serif;
    font-size: 32px;
    color: #3099D3;
    text-align: center;
  }
}</style>
```

The diagram illustrates the components of a CSS rule. A horizontal line spans the width of the code block. Four arrows point from labels above the line to specific parts of the code: 'selector' points to 'body', 'property' points to 'background-color', 'value' points to '#000000', and 'rule' points to the closing curly brace of the 'body' rule. A large curly brace on the left groups the 'body' rule and the 'h1' rule together.

# Web Page Components

68

- Content and structure
  - HTML
- Presentation
  - CSS
- Behavior
  - **JavaScript**



# What is JavaScript?

69

- **Purpose:** JavaScript allows a user to **interact** with a web page
- JavaScript is a programming language that allows web pages to do complex things
  - ▣ Automatically updating content, playing media, showing the current time, etc.

# What is JavaScript? (2)

70

- Almost anything a web page does besides displaying static content will use JavaScript



# Web Languages Summary

71

- The main web languages are HTML, CSS, and JavaScript
  - ▣ display content to the user
  - ▣ allow the user to interact with web data
- HTML provides the **content** and **structure** of a web page
  - ▣ HTML uses tags that a browser interprets
- CSS defines the **look** and **feel** part of a web page
  - ▣ Adds **styles** to HTML tags
- JavaScript controls the **behavior** of web pages
  - ▣ Allows users to interact with a web page

# Attribution Notice

This presentation was assembled using information found online and referenced materials. Attribution is provided of borrowed materials if the author is clearly identified. Unreferenced materials are common knowledge or commonly found online without knowing the original author.