

# CS2204 Fundamentals of Internet Applications Development

## Lecture 1: Introduction and Internet

*Computer Science, City University of Hong Kong*

*Semester B 2024-25*

# Agenda

**Teaching patterns, course structure, and assessment**

**Terms and concepts in computer network**

**Computer communication systems**

**Internet applications**

**HTML – Part 1**

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**Teaching patterns, course structure, and assessment**

Terms and concepts in computer network

Computer communication systems

Internet applications

HTML – Part 1

# Teaching Patterns

## Lectures (3 hours per week)

- Explain the terminologies, concepts, methodologies...
- Every Thurs 4:00 pm – 6:50 pm
- Location: LT-10

## Labs (1 hour per week)

- Hands-on *programming* activities and discovery exercises
- **8 Labs** starting from **Week 2**
- Please check your registered session for schedule information
- Location: YEUNG 7520

# Course Materials

All materials related to this course will be posted on the Canvas course page  
<https://canvas.cityu.edu.hk/courses/62237>

Please DO NOT distribute the course materials

It is **your own responsibility** to check for updated information and announcements on Canvas course page

## Course Aims

This course aims to provide the fundamental skills in programming Internet applications. Upon completion, students should be able to (1) be familiar with the development of WEB programming; (2) write web pages with the Extensible HyperText Markup Language (XHTML) and Cascading Style Sheet (CSS); (3) write dynamic web pages using scripting; and (4) write a basic client-side web-based application.

## Course Intended Learning Outcomes

1. Be familiar with the development of WEB programming
2. Write web pages with the Extensible HyperText Markup Language (XHTML) and Cascading Style Sheet (CSS)
3. Write dynamic web pages using scripting
4. Write a basic client-side web-based application

## Assessment Patterns

- Coursework (50%)
  - [Post-lab quiz](#) (7%)
  - Two assignments (28%)
  - Mid-term (15%)
- Examination (50%)
- Bonus points for class participation (up to 2%)

Passing criteria:

- at least 30% of the maximum mark for the examination must be obtained; and
- at least 35% of the maximum mark for the overall course grade must be obtained

## Lecture Information

Time: 16:00 pm - 18:50 pm on Thurs

Location: LT-10

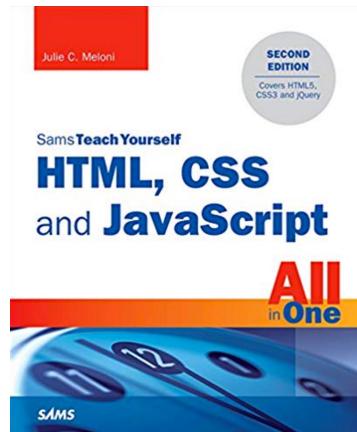
11 lectures + one course review (No lecture on Jan 30th)

# Additional course materials

Textbook (optional)

Reference books

- **HTML, CSS and JavaScript All in One**, 2nd Ed., Julie C. Meloni, Sams Publishing, ISBN: 9780672337147 (paper), e-book available
- **Javascript & jQuery – interactive front-end web development**, 1st Ed., Jon Duckett, Wiley, ISBN: 978-1-118-53164-8 (paper back)



# Communication Channel

Announcement and Email via **Canvas**. (if you send an email directly to the instructor you may not receive a response as fast as Canvas)

The screenshot shows the Canvas course interface for '202502CS2204'. The left sidebar is visible with various navigation links: Account, Dashboard, Courses, Calendar, **Inbox** (highlighted with a green box), History, and Help. The main content area shows an announcement titled 'No Lab in Week 1' posted by 'Yuhan LUO AUTHOR | TEACHER' on Jan 7 3:39pm. The announcement text reads:

Hi all,  
Welcome to CS2204 Fundamentals of Internet Applications Dev!  
Please note that our lecture is scheduled every Thurs (starting next week, Jan 16th) at LT-10 from 16:00 pm - 18:50 pm. We have 8 labs throughout the semester, and there is **NO Lab in Week 1**.  
According to university policy, all lectures and labs will be conducted face-to-face. Therefore, we will not provide Zoom recordings or online sessions unless there is extreme weather or individual students have special reasons with solid justification (and reach out in advance of the scheduled lecture/lab sessions).  
You can take a look at the course overview on the [home page](#) and find the lecture and lab under the [lecture](#) and [lab](#) page. The slides handout will be uploaded at least one day before the lecture.

See you next week!

This topic is closed for comments.

# Course Schedule

Mid-term is tentatively set on Mar 13<sup>th</sup> afternoon in LT-10, the same time as our regular lecture time

If you cannot make the mid-term, you should follow the university guideline to submit a mitigation request with validated proof:

[https://www.cityu.edu.hk/arro/asmt/mitg\\_main.htm](https://www.cityu.edu.hk/arro/asmt/mitg_main.htm)

## Lecture Schedule

Date (Week)	Topic
Jan. 16 (Week 01)	Lec 01 Introduction & HTML Part 1
Jan. 23 (Week 02)	Lec 02 HTML - Part 2
Jan. 30 (Week 03)	No Lecture - Public Holiday
Feb. 6	Lec 03 HTML - Part 3 & CSS - Part 1
Feb. 13 (Week 04)	Lec 04 CSS - Part 2
Feb. 20 (Week 05)	Lec 05 CSS - Part 3
Feb. 27 (Week 06)	Lec 06 JavaScript - Part 1
Mar. 6 (Week 07)	Lec 07 JavaScript - Part 2
Mar. 13 (Week 08)	Mid-term
Mar. 20 (Week 09)	Lec 08 JavaScript - Part 3
Mar. 27 (Week 10)	Lec 09 JavaScript - Part 4
Apr. 3 (Week 11)	Lec 09 JavaScript - Part 4
Apr. 10 (Week 12)	Lec 10 JavaScript - Part 5
Apr. 17 (Week 13)	Course Review

## Lab Schedule

Week	Date (For Mon sessions)	Lab	Topic
Week 1	Jan 13rd	No Lab	
Week 2	Jan 20th	Lab 01	Telnet/SSH/SFTP Client
Week 3	Jan 27th	No Lab	
Week 4	Feb 10th	Lab 02	Visual Studio Code & HTML Basics: Tags and Forms
Week 5	Feb 17th	Lab 03	HTML: Forms and Video
Week 6	Feb 24th	Lab 04	CSS Basics & Personal Website
Week 7	Mar 3rd	Lab 05	CSS Selector and Layout
Week 8	Mar 10th	Lab 06	CSS page partition and responsive design
Week 9	Mar 17th	Lab 07	JavaScript Basics
Week 10	Mar 24th	Lab 08	JavaScript Event Handlers

# Assessment

## **Course work (50%)**

- Post-lab quiz (7%)
- Two assignments (23%)
- Mid-term (20%)

## **Examination (50%)**

**Bonus points** for class participation (up to 2%)

## **Passing Criteria**

At least **30%** of the maximum mark for the **examination** must be obtained

At least **35%** of the maximum mark for the **overall course grade** must be obtained

# Assessment: post-lab quiz (1)

There are 8 post-lab quizzes in total, but **the first one is for practice only**, and is NOT counted into the final grades. Thus, the post-lab quizzes take **7%** of the final grade (1% per quiz)

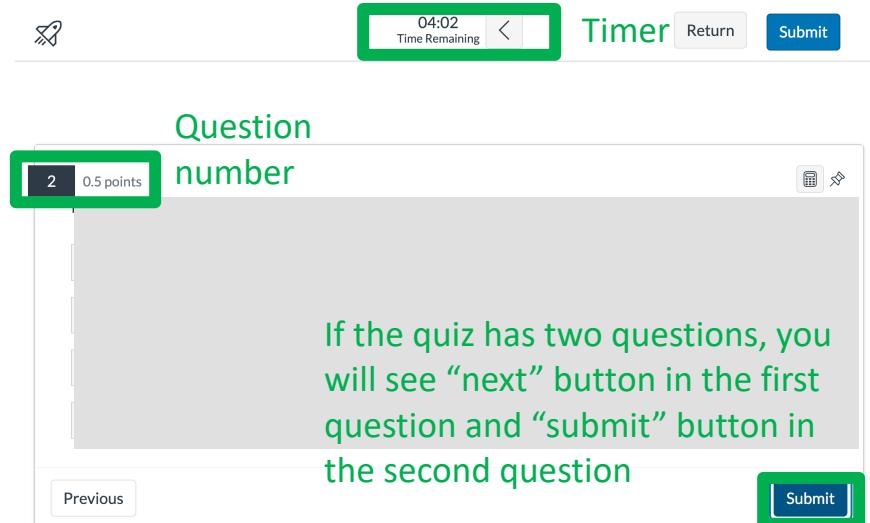
- The quiz will be available on the day of the last lab session of that week (Fri, 7PM) and is **due in one week** (next Fri, 23:59 PM)
- Each quiz has 1 – 2 questions, which are designed to be relatively simple as long as you complete the lab tasks

The screenshot shows the Canvas LMS interface. On the left is a vertical sidebar with icons for Account, Dashboard, Courses, Calendar, Inbox, History, Help, Announcements, Assignments, Discussions, Grades, Pages, Files, Syllabus, and Quizzes. The Quizzes icon is highlighted with a green box. To the right of the sidebar is the main content area. At the top, it says "202502CS2204 > Quizzes". Below that is a search bar labeled "Search for Quiz". A section titled "Assignment Quizzes" is expanded, showing a single item: "Post-Lab Quiz 1". Below the quiz title, it says "Not available until Jan 24 at 7pm 1 pt".

# Assessment: post-lab quiz (2)

To prevent academic dishonesty in post-lab quizzes, we implemented the following rules:

- Once you start a quiz, you have limited time (5 – 10 mins) to complete it, depending on the difficulty of that quiz
- Every student has only **ONE** chance to complete each quiz
- After submitting your answers, the system will automatically show your grade, but not your original responses and correct answers (to prevent answer sharing with others)



For questions with high error rates, we will discuss them in the next lecture

# Assessment: Assignments

There are two assignments throughout the semester, which take up 23% of the final grade. They are interconnected and focus on building an interactive website for Disneyland Promotion with HTML, CSS, and JavaScript.

Assignment 1 (10%): Static website layout with HTML and CSS, available in Week 5 and due in Week 7.

Assignment 2 (13%): Interactive effects with JavaScript, available in Week 10 and due in Week 13.

The screenshot shows the official website for Hong Kong Disneyland. At the top, the Disney logo is displayed with "HONG KONG" above "DisneyLAND". Below it, the text "DisneyLand" is written. A "Welcome" message is visible. On the left side, there is contact information: Address (Hong Kong Disneyland Resort, Penny's Bay, Lantau Island, Hong Kong), Tel (+852 1-830-830), Business Hours (10:30 AM to 8:30 PM), Brief Introduction (describing the park as a magical kingdom inspired by fairy-tale dreams and featuring 7 lands - Adventureland, Grizzly Gulch, Mystic Point, Toy Story Land, Fantasyland, Tomorrowland and Main Street, USA - filled with beauty, excitement and Disney Characters), and Location (a map of the park grounds). A "BOOK TICKETS" button is located at the bottom of this sidebar. On the right side, there is a promotional banner for "DISNEY PREMIER ACCESS & 8-ATTRACTIIONS WITH 1 SHOW, STARTING FROM HK \$379". Below the banner is a photograph of a man standing next to large, colorful spherical structures resembling planets or celestial bodies. A quote at the bottom of the photo reads: "我希望發明出讓人永遠開心的方法" and "I wish I could create happiness for everyone." At the very bottom, there is a "Booking information:" form with fields for Date (dd/mm/yyyy), Time (8:00-10:00am), No.of Visitors, a "Check Availability" button, and a "Reset" button.

# Assessment: Bonus points (2%)

**The bonus points are designed to encourage active class participation**

- During each lecture, the instructor will ask questions about the course materials
- Raise your hand to answer the questions
- If your answer is **correct** (or close to correct), you will receive **0.5 bonus points**
- For students who answered a question correctly, go to the podium during the break to note down your name
- Each student can earn **up to 0.5 bonus points per lecture** (you may answer multiple questions, but the bonus points will not be added together)
- Each student can earn **up to 2 bonus points in the semester** (correctly answer questions in four lectures)

# Key to success in this course (1)

## Practice by yourself

- Design and write the code on your own
- Discuss the problems with any other people, but do not copy and paste their code

### University requirement on academic honesty.

– Violations of academic honesty are regarded as serious offences in the University. Acts such as plagiarism (and fabrication of research findings) can lead to disciplinary action. Most commonly the penalty is failure in a course, but in the most serious cases expulsion from the University and debarment from re-admission may occur.

# Key to success in this course (2)

## Be proactive

- Study any resources e.g., materials on the internet
- Ask questions in class and lab
- Seek help from multiple sources (refer to the “help seeking” section on Canvas)
  - **Student helper**
  - **Canvas discussion board (highly encouraged)**
  - CS programming clinics
  - Email the instructor (via canvas)

## Help-Seeking

**Student Helper:** BUDIANTO Audrey Gandyna (abudianto2-c@my.cityu.edu.hk)

We will also arrange group Zoom Q&A sessions as needed.

Before you reach out for help, you are strongly encouraged to:

- Ask the professors/lab tutors/teaching assistants during class (lecture/lab) if you have any questions
- Post a message on the [discussion board](#) (Discussions on the left menu on the Canvas course page)
- Seek help from our dedicated CS student helpers at the [the programming clinic](#) at scheduled time slots
- Email the course leader if you have specific concerns/feedback/suggestions.

Course Leader: Prof. Yuhua Luo (yuhuanluo@cityu.edu.hk)

# Key to success in this course (3)

## Do not afraid of breaking things

- Programming skills are developed over time
- You need to make mistakes to grow better
- Students in this course are from different backgrounds, so your prior knowledge in programming may differ from others. There is no need to compete with your peers, but instead, focus on improving yourself

# Notes on academic honesty

## Plagiarism

- **Punishment** ranges from **warning** to course **failure**
- May cause you be forced out of CityU

## How to prevent?

- In plagiarism cases, both the **giver** and **copier** receive punishments
- Protect your code (do not share it with others or via online platforms)

## As instructors

- We have the responsibility to report academic dishonesty cases so as not to compromise the quality of education
- We take suspected plagiarism cases very seriously.

# Main topics in this course

## Internet & Internet applications

### Web technologies:

- HTML5 (Hypertext Markup Language)
- CSS (Cascade Style Sheet)
- JavaScript



# Agenda

Teaching patterns, course structure, and assessment

**Terms and concepts in computer network**

Computer communication systems

Internet applications

HTML – Part 1

# Computer Networks

**Computer network:** a communication system that connects two or more computers so that they can exchange information and share resources

## Node

Any device that is connected to the network

## Client

A node that **requests resources** available from other nodes

## Server

A node that **shares resources** with other devices

## Host

A node that communicates with other devices on the network, which **can act as a client, server, or both**

## Directory Server

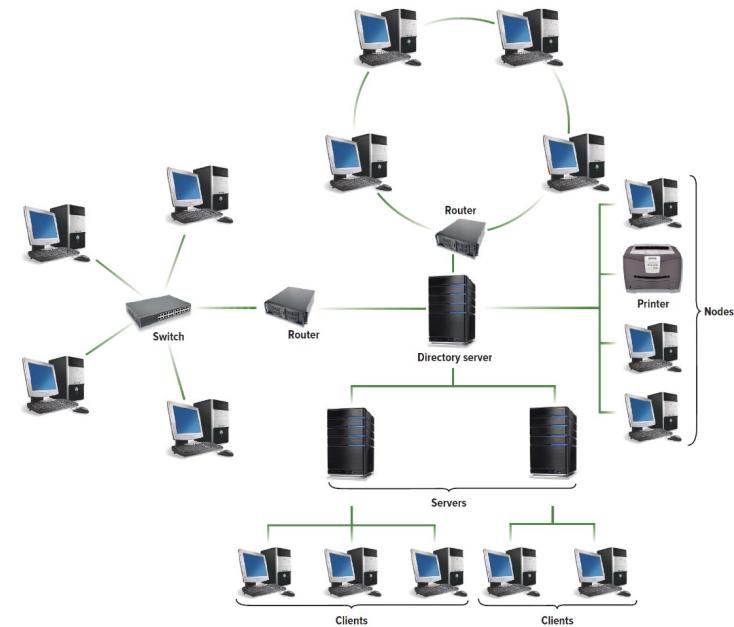
A specialized server that manages resources, such as user account, for an **entire** network

## Router

A node that forwards or routes data packets from **one network** to their destination in **another network**

## Switch

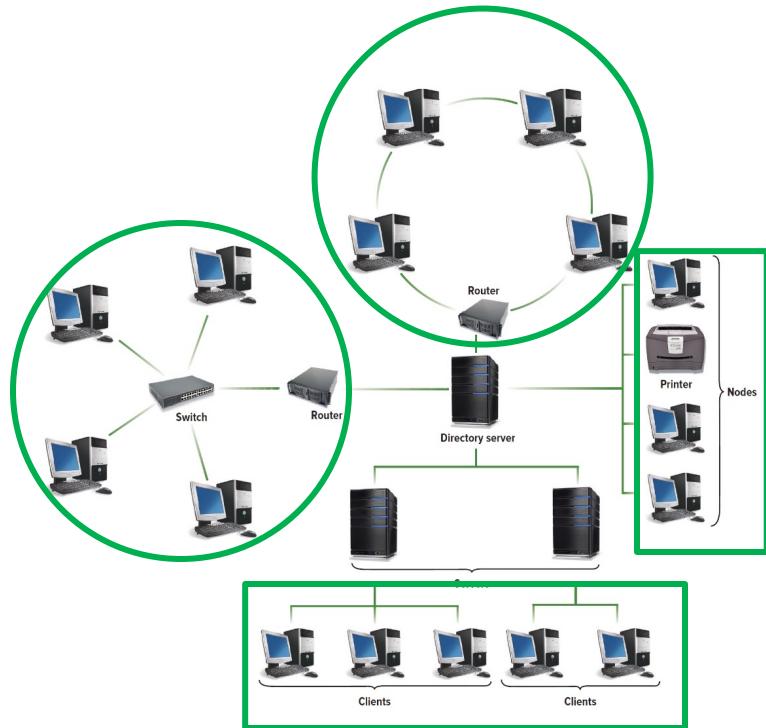
Central node that coordinates the flow of data by sending messages **directly between sender and receiver node**



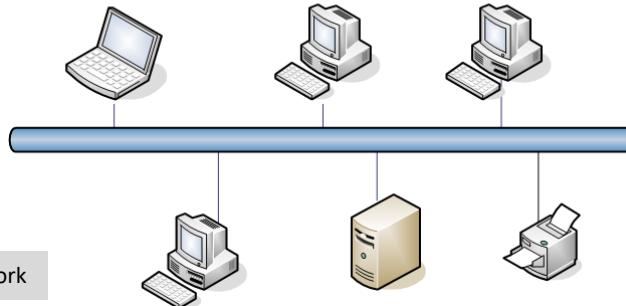
# Network Topologies

The physical or logical layout of a computer network

It defines how devices, such as computers, servers, switches, routers, and other network components, are connected to each other and how data flows within the network

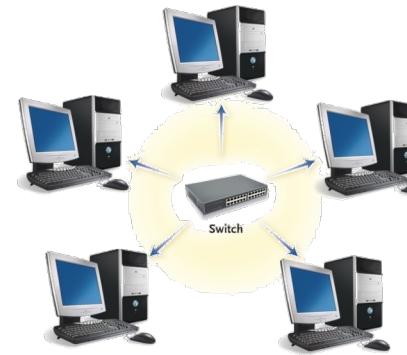


# Network Topologies (1)



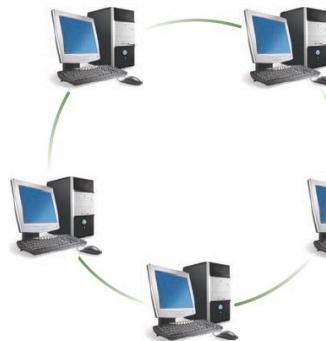
Bus Network

Each device is connected to a common cable called a bus or backbone, and all communications travel along the bus.



Star Network

Each device is connected directly to a central network switch. Whenever a node sends a message, it is routed to the switch first, which then passes the message along to the intended recipient.



Ring Network

Each device is connected to two other devices. When a message is sent, it is passed around the ring until it reaches the intended destination.

# Network Topologies (2)



Tree Network (or Hierarchical Network)

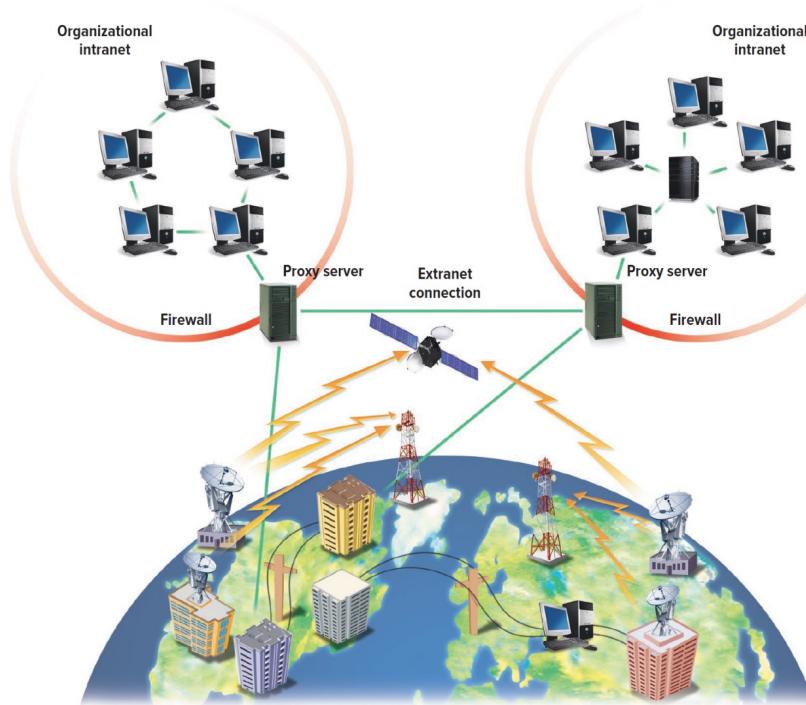
Each device is connected to a central node, either directly or through one or more other devices. The central node is connected to two or more subordinate nodes that in turn are connected to other subordinate nodes, and so forth, forming a treelike structure.



Mesh Network

Each node has more than one connection to other nodes. If a path between two nodes is somehow disrupted, data can be automatically rerouted around the failure using another path.

# Organizational Networks



## Intranet

A private network within an organization that resembles the Internet

## Extranet

A private network that connects more than one organization.

Use Internet technologies to allow suppliers and others limited access to their networks.

# Network Strategies

How information and resource are shared among the hosts in a network

**Client/server network**



Individual computers (client) are connected to a **central computer** (server), so the client can access programs or files stored on the server, sharing the **processing or storage power** of the server

**Peer-to-peer network**



Every computer, called peer, is connected directly or indirectly to other peers. Each computer controls its **own** resources, and can access resources or provide resources to other computers

# Network Strategies

How information and resource are shared among the hosts in a network

**Client/server network**



**Peer-to-peer network**



- Clients **request** for services whereas servers **provide** services
- Server **controls** what the clients can access
- Server and client computers install **different** software

Each computer has the **similar** type of software that support the sharing

# Network Strategies

	<b>Client/Server Network</b>	<b>Peer-to-Peer (P2P) network</b>
Description	<ul style="list-style-type: none"><li>• Uses central servers to coordinate and supply services to other nodes on the network</li><li>• Server nodes coordinate and supply specialized services, and clients request the services</li></ul>	Nodes have equal authority and can act as both clients and servers
Advantage	<ul style="list-style-type: none"><li>• Ability to handle very large networks efficiently</li><li>• Availability of powerful network management software to monitor and control network activities</li></ul>	Easy and inexpensive (often free) to set up and use
Disadvantage	Cost of installation and maintenance	Lack of security controls or other common management functions

# Network Types

Network coverage, area, and scale differ depending on their purposes

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Type	Description
LAN	Local area network; located within close proximity
Home	Local area network for home and apartment use; typically wireless
WLAN	Wireless local area network; all communication passes through access point
PAN	Personal area network; connects digital devices, such as PDAs
MAN	Metropolitan area network; typically spans cities with coverage up to 100 miles
WAN	Wide area network for countrywide or worldwide coverage

# Agenda

Teaching patterns, course structure, and assessment

Terms and concepts in computer network

**Computer communication systems**

Internet applications

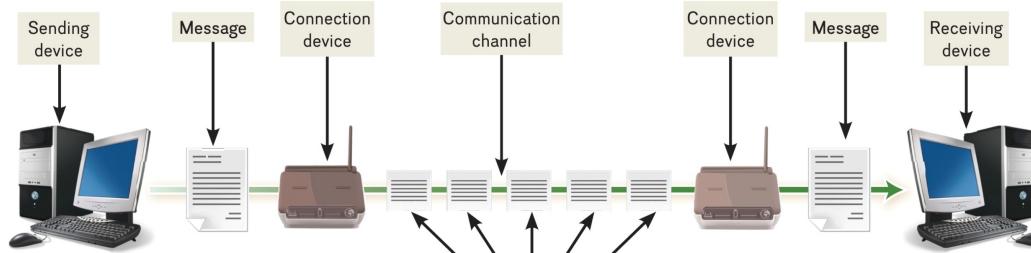
HTML – Part 1

# Communication System

A collection of interconnected devices and networks that enables **data transmission** from one location to another

**Sending and Receiving Device** (client or server)  
They originate (send) as well as accept (receive) messages (data) with each other

**Communication Channel**  
Actual connecting or transmission medium that carries the message through physical wire or cable or wireless



**Connection Device** (switch or router)  
An interface between the sending and receiving devices and the communication channel, which converts messages into a form that can travel across the communication channel

**Data Transmission Specifications** (protocols)  
Rules and procedures that coordinate the sending and receiving devices by defining how the message will be sent across the communication channel

# Sending and Receiving Devices

Originate (send) or accept (receive) the transmission of data, instructions and information

Examples: computers, tablets, mobile devices (e.g., smartphones), midrange servers.

Applications: email, message, video conferencing



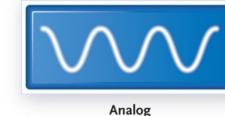
# Connection Devices and signal conversion

Electronic waves collected from the real world are **analog signals which are continuous**, but computers represent data only with **digital signals which are discrete**

**So how do we convert between analog and digital signals?**

**Modem:** modulator-demodulator

- Modulation: the process of **converting** from **digital** to **analog**
- Demodulation: the process of converting from **analog** to **digital**



Digital  
Subscriber Line

# Communication Channels

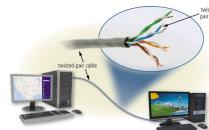
**Communication channel** actually carries the data from one device to another

## Physical Connection

Ethernet Cable



Twisted-pair cable



Coaxial Cable



Fiber-optic Cable



## Wireless Connection

- Bluetooth
- Wi-Fi (Wireless Fidelity)

- Microwave

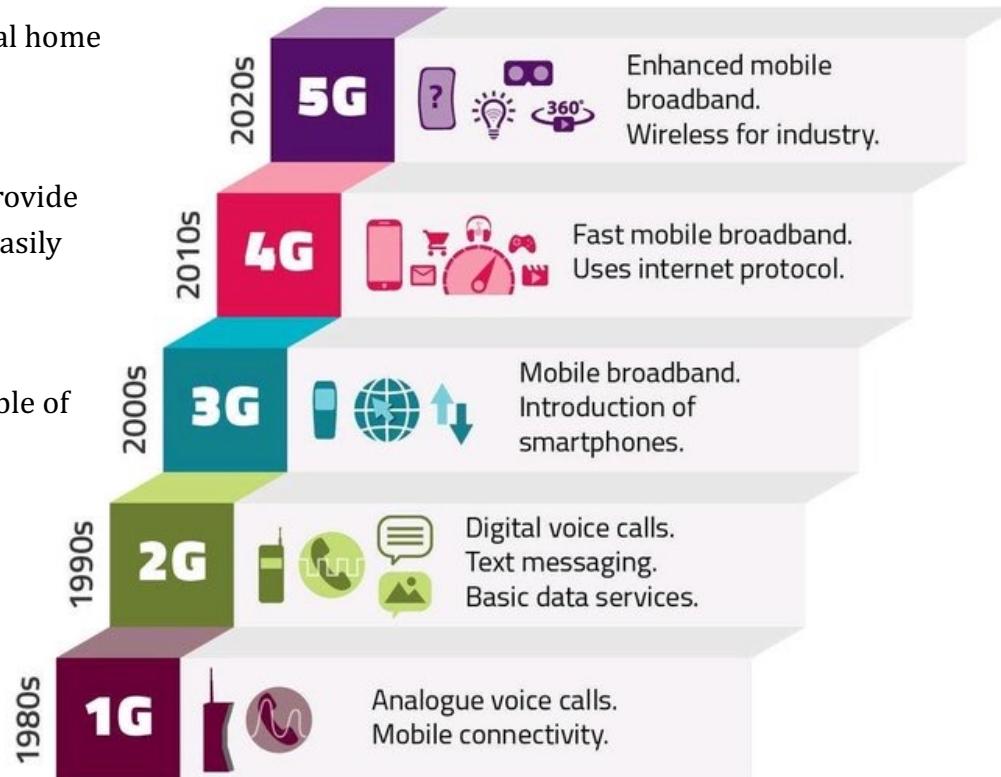
- WiMax (Worldwide  
Access)

- Cellular (often embedded in  
mobile devices)
- Satellite



# Generations of Cellular Networks

- The most recent generation, with speeds that rival home Internet connections
- Use LTE (Long Term Evolution) connections to provide faster Internet access, allowing smartphones to easily stream videos and music
- Improve data speeds and provided services capable of effective connectivity to the Internet
- Use digital radio signals for cellular calls
- Use analog radio signals to provide analog voice transmission service



# Data Transmission

Transfer of data from one device to another

Measurements of the transmission efficiency:

- **Transfer rate (data rate):** the **speed** of data transmission
- **Bandwidth:** the **capacity** of the communication channel (the maximum amount of data that can be transmitted over given a time period)
- The transfer rate may be lower than the bandwidth, while they can be both represented in Mbps, Gbps, or Tbps ...

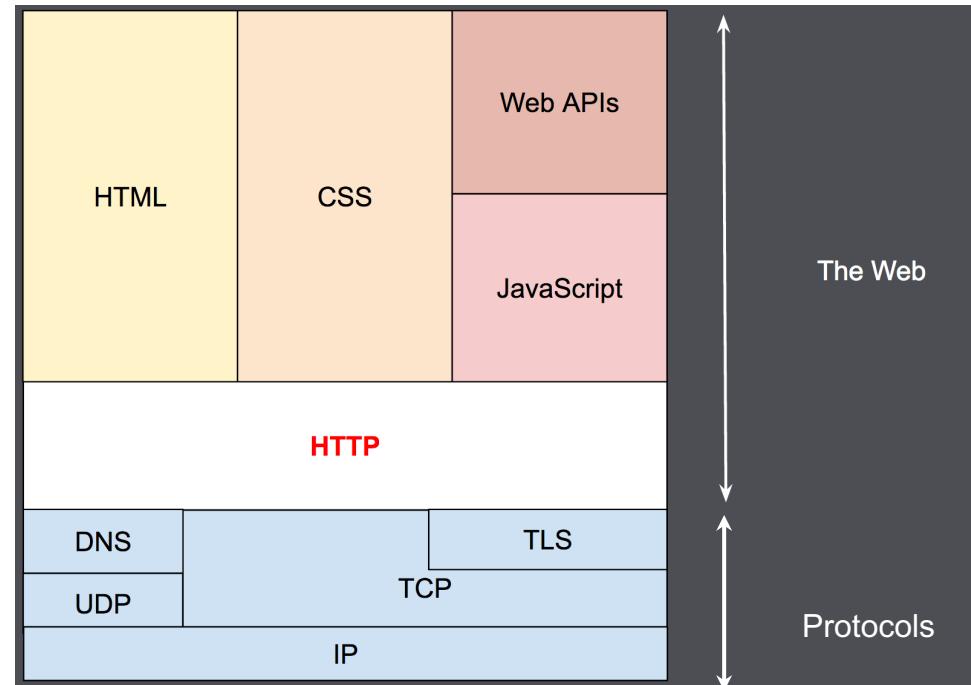
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Standard	Maximum speed
802.11g	54 Mbps
802.11n	600 Mbps
802.11ac	2.6 Gbps
802.11ax	10.5 Gbps

# Data Transmission: Protocols and web infrastructure

**Protocols** are data transmission specifications: **rules** for exchanging data between devices in the computer network

- HTTP/HTTPS
- TCP/IP
- FTP
- SSH
- UDP
- ...

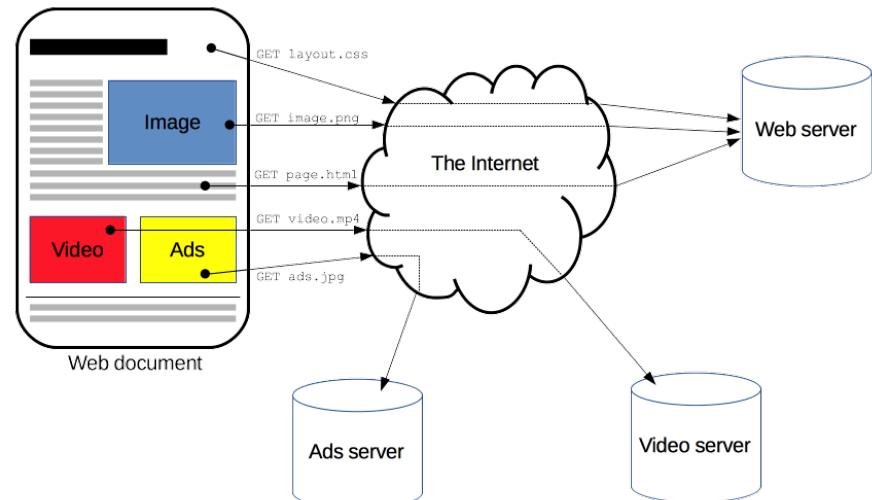
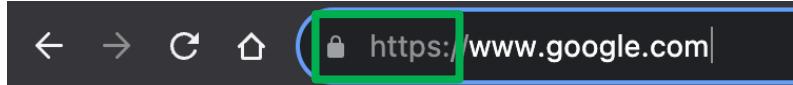


# Protocol: HTTP

## HTTP: HyperText Transfer Protocol

- A client-server protocol
- Fetches resources such as HTML documents (but has nothing do to with HTML itself)
- Specifies the **command** and **syntax** for transmitting web pages and file

HTTPS is a **secure** version of HTTP in which the data transmission is encrypted and needs server authentication



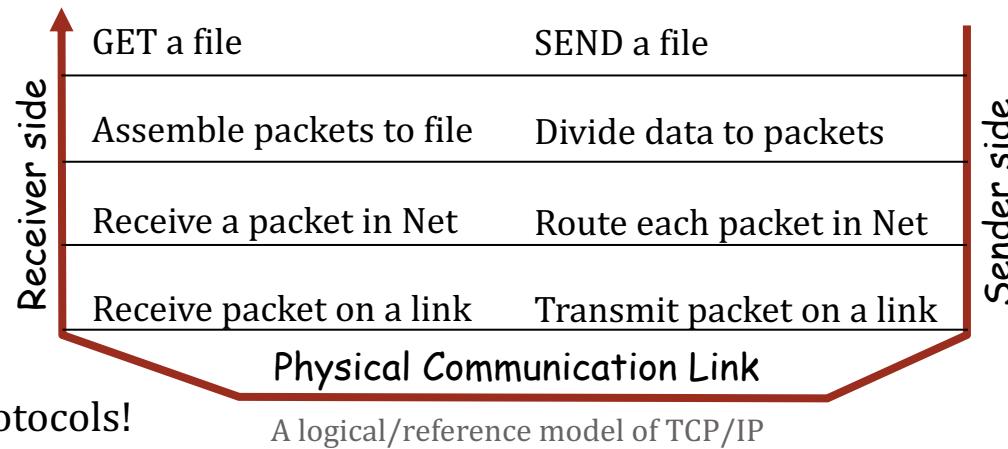
# TCP/IP Model

The fundamental suite in internet communication

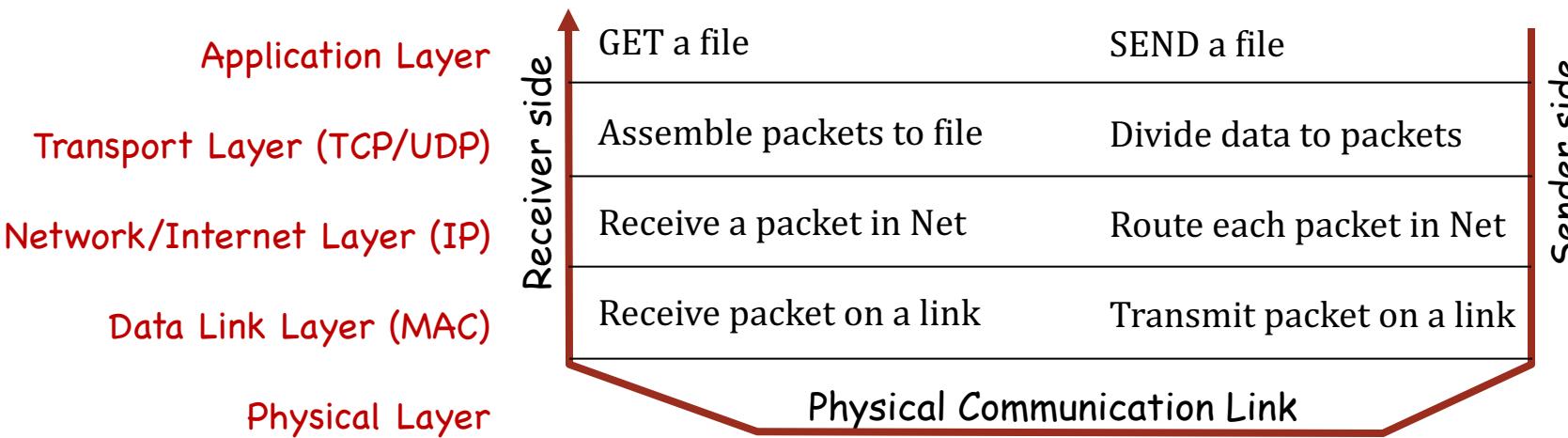
Enabling **reliable** data transmission by dividing the data into packets at the sender's end and the same packets have to be recombined at the receiver's end to form the same data

Note that TCP and IP are two different protocols!

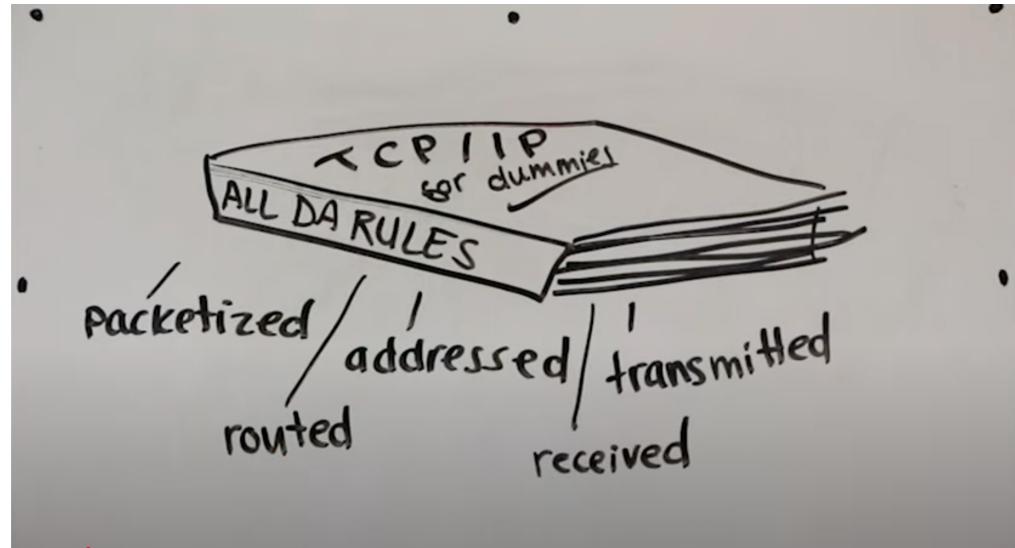
- **IP (Internet Protocol):** finds the location (address) of the destination
- **TCP (Transmission Control Protocol):** send and receive the data



# TCP/IP Model Explained



# TCP/IP Model Further Explained



Advantages?

<https://youtu.be/KEWe-5Bk3Q0?si=HvBIRfkvl016c0hA>

# How does IP protocol find the destination address?

**IP address** (Internet Protocol address): a sequence of numbers that **uniquely** identifies each computer or device connected to the Internet



The Internet uses 2 IP addressing schemes:

- **IPv4:** the original and most commonly used scheme, but are being run out now. e.g., 74.125.224.72 (4 numbers ranging from 0 to 255 separated by ".")
- **IPv6:** new addressing scheme that can support more addresses. e.g., 2001:4860:4db0:0000:0000:0000:8844 (8 groups of 4-digit hexadecimal numbers separated by ":", where leading 0s in each group can be simplified with "::" )

The Internet relies on an **addressing system** much like the postal service to send data to a computer or device at a specific destination

# Domain Name

It is **difficult** for users to remember an IP address that is required to identify the computer in order to access information such as a webpage

As a result, a **domain name** is introduced which is a more human readable text-based name that allows the user to specify the location to be connected to e.g., [www.cityu.edu.hk](http://www.cityu.edu.hk) (144.214.4.184)

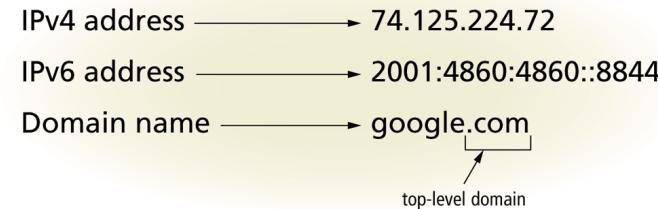
A **DNS** (**Domain Name System**) is required to translate the domain name into its associated IP address



# Domain Name System

How are domain names related to IP addresses?

- The correspondence between IP addresses and domain names are stored in a large distributed database
- Computers that host parts of the DNS database are called *domain name servers* (DNS), which are responsible for translating **human-readable domain names** into **numerical IP addresses**
- DNS servers are organized in a **tree** structure following the layers of domain names (e.g., DNS servers for “cs.cityu.edu.hk”, “cityu.edu.hk”, ...)



# Top-Level Domain Names

Top level domains appear in the **last part (web suffix)** of domain names and may indicate the **type** or **country** of the site

Domain	Description
biz	Unrestricted use; usually for commercial businesses
com	Unrestricted use; usually for commercial businesses
edu	Restricted to North American educational institutions
gov	Restricted to U.S. government agencies
info	Unrestricted use
int	Restricted to organizations established by international treaties
mil	Restricted to U.S. military agencies
net	Unrestricted use; traditionally for Internet administrative organizations
org	Unrestricted use; traditionally for professional and nonprofit organizations

# Universal Resource Locator (URL)

How to locate a resource (e.g., a file) on the Internet?



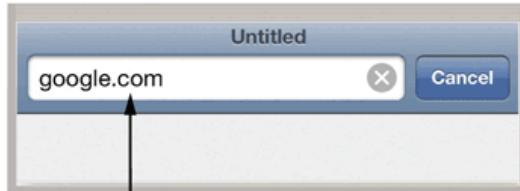
- The browser breaks the URL into several parts and asks a DNS server to translate the **host+domain** name to IP address
- The browser then uses the **IP address** to set up a **TCP connection** to the destination server
- Using **HTTP protocol**, the browser sends a request to the connected server asking for the HTML file
- The server returns the corresponding HTML file to the browser
- The browser reads the file, interprets the HTML tags and displays the page

# Browsing a Webpage

## How a Browser Displays a Requested Webpage

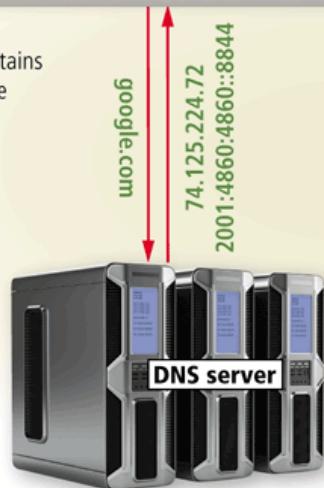
### Step 1

Run the browser and enter the web address in the browser's address bar.



### Step 2

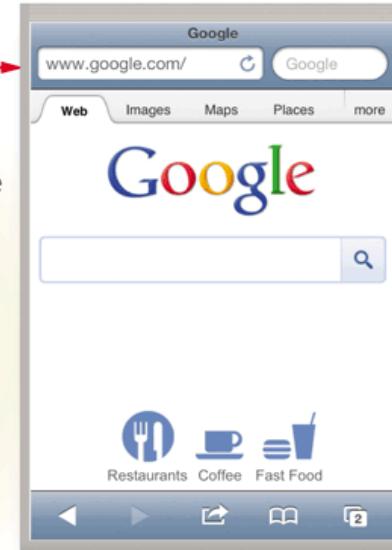
The browser communicates with a DNS server maintained by your ISP or another provider. The DNS server looks up the domain name portion of the web address, finds its associated IP address, and then sends the IP address to your computer or mobile device.



74.125.224.72  
2001:4860:4860::8844

### Step 3

The browser uses the IP address to contact the web server at the specified IP address to request the content of the desired webpage. The web server fulfills the user's request by sending the desired content to the user's browser, which formats the page for display on the screen.



ISP: Internet Service Provider – a business that provides individuals and organizations access to the Internet

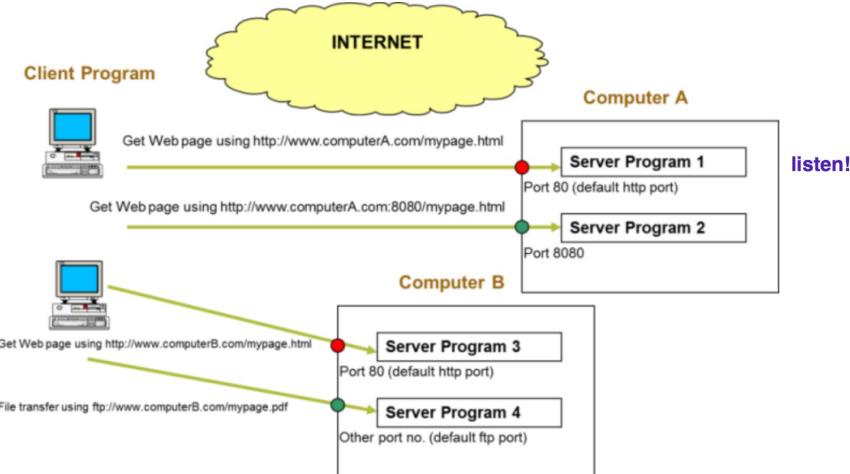
# Port Number

The domain name in a URL only points to a host (computer), but inside there could be **more than one server programs** running to provide service, e.g., run two Web servers in one computer

**Port number** are used to differentiate services by {IP address: port number} .

192.168.0.1:80

Usually a **default port number** has been allocated for common applications or protocols



Port number	Service
20	File Transfer Protocol(FTP)
23	Telnet
25	Simple Mail Transfer Protocol(SMTP)
53	Domain Name System(DNS)
80	Hypertext Transfer Protocol(HTTP)
161	Simple Network Management Protocol (SNMP)
443	HTTP Secure(HTTPS)

# From URL to Website



<https://www.youtube.com/watch?v=2ZUxoi7YNgs>

# Agenda

Teaching patterns, course structure, and assessment

Terms and concepts in computer network

Computer communication systems

**Internet applications**

HTML – Part 1

# Webpage, website, and web server

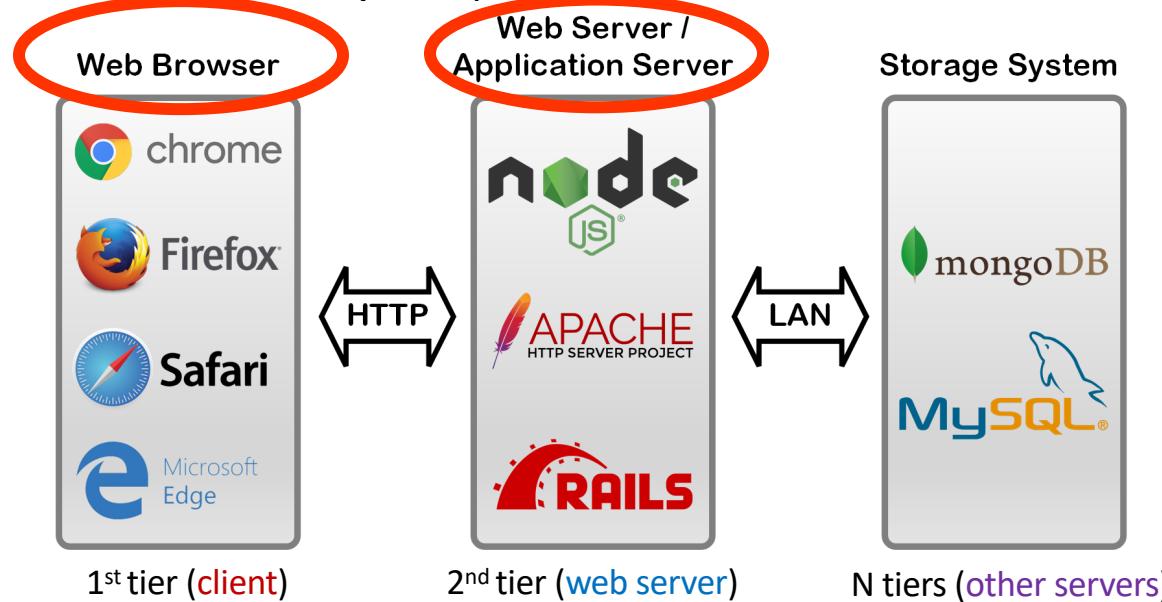
The World Wide Web (WWW), or web, consists of a worldwide collection of electronic documents (webpages)

- **Webpage:** a **document** displayed on a browser, which can contain text, graphics, animation, audio and video
- **Website:** a **collection of related webpages** and associated items, such as documents and photos, stored on a web server
- **Web server:** a **computer** that delivers requested webpages to a computer or mobile devices



# Architecture of Web Applications

Full stack architecture (**N-tier** System)



Programming languages used

- HTML, CSS, Javascript, etc.

# Browser

**Browsers** are programs that provide access to **web resources** with an interface (a home page is the first page that a website displays)



# E-mail

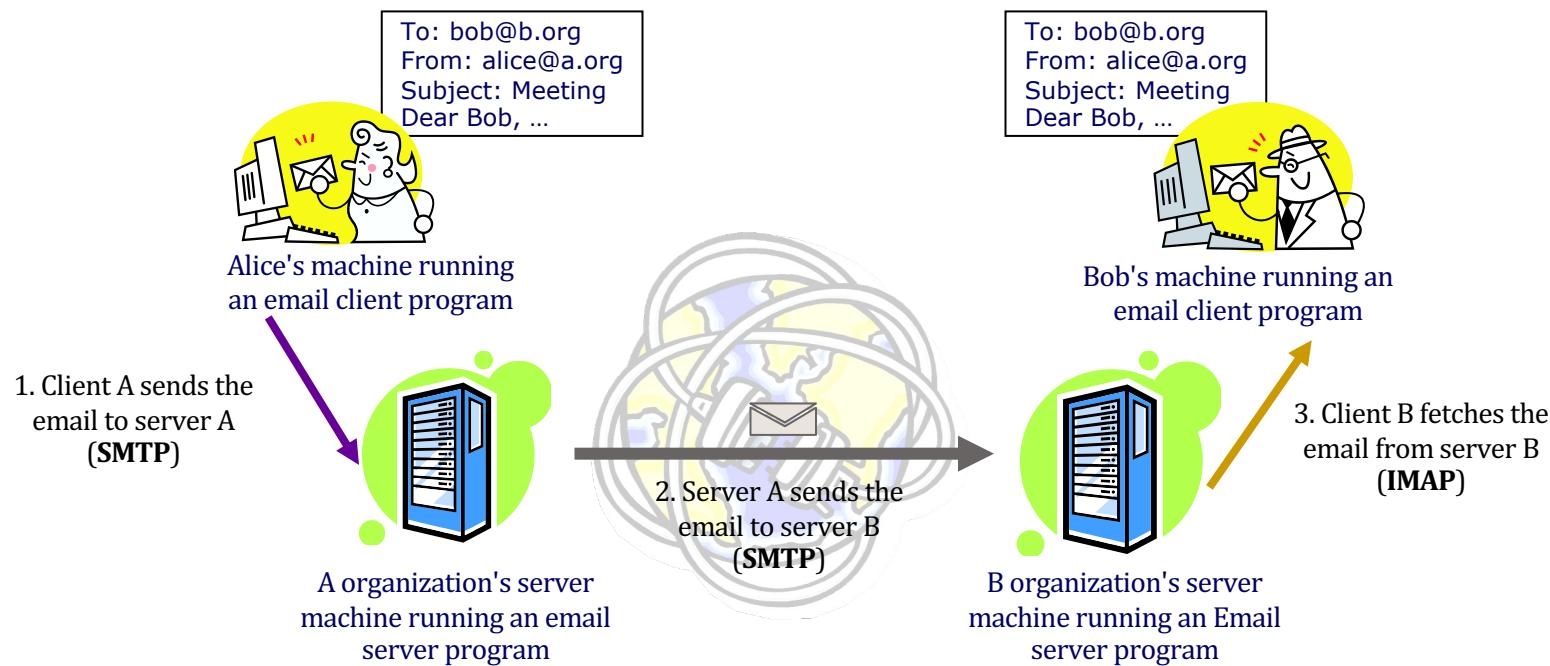
E-mail or electronic mail is the transmission of electronic messages over the Internet



1. Client-based e-mail systems
  - Require a special program known as e-mail client to be run from your computer, e.g., Microsoft Outlook
2. Web-based e-mail systems
  - Use browser to connect to e-mail service provider, e.g., Gmail

Sending and receiving Email also follows specific data transmission protocol, such as **SMTP** (Simple Mail Transfer Protocol), **IMAP** (Internet Message Access Protocol), and **POP** (Post Office Protocol).

# Mail transfer



# Social Networking

Fastest-growing and most significant Web 2.0 applications

## Social networking sites

- focus on connecting people and organizations that share a common interest or activity
- typically provide a wide array of tools that facilitate meeting, communicating, and sharing



Organization	Site
Facebook	<a href="http://www.facebook.com">www.facebook.com</a>
LinkedIn	<a href="http://www.linkedin.com">www.linkedin.com</a>
Instagram	<a href="http://www.instagram.com">www.instagram.com</a>
Pinterest	<a href="http://www.pinterest.com">www.pinterest.com</a>
Tumblr	<a href="http://www.tumblr.com">www.tumblr.com</a>
TikTok	<a href="http://www.tiktok.com">www.tiktok.com</a>
Snapchat	<a href="http://www.snapchat.com">www.snapchat.com</a>

# Web Generations (1)

## Web 1.0 (1996 - 2004)

- Focused on linking existing information
- Search programs were created, e.g., Google

## Web 2.0 (2004 - 2016)

- Supported more dynamic content creation and social interaction, e.g., Facebook

## Web 3.0 (2016 +)

- Identifies relationships between data, e.g., Siri and Google Assistant



# Web Generations (2)

## Web 4.0 (2016 +)

- Use of mobile tools that provide new sources of information for users
- An extension of Web 3.0 where programs draw relationships among data to assist individuals but includes the information gathered by mobile devices

## Web 5.0 (2016 +)

- Open, linked, and intelligent web - emotional web
- May include programs that anticipate our needs based on our mood and behavior
- Not yet realized and the specifics are still to be determined

New generations of web do not completely replace older ones

- There are still innovations in Web 1.0 and Web 2.0 technologies

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Computer communication systems

Internet applications

**HTML – Part 1**

# HTML: Introduction

**HyperText Markup Language (HTML)** is a **markup language** for displaying webpages

Note that HTML is **NOT** a programming language because it cannot perform logical operations and calculations

HTML5 is a new version of HTML with new functionalities with markup language with Internet technologies.

- easier types of character encoding
- supports audio and video controls with the use of `<audio>` and `<video>` tags.
- handling inaccurate syntax.

# Structure of a Webpage

Each HTML file should have one and only one html tag, head section and body section

The **indentation** improves the visual layout of the HTML code so that it is easier for human to see the structure, but has no effect on the browser

The diagram illustrates the structure of an HTML document with numbered lines on the left and callout boxes on the right. The lines show the following code:

```
1  <!DOCTYPE html>
2
3  <html>           opening html tag
4  |   <head>
5  |       <title>Introduction</title>
6  |   </head>
7
8  |   <body>
9  |       <p>This is a sample page</p>
10 |       <p>This is a sample page</p>
11 |       <p>This is a sample page</p>
12 |   </body>
13 |> </html>
```

Annotations include:

- A callout box labeled "opening html tag" points to line 3.
- A callout box labeled "head section" groups lines 4 through 7.
- A callout box labeled "body section" groups lines 8 through 12.
- A callout box labeled "closing html tag" points to line 13.
- A callout box labeled "Code Example: lec01-01-example.html" points to the code area.

This is a simple example.  
This is a simple example.  
This is a simple example.

# HTML: Sections

**Head section:** a container for page title & metadata (document title, character set, styles, scripts, which are NOT shown on the webpage)

## Body section:

- A container for HTML content
- Must be the second element of the `<html>` element and follows the head section

```
1  <!DOCTYPE html>
2
3  <html>
4  <head>
5      <title>Introduction</title>
6  </head>
7
8  <body>
9      <p>This is a sample page</p>
10     <p>This is a sample page</p>
11     <p>This is a sample page</p>
12 </body>
13 </html>
```

The diagram illustrates the hierarchical structure of an HTML document. It shows the root element `<html>` containing the `<head>` and `<body>` sections. The `<head>` section is highlighted with a red bracket and labeled "head section". The `<body>` section is also highlighted with a red bracket and labeled "body section". The code lines are numbered from 1 to 13 on the left.

Code Example: lec01-01-example.html

# HTML: Tags (1)

The angle brackets `< >` together with the enclosed name are called a **tag** e.g., `<body>`, `<div>`

Most tags work in pairs, with an opening tag and a closing tag

- e.g., opening tag `<head>` and closing tag `</head>`
- Content - the text enclosed by the opening & closing tags

Some tags are **NOT** in pair, called empty tags, e.g., `<br>`, `<hr>`

- An empty tag therefore has no content.

Tags can also have properties, formally known as attributes used to specify its characteristics, e.g.,  
`<div id="me">` div's content `</div>`

```
1  <!DOCTYPE html>
2  <html>
3      <head>
4          <title>Webpage and Source Code</title>
5      </head>
6      <body>
7          <div id="main_container">
8              <h1>Welcome to CS2204!</h1>
9              <div>
10                 <div id="rightbox">
11                     <h2>Hello student</h2>
12                 </div>
13                 <div id="leftbox">
14                     
15                 </div>
16                 <br />
17                 <div id="footer">
18                     <p>Hope you have a positive learning experience and <span id="fun">have fun</span> in this course!</p>
19                 </div>
20             </div>
21         </body>
22     </html>
```

attribute

Opening tag

closing tag

Empty tag

Code Example: lec01-02-tags.html

# HTML: Tags (2)

```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <title>Webpage and Source Code</title>
5   </head>
6   <body>
7     <div id="main_container">
8       <h1>Welcome to CS2204!</h1>
9       <div>
10         <div id="rightbox">
11           <h2>Hello student</h2>
12         </div>
13         <div id="leftbox">
14           
15         </div>
16       </div>
17       <br />
18       <div id="footer">
19         <p>Hope you have a positive learning experience and <span id="fun">have fun</span> in this course!</p>
20       </div>
21     </div>
22   </body>
23 </html>
```

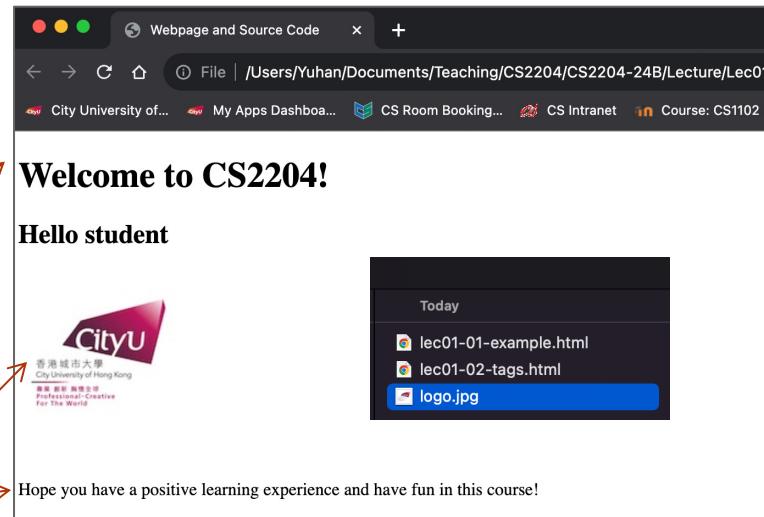
Diagram illustrating the mapping of HTML tags to the displayed webpage:

- heading tag**: Points to the `<h1>Welcome to CS2204!` element.
- heading tag**: Points to the `<h2>Hello student` element.
- image tag**: Points to the `` element.
- Line switch tag**: Points to the `<br />` element.

The displayed webpage shows:

- Welcome to CS2204!**
- Hello student**
- CityU** logo (with text: 香港城市大學 City University of Hong Kong 融通·創新·開拓全球 Professional-Creative For The World)
- Hope you have a positive learning experience and have fun in this course!**

Code Example: lec01-02-tags.html



Heading tags: `<h1>` `<h2>` ... `<h6>` represents different levels of headings

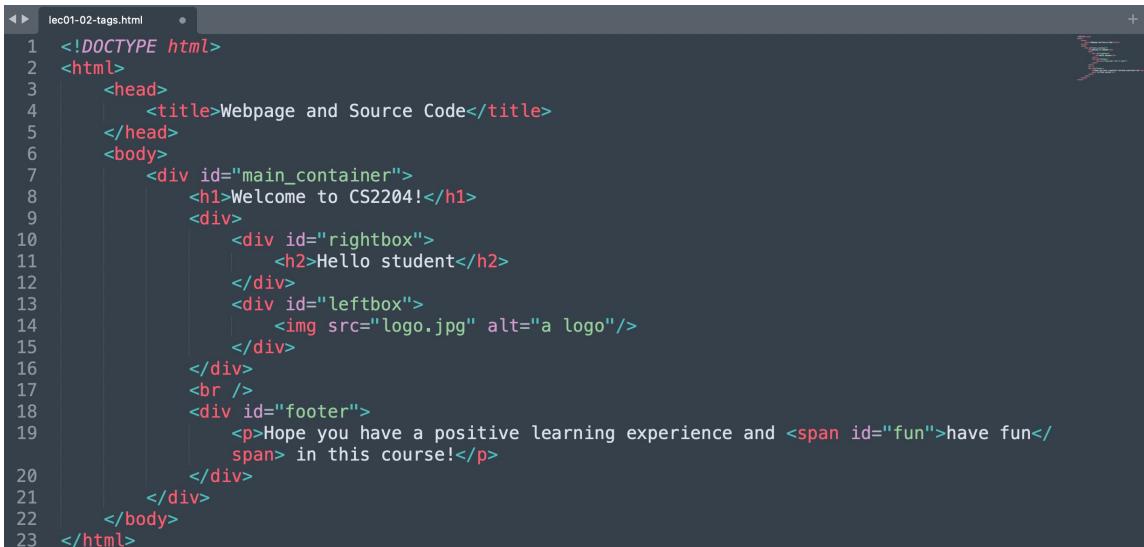
`<img>` `<br/>` are empty tags without the need of opening and closing tags

`<div>` is used to define a division or a container that groups and organizes multiple HTML elements

# HTML: Use a Code Editor

## Recommendations

- Visual Studio Code (<https://code.visualstudio.com/download>)
- Sublime: <https://www.sublimetext.com/>



A screenshot of a code editor window titled "lec01-02-tags.html". The code editor displays the following HTML code:

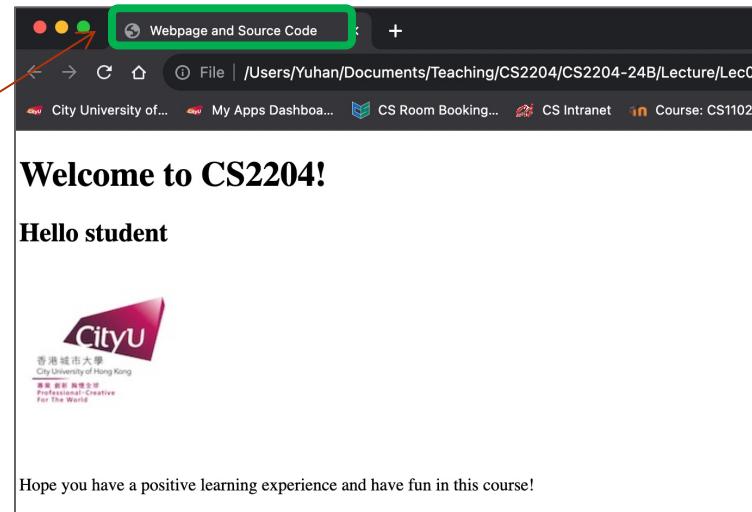
```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <title>Webpage and Source Code</title>
5   </head>
6   <body>
7     <div id="main_container">
8       <h1>Welcome to CS2204!</h1>
9       <div>
10         <div id="rightbox">
11           <h2>Hello student</h2>
12         </div>
13         <div id="leftbox">
14           
15         </div>
16       </div>
17       <br />
18       <div id="footer">
19         <p>Hope you have a positive learning experience and <span id="fun">have fun</span> in this course!</p>
20       </div>
21     </div>
22   </body>
23 </html>
```

## Advantages:

- Readability: color-coded tags
- Automatic indentation
- Line number
- Some editors also supports syntax checking

# HTML: Title

```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <title>Webpage and Source Code</title>
5   </head>
6   <body>
7     <div id="main_container">
8       <h1>Welcome to CS2204!</h1>
9       <div>
10         <div id="rightbox">
11           <h2>Hello student</h2>
12         </div>
13         <div id="leftbox">
14           
15         </div>
16       </div>
17       <br />
18       <div id="footer">
19         <p>Hope you have a positive learning experience and <span id="fun">have fun</span> in this course!</p>
20       </div>
21     </div>
22   </body>
23 </html>
```



Code Example: lec01-02-tags.html

The page **title** can

- help quickly **identify** a webpage on a browser if you open many tabs
- be used by **search engine** to determine the relevance with respect to keyword search
- be used as the default title when you **bookmark** the webpage

The page title is added between the `<title>` and `</title>` tags in the HTML file

# HTML: Links

A **hyperlink**, or simply called a **link**, can be text or image in a webpage that a user can click to navigate to a different webpage or a file

```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <title>HTML Simple</title>
5   </head>
6   <body>
7     <!-- Page content begins here -->
8     <h1>Simple Link</h1>
9     <p>You can navigate to <a href="http://www.cs.cityu.edu.hk/">CS Department's homepage</a></p>
10    <!-- Page content ends here -->
11  </body>
12 </html>
```

Code Example: lec01-03-HTML-simple-link.html

## Simple Link

You can navigate to [CS Department's homepage](http://www.cs.cityu.edu.hk/)

The `<a>` anchor tag is used to link to another hypertext location  
The `href` attribute value contains the URL (Uniform Resource Locator), i.e., the link destination

# HTML: Link Target

By default, the link destination will be opened in the same browser tab or window

## HTML Link with Target

You can open [CS Department's homepage on the same window/tab](http://www.cs.cityu.edu.hk/)

You can open [CS Department's homepage on new window/tab](http://www.cs.cityu.edu.hk/)

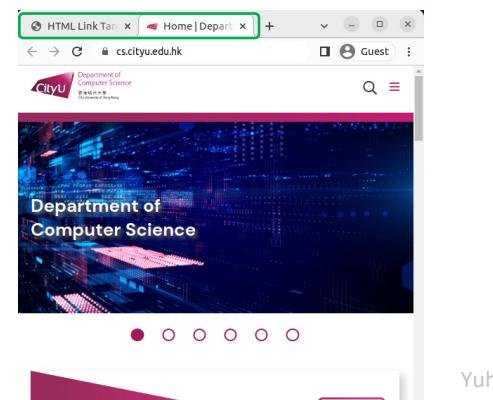
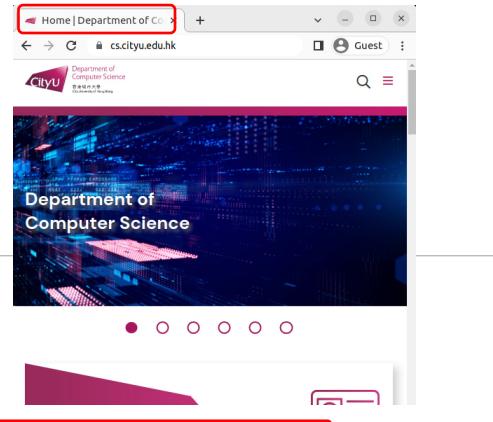
```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <title>HTML Link Target</title>
5   </head>
6   <body>
7     <!-- Page content begins here -->
8     <h1>HTML Link with Target</h1>
9     <p>You can open <a href="http://www.cs.cityu.edu.hk/">CS Department's homepage on the same window/tab</a></p>
10    <p>You can open <a href="http://www.cs.cityu.edu.hk/" target="_blank">CS Department's homepage on new window/tab</a></p>
11    <!-- Page content ends here -->
12  </body>
13 </html>
```

With the attribute  
target="\_blank", the  
linked destination is  
opened in a new window  
or tab

## HTML Link with Target

You can open [CS Department's homepage on the same window/tab](http://www.cs.cityu.edu.hk/)

You can open [CS Department's homepage on new window/tab](http://www.cs.cityu.edu.hk/)



# HTML: Link Actions

A hyperlink can also be used to perform other **action** than navigating to another webpage

- Sending an email: <a href="mailto:abcdef@cityu.edu.hk">
- Download a file: <a href="2-HTML.pdf">

```
1  <!DOCTYPE html>
2  <html>
3    <head>
4      <title>HTML Link Actions</title>
5    </head>
6    <body>
7      <!-- Page content begins here --&gt;
8
9      &lt;h1&gt;HTML Link Actions&lt;/h1&gt;
10
11     &lt;p&gt;You can email to &lt;a href="mailto:abc@cityu.edu.hk"&gt;
12       the course instructor&lt;/a&gt;&lt;/p&gt;
13
14     &lt;p&gt;You can download &lt;a href="2-HTML.pdf"&gt;the lecture
15       slides&lt;/a&gt;&lt;/p&gt;
16
17      <!-- Page content ends here --&gt;
18    &lt;/body&gt;
19  &lt;/html&gt;</pre>
```

## HTML Link Actions

You can go to [Canvas](#) for accessing the CS2204 course

You can [email the course instructor](#)

You can [download the lecture notes](#)

Run an email client (if installed) to compose email to a specific recipient

Download a file

# HTML: Internal Links

Links pointing to **specific locations** inside the same page. Used in **long page** to move to the top or bottom (e.g., discussion forum, table of content, etc)

You can set up **target locations** by giving any HTML element an **id**.  
Note that id must be **unique** within the page

```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <title>HTML Link Target</title>
5   </head>
6   <body>
7     <!-- Page content begins here -->
8     <h1>HTML Internal Link</h1>
9     <p>You can navigate to <a href="#pHTML5">From HTML5</a></p>
10    <p>You can navigate to <a href="#pCSS">paragraph</a></p>
11    <p>You can navigate to <a href="#pJavaScript">paragraph JavaScript</a></p>
12    <h2>Web Development</h2>
13    <p>Often you will find 3 components in a webpage source code:</p>
14
15    <h2 id="pHTML5">HTML5</h2>
16    <p>HyperText Markup Language (HTML) uses a set of codes called tags to
17      describe the structure of a webpage. You should check to make sure that
18      your HTML tags are valid, e.g., matching start tags with end tags.</p>
19
20    <p>The HTML tags are not displayed by the web browser in showing the
21      webpage, but are used to determine how the document should be displayed.
22      A webpage looks fine on one browser does not mean that it will always
23      look the same on another browser so you should test on different browsers
```

To

Code Example: lec01-06-HTML-internal-links.html

**HTML Internal Link**

You can navigate to paragraph HTML5  
You can navigate to paragraph CSS  
You can navigate to paragraph JavaScript

**From**

**Web Development**

Often you will find 3 components in a webpage source code:

**HTML5**

HyperText Markup Language (HTML) uses a set of codes called tags to describe the structure of a webpage. You should check to make sure that your HTML tags are valid, e.g., matching start tags with end tags.

The HTML tags are not displayed by the web browser in showing the webpage, but are used to determine how the document should be displayed. A webpage looks fine on one browser does not mean that it will always look the same on another browser so you should test on different browsers to ensure compatibility.

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**HTML**

To

**HTML5**

HyperText Markup Language (HTML) uses a set of codes called tags to describe the structure of a webpage. You should check to make sure that your HTML tags are valid, e.g., matching start tags with end tags.

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The HTML tags are not displayed by the web browser in showing the webpage, but are used to determine how the document should be displayed. A webpage looks fine on one browser does not mean that it will always look the same on another browser so you should test on different browsers to ensure compatibility.

**CSS**

Cascading Style Sheets (CSS) describes how the HTML elements should be displayed by specifying the fonts, colors, layout and placement of these HTML elements. CSS can be embedded on the HTML file or can be defined and referred as an external file.

Although you could provide the same formatting and layout instructions using HTML, it is better to use CSS as a single CSS rule can be applied to multiple HTML elements at once when defining the appearance of individual HTML elements one by one. The same CSS can also be applied across webpages under the same website.

Cascading Style Sheets (CSS) describes how the HTML elements should be displayed by specifying the fonts, colors, layout and placement of these HTML elements. CSS can be embedded on the HTML file or can be defined and referred as an external file.

We can extend this internal link idea to locations in other pages (even in other server) provided that the target id is known. Just put the page link before the # sign.  
**< a href="http://abc.com/xyz.html#pagelocation">Go</a>**

# Agenda

Teaching patterns, course structure, and assessment

Terms and concepts in computer network

Computer communication systems

Internet applications

HTML – Part 1

# Lecture Summary

- **Computer network** is a communication system that connects two or more computers so that they can exchange information and share resources
- **Communication system** is a collection of interconnected devices and networks that enables **data transmission** from one location to another
- Network topologies define the logical layout of the network; network strategies define how information and resources are shared among the hosts
- Internet protocols are transmission specifications used to define the rules of data exchange between devices and computers
- The browser breaks the URL into several parts and asks a DNS server to translate the host+domain name to IP address
- HTML is markup language that specifies how content (text, image, video, etc) display on a webpage

# Reminder

Do not forget to attend our first lab next week!

# Useful Resources

Useful URLs (accessible inside CityU ONLY, or through CityU/CS VPN)

- Webserver ([gateway.cs.cityu.edu.hk](http://gateway.cs.cityu.edu.hk))
  - Access using MobaXterm or Terminal to upload or update your webpage(s)
- Personal webpage (<http://personal.cs.cityu.edu.hk/~<eid>>)
  - Access using a browser to view your webpage
- Course webpage for examples (<https://personal.cs.cityu.edu.hk/~cs2204>)
  - Access using a browser to view the demo examples

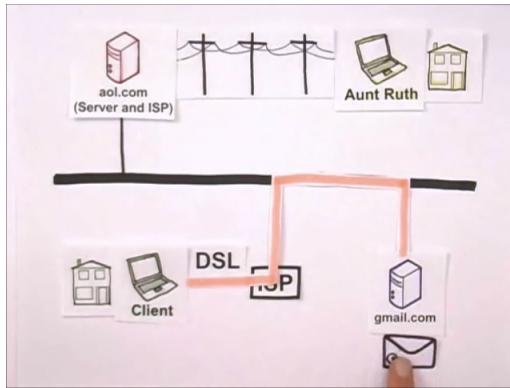
## Other resources

- Google
- Howstuffworks.com (<http://computer.howstuffworks.com/>)
- W3School (<https://www.w3schools.com/>)

When you are outside campus

- Option 1: Use VPN to connect to CityU network: <https://cslab.cs.cityu.edu.hk/services/cslab-vpn-sonicwall>)
- Option 2: Use a remote desktop tool to connect the CSLab computer:  
<https://cslab.cs.cityu.edu.hk/services/macos-remote-desktop-service>

# Useful videos



**How the Internet Works in 5 Minutes**  
[https://www.youtube.com/watch?v=7\\_L\\_PdttKXpc](https://www.youtube.com/watch?v=7_L_PdttKXpc)



**The client server model – 4:33**  
[https://www.youtube.com/watch?v=L5BlpPU\\_muY](https://www.youtube.com/watch?v=L5BlpPU_muY)