

# Web GIS

**Lecture 03**  
**Introduction to Web Technology**

Dr. Usman Mazhar

[usmanmazhargeo@outlook.com](mailto:usmanmazhargeo@outlook.com)

# In Today's Class

1. Internet
2. World Wide Web (WWW)
3. Web content
4. Types of Website
5. Internet Protocols
6. Application Programming Interface (API)
7. Basic Components of the Internet
8. Web Architecture

# 1. Internet

- The Internet is a global network of networks that enables computers of all kinds to directly and transparently communicate and share services throughout the world.
- In 1969 the precursor of Internet is born: ARPAnet.
- ARPA = Advanced Research Projects Agency sponsored by the American Department of Defense (DOD).
- Designed to connect military research centers.
- The Internet = a network of networks.
- People around the world share ideas, information, comments, and stories.

# Popular services

Email (electronic mail) is the most popular service.

- You can send and receive mail (electronic text), faster and cheaper than surface mail.

Web browsing to find information.

- Example: [www.uog.edu.pk](http://www.uog.edu.pk)

## 2. World Wide Web (WWW)

- The World Wide Web allows computer users to locate and view multimedia-based documents (i.e., documents with text, graphics, animations, audios or videos) on almost any subject.
- Even though the Internet was developed more than three decades ago, the introduction of the World Wide Web is a relatively recent event. In 1990, Tim Berners-Lee of CERN (the European Laboratory for Particle Physics) developed the World Wide Web and several communication protocols that form the backbone of the Web.
- The Internet and the World Wide Web surely will be listed among the most important and profound creations of humankind.

# Browsers

- WWW Clients, or "Browser": The program you use to access the WWW is known as a browser because it "browses" the WWW and requests these hypertext documents.
- Browsers can be graphical, allows to see and hear the graphics and audio.
- Browser: Sends request, Receives response, Renders webpage
- Examples: Google Chrome
- Mozilla Firefox
- Microsoft Edge

### 3. Web Contents

- Web content is the textual, visual or aural content that is encountered as part of the user experience on websites.
- It may include, among other things: text, images, sounds, videos and animations.

# HTML web content

- HTML stands for Hypertext Markup Language.
- It is a Language used to create Web Pages or Hypertext document.
- A Markup Language is a set of instructions often called TAGS which can be added to text files.
- HTML is platform independent i.e, for example if we can access internet, we can access WORLD WIDE WEB (WWW) irrespective of client OS and OS of the web server are accessing. So, we can view one download HTML files on www through browser.

# 4. Types of Website

- Static Web Site
- Dynamic Web Site

# Static Web Site

- A static web page (sometimes called a flat page) is a web page that is delivered to the user exactly as stored.
- Consequently, a static web page displays the same information for all users, from all contexts.
- Static web pages are often HTML documents stored as files in the file system and made available by the web server over HTTP.
- Static Web pages are very simple in layout and informative in context.

# Dynamic Web Sites

- A dynamic web page is a kind of web page that has been prepared with fresh information (content and/or layout), for each individual viewing.
- It is not static because it changes with the time (ex. news content), the user (ex. preferences in a login session), the user interaction (ex. web page game), the context (parametric customization), or any combination of the foregoing.

# 5. Internet Protocols

- The Internet Protocol (IP) is a set of rules governing the format, addressing, and routing of data packets across networks, allowing them to reach their correct destination.
- TCP/IP
- HTTP/HTTPS

# TCP/IP Vs HTTP/HTTPS

- TCP/IP (Transmission Control Protocol/Internet Protocol) is the foundational transport/network layer protocol suite responsible for reliably delivering data packets between devices.
- Breaks data into packets, ensures reliable delivery (re-transmits lost packets), and handles routing.
- In contrast, HTTP (Hypertext Transfer Protocol) is an application-layer protocol that runs over TCP to define how web browsers and servers exchange information, such as web pages.
- Operates using a request-response model

# Key Differences

- Layer: TCP/IP operates at the Transport/Internet layers, while HTTP operates at the Application layer.
- Purpose: TCP/IP ensures data gets from point A to point B safely. HTTP defines the format of the request and response (e.g., GET, POST).
- Relationship: HTTP relies on TCP/IP to create a connection first.
- Analogy: If TCP/IP is the shipping company (FedEx) delivering a box, HTTP is the specific document inside the box.

# 6. Application Programming Interface (API)

- An API, or Application Programming Interface, is a set of rules and protocols that enables different software programs to communicate and exchange data with each other.
- It acts as an intermediary or "middleman" that allows one application to access the functionality or data of another without needing to understand its internal workings.

# How APIs Work

- The communication typically follows a client-server model, often illustrated with a restaurant analogy:
- **The Client (You):** An application (e.g., a weather app on your phone) needs information or wants to perform an action.
- **The API (The Waiter):** The app uses the API to send a specific request (like ordering from a menu) to an external system.
- **The Server (The Kitchen):** The external system (e.g., the national weather service database) receives the request, processes it, and prepares a response.
- **The Response (The Food):** The API delivers the data or confirmation back to the initial application, which then presents it to the user in a readable format.

# Common Examples

- **Logging in with a social media account:** When you use your Facebook or Google credentials to log into a different website, you are using their API for authentication.
- **Online payments:** E-commerce sites use APIs to connect with payment gateways like PayPal or Stripe to process transactions securely.
- **Maps and Geolocation:** Services like Google Maps provide APIs that allow ride-sharing or food delivery apps to embed maps and real-time location services.
- **Weather updates:** Weather apps on your phone fetch current data and forecasts from external weather services via APIs.

# Types of APIs

- APIs can be categorized by their scope and architecture:
- **Public APIs (Open APIs)**: Accessible to any external developer, often with some form of registration or API key.
- **Private APIs (Internal APIs)**: Used internally within a single organization to connect different systems and teams.
- **Partner APIs**: Shared with specific, authorized business partners to facilitate business-to-business integrations.
- **Composite APIs**: Combine multiple APIs into a single call to perform complex tasks more efficiently.

# 7. Basic Components of the Internet

- Clients/End Devices: User-operated devices like computers, smartphones, and IoT devices that access the internet.
- Servers: High-powered computers that store data, websites, and applications, providing them to clients upon request.
- Internet Service Providers (ISPs): Companies that provide access to the internet, connecting local networks to the larger, global infrastructure.

- Protocols (TCP/IP, HTTP): A set of standardized rules that govern how data is formatted, addressed, transmitted, and received.
- Domain Name System (DNS): Translates human-readable domain names (e.g., example.com) into machine-readable IP addresses (e.g., 192.0.2.1).
- IP Addresses: Unique numerical labels assigned to each device on a network, allowing them to be located and identified.

## How They Work Together

- When a user clicks a link, the client sends a request via an ISP. The DNS translates the website name into an IP address, and routers direct the request to the correct server. The server sends the data back in small packets.

# 8. Web Architecture - Client Server Model

- The basic components of the client-server model in web architecture are the client, the server, and the network that connects them using specific communication protocols.

- **Client:** The client is the user's device or software application that initiates communication by sending requests for services or resources.
- **Role:** Manages the user interface and presentation logic, processes user input, and displays the response received from the server.
- **Examples:** Web browsers (Chrome, Firefox, Safari), mobile apps, and email clients.

- **Server:** The server is a powerful computer system or application that provides resources and services in response to client requests.
- **Role:** Listens for incoming requests, processes them using application or business logic, retrieves data from databases, and sends back the appropriate response (e.g., HTML files, data, etc.).
- **Examples:** Web servers (Apache, Nginx), database servers (MySQL, PostgreSQL), and file servers.

- **Network:** The network (such as the Internet) is the underlying infrastructure that facilitates the physical connection and data exchange between the client and server.
- **Role:** Transmits the requests and responses, ensuring that information flows between the correct entities.  
Basic Components of the Internet

**Communication Protocols:** These are the standardized rules and guidelines that govern how clients and servers communicate and exchange data.

- **Role:** Ensure that requests and responses are formatted, transmitted, and interpreted correctly, allowing different systems to interoperate.

# How the Internet Works

- When a student types: arcgis.com, What happens?

## **Step 1: DNS Lookup**

- Domain Name System converts name to IP address.
- Example:  
www.arcgis.com →  
54.xx.xx.xx

## **Step 2: Request Sent**

- Your browser sends a request to the server using:
- HTTP or HTTPS

## **Step 3: Server Response**

- Server sends:
- HTML
- CSS
- JavaScript
- Map tiles (in case of Web GIS)



Thank you!

**Any Questions**

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