**Topic: Retrieval and location of web pages**

Reading Time: 15 mins

**·        Note\* Highlight important/core points while reading**

·        Read the content and write the answers given in the document in your words, to get the solid grip on topic.

**Retrieval and Location of Web Pages**

When a user wants to access a website, their computer must **locate the correct web server** that stores the requested web pages. This process involves the **Domain Name System (DNS)**, which translates human-readable web addresses (**URLs**) into machine-readable **IP addresses**.

**Step-by-Step Process of Web Page Retrieval**

**1. User Requests a Web Page**

* The user **opens a web browser** and enters a website URL (e.g., www.hoddereducation.co.uk).
* The browser does not understand domain names directly, so it needs the corresponding **IP address** of the website.

**2. Querying the Domain Name System (DNS)**

* The browser asks a **DNS server (1)** for the IP address of www.hoddereducation.co.uk.
* The DNS server (1) checks its **database/cache** to see if it has the IP address stored.

**3. Resolving the IP Address**

* If **DNS server (1) does not have the IP address**, it **forwards the request** to another **DNS server (2)**.
* The **DNS server (2)** finds the matching **IP address (107.162.140.19)** and sends it back to **DNS server (1)**.
* **DNS server (1) now stores** this information in its cache for faster future access.

**4. Returning the IP Address to the Browser**

* **DNS server (1) sends the resolved IP address** (107.162.140.19) back to the user's computer.
* The browser can now communicate directly with the website’s **web server**.

**5. Establishing a Connection and Retrieving Web Pages**

* The browser **sends a request** to the web server at **107.162.140.19**.
* The web server processes the request and sends back the required **HTML files, images, CSS, and JavaScript**.
* The browser **interprets the HTML and other web page elements** to display the content to the user.

**Role of the Domain Name System (DNS)**

The **DNS** is an essential part of the Internet. It acts like a **phonebook**, mapping **domain names to IP addresses**.

* Without DNS, users would need to remember numeric IP addresses instead of simple domain names.
* DNS servers communicate with each other to resolve website addresses efficiently.

**A-Rated Questions/Answers By Examiner**

**Q1: What is the purpose of a DNS server in web browsing?**

**Answer:**A **Domain Name System (DNS) server** translates **human-readable domain names** (e.g., www.google.com) into **numeric IP addresses** (e.g., 142.250.180.46). This allows browsers to locate and retrieve web pages from the correct server.

**Q2: Describe the step-by-step process of retrieving a web page.**

**Answer:**

1. **User enters a URL** in the web browser.
2. The browser asks a **DNS server** for the IP address of the website.
3. If the first DNS server doesn’t have the IP, it queries another **DNS server**.
4. Once the IP address is found, it is sent back to the user’s computer.
5. The browser **establishes a connection** with the web server and requests the web page.
6. The web server sends **HTML files** and other content to the browser.
7. The browser **interprets and displays** the web page to the user.

**Q3: Why do DNS servers store information in a cache?**

**Answer:**DNS servers use a **cache** to store previously resolved domain names and IP addresses. This:

* **Speeds up future access** to frequently visited websites.
* **Reduces network traffic** by avoiding repeated DNS lookups.
* **Improves overall performance** of web browsing.

**Q4: What happens if a DNS server cannot find an IP address in its database?**

**Answer:**If a **DNS server** cannot find an IP address in its database, it:

1. **Forwards the request** to another DNS server.
2. If the second DNS server finds the IP address, it returns it to the first DNS server.
3. The first DNS server **stores the IP address** in its cache for future use.
4. The IP address is sent to the user's computer, which then contacts the web server.

**Q5: What is the role of HTML in displaying web pages?**

**Answer: HTML (Hypertext Markup Language)** is the standard language used to structure web pages. It:

* Defines the **content and layout** of a web page.
* Works alongside **CSS** (for styling) and **JavaScript** (for interactivity).
* Is interpreted by the web browser to display text, images, links, and multimedia elements.

### Write your Answers on your Notebook and Verify it on Next Screen

**Q6: What is an IP address, and why is it important in web browsing?**

**Q7: What is the difference between IPv4 and IPv6?**

**Q8: What happens if a DNS server is down or unreachable?**

**Q9: What is a recursive DNS query, and how does it work?**

**Q10: How do CDN (Content Delivery Networks) affect web page retrieval?**

**6. Answer:**

1. An IP (Internet Protocol) address is a unique numerical label assigned to each device connected to the internet.
2. It allows devices to identify and communicate with each other over the network.
3. Websites have IP addresses that browsers use to locate and retrieve web pages.
4. Example: Instead of typing "[www.google.com](http://www.google.com/)," users could enter "142.250.180.46" (Google's IP), but DNS makes it easier by translating domain names to IP addresses.

**7. Answer:**

1. **IPv4 (Internet Protocol version 4):**
   * Uses a 32-bit address system (e.g., 192.168.1.1).
   * Can support about 4.3 billion unique addresses.
   * Due to high internet growth, IPv4 addresses are running out.
2. **IPv6 (Internet Protocol version 6):**
   * Uses a 128-bit address system (e.g., 2001:0db8:85a3::8a2e:0370:7334).
   * Provides an almost limitless number of addresses.
   * Improves efficiency, security, and device communication.

**8. Answer:**

1. If a DNS server is down, the browser cannot resolve domain names to IP addresses.
2. Users may see an error message like "DNS Server Not Responding."
3. The computer may try an alternative DNS server (if configured).
4. Solutions include switching to a different DNS provider (e.g., Google DNS: 8.8.8.8, Cloudflare DNS: 1.1.1.1) or checking the internet connection.

**9. Answer:**

1. A **recursive DNS query** is when a DNS server takes full responsibility for finding an IP address.
2. If the first DNS server does not have the answer, it contacts other servers on behalf of the user.
3. The query goes through:
   * **Recursive Resolver** → Contacts other DNS servers.
   * **Root DNS Server** → Directs to a Top-Level Domain (TLD) server.
   * **TLD Server** → Directs to the authoritative DNS server.
   * **Authoritative DNS Server** → Provides the final IP address.
4. The resolved IP address is returned to the user's browser.

**10. Answer:**

1. **CDNs** store copies of web content on multiple servers worldwide.
2. When a user requests a page, the content is delivered from the nearest CDN server instead of the original web server.
3. **Benefits:**
   * Faster loading speeds.
   * Reduced server load.
   * Improved reliability and availability.
   * Better performance for users in different geographical locations.
4. Examples: Cloudflare, Akamai, Amazon CloudFront.