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**Watching a YouTube Video - A Modularized Process**

Modularization is a key concept in networking, breaking down complex operations into structured layers. The **top-down approach** follows the OSI model starting from the **Application Layer (Layer 7)** (which is closest to the user) and works downward to the **Physical Layer (Layer 1)** (which handles raw data transmission). Watching a YouTube video is an excellent real-life example of modularization, as multiple processes occur in the background to ensure smooth video streaming. By understanding how each layer functions, we can appreciate the complexity of modern digital communication.

1. **Application Layer (Layer 7)** – This is where the user interacts with YouTube’s interface. The user searches for a video, presses play, and interacts with features like comments, likes, and subscriptions. The application layer processes these requests and ensures the video player loads correctly.
2. **Presentation Layer (Layer 6)** – Once the video data is received, it is typically compressed (e.g., H.264, VP9) to reduce file size. This layer handles decompression and format translation, ensuring the video is displayed correctly on the user's device. It also processes subtitles and different resolution settings (1080p, 720p, etc.).
3. **Session Layer (Layer 5)** – This layer manages the session between the user's device and YouTube’s servers. It ensures that if the user pauses the video and resumes later, the session remains active. If the internet disconnects momentarily, this layer helps re-establish the connection.
4. **Transport Layer (Layer 4)** – The transport layer determines how video data is delivered. It uses **TCP (Transmission Control Protocol)** to ensure the video loads smoothly by delivering data packets in order. For live streaming, **UDP (User Datagram Protocol)** might be used, which prioritizes speed over reliability, allowing for real-time video playback even if some packets are lost.
5. **Network Layer (Layer 3)** – This layer is responsible for routing data from YouTube’s servers to the user's device. When a user clicks on a video, their device requests data from YouTube’s content delivery network (CDN), ensuring the fastest possible streaming based on server location and network conditions.
6. **Data Link Layer (Layer 2)** – This layer ensures data is transmitted correctly between the user's device and the internet. If the user is connected via Wi-Fi, this layer manages packet transmission and handles minor errors to prevent video buffering.
7. **Physical Layer (Layer 1)** – This is the foundation of the entire process. It includes the actual hardware used to transmit data, such as Wi-Fi signals, fiber-optic cables, or mobile networks (4G/5G). If there is a weak internet signal, video streaming quality may be affected.

By using the **top-down approach**, we can see how YouTube video streaming begins with user interaction and flows downward through different layers, ensuring data is properly processed, transmitted, and displayed. This modularized system makes troubleshooting easier—if a video is buffering, engineers can analyze whether the issue is with application-level processing, network routing, or physical connectivity. Understanding modularization not only helps in networking but also improves efficiency in software design, where complex processes are divided into layers for better management and scalability.