**Identify a real-world application for both parallel computing and networked systems. Explain how these technologies are used and why they are important in that context**

**1**. **Parallel** **Computing**

**How it's used:**

* **Video Encoding/Transcoding:** Before a video is streamed, it must be encoded into multiple formats (e.g., 1080p, 4K) and bitrates to adapt to different devices and network conditions. This process is highly parallelized using distributed computing frameworks (e.g., Apache Spark, GPU acceleration) to process multiple chunks of video simultaneously.
* **Real-time Processing:** Features like personalized recommendations and dynamic ad insertion rely on parallel processing of user data to deliver content quickly.

**Why it's important:**

* **Speed & Efficiency:** Encoding terabytes of video sequentially would take too long; parallelism speeds up processing.
* **Scalability:** As demand grows, parallel computing allows services to handle more content without delays.

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**2**. **Networked** **Systems**

**How it's used:**

Content Delivery Networks (CDNs): Videos are stored on distributed servers worldwide. When a user streams a movie, the closest server delivers it, reducing latency.

Load Balancing: Networked systems distribute user requests across multiple servers to prevent overload and ensure smooth streaming.

Peer-to-Peer (P2P) Streaming (in some cases): Devices in a network share parts of the video file, reducing bandwidth costs for the provider.

**Why it's important**:

Low Latency: CDNs minimize buffering by reducing the distance data travels.

High Availability: Network redundancy ensures that if one server fails, others can take over, preventing service interruptions.

Global Reach: Networked systems allow seamless streaming across different regions.

Conclusion

Parallel computing and networked systems are essential for online streaming platforms to deliver high-quality, low-latency video to millions of users worldwide. Without these technologies, buffering, slow load times, and service outages would be far more common.