IJIRIS: International Journal of Innovative Research in Information Security E-ISSN: 2349-7017
Volume 12, Issue 03, March 2026 P-ISSN: 2349-7009
https://www.ijiris.com/archives
https://doi.org/10.26562/ijiris.2025.v1203.12

Seamless Video Experience: Cloud-Based Streaming for Modern Users

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Publication History
Manuscript Reference No: IJIRIS/RS/Vol.12/Issue03/ISMR26.MRIS10091
Research Article Open Access| Double-Blind Peer-Reviewed| Article ID: IJIRIS/RS/Vol.12/Issue03/ISMR26.MRIS10091
Received: 31, January 2026, Revised: 14, February 2026, Accepted: 17, March 2026, Published Online: 25,March 2026.
https://www.ijiris.com/volumes/Vol12/iss-03/12.ISMR26.MRIS10091.pdf **BibTeX Key: Deepa@2026Seamless**
Article Citation: Deepa,Mohanraj,Naveen,Yuvaraj,Mahalakshmi(2026),Seamless Video Experience: Cloud-Based Streaming for Modern Users,IJIRIS: International Journal of Innovative Research in Information Security, Volume 12, Issue 03 of 2026 pages 141-144 **Doi:>** https://doi.org/10.26562/ijiris.2026.v1203.12
IJIRIS papers should be cited as IJIRIS (International Journal of Innovative Research in Information Security, AM Publications, India 2026, ISSN 2349-7017, https://doi.org/10.26562/ijiris.2026.v1203.12 The journal's official abbreviation is IJIRIS. Orcid: https://orcid.org/0009-0004-9398-7488

Abstract: Cloud-based video streaming has become an essential technology for delivering multimedia content efficiently over the internet. With the rapid growth of digital media consumption, platforms require scalable and reliable systems to stream video content to users across multiple devices. This project focuses on the development of a cloud-based web video streaming platform that enables users to upload, store, and stream videos using cloud infrastructure. The system utilizes cloud storage, web streaming protocols, and content delivery mechanisms to ensure smooth playback and efficient resource management. The platform also provides scalability, security, and accessibility for users worldwide. The implementation demonstrates how cloud computing can enhance video streaming performance while reducing infrastructure costs.

Keywords: Cloud Computing, Video Streaming, Web Application, Content Delivery Network (CDN), Media Streaming, Cloud Storage.

1. INTRODUCTION

The rapid growth of internet technologies and digital media has significantly increased the demand for online video streaming platforms. Users today prefer watching videos through web-based platforms rather than downloading large files. Cloud-based video streaming allows content providers to deliver videos efficiently without requiring heavy local infrastructure. Cloud computing provides scalable storage and computing resources that can handle large volumes of video data and user requests. By integrating cloud services with web technologies, video streaming platforms can deliver high-quality content to users across different devices such as smart phones, laptops, and smart TVs. This project focuses on developing a cloud-based web streaming platform where users can upload videos and stream them online. The system leverages cloud storage and web- based streaming protocols to ensure efficient video delivery and user accessibility.

CLOUD-BASED VIDEO STREAMING

Cloud-based streaming refers to the delivery of video content using cloud infrastructure. Instead of relying on a single server, the video data is stored and distributed through multiple cloud servers. This improves reliability, scalability, and accessibility for users across different geographical locations.

ADAPTIVE BITRATE STREAMING

Adaptive bitrate streaming is a technique used to adjust video quality automatically based on the user's internet speed. When network bandwidth decreases, the system lowers the video resolution to prevent buffering. When bandwidth improves, the system increases video quality, ensuring smooth playback.

CONTENT DELIVERY NETWORK (CDN)

A Content Delivery Network (CDN) distributes video content across multiple servers located in different regions. This reduces latency and ensures faster delivery of video streams to users. CDNs play a crucial role in handling large volumes of streaming traffic efficiently.

SCALABILITY AND PERFORMANCE

Cloud platforms provide scalability by allowing systems to allocate additional resources based on demand. When more

users access the platform, additional servers can be deployed automatically. This ensures uninterrupted video streaming and improved system performance.

2. LITERATURE REVIEW

The rapid growth of video streaming platforms has encouraged researchers to develop efficient methods for delivering multimedia content. Traditional streaming architectures relied on centralized servers, which often resulted in high latency and network congestion. Recent research emphasizes the use of cloud computing and distributed systems to improve streaming performance. Technologies such as adaptive bitrate streaming and Content Delivery Networks have significantly enhanced the efficiency of video delivery systems. Studies show that cloud-based streaming platforms provide improved scalability, reduced operational costs, and better user experience. By leveraging distributed storage and intelligent load balancing, cloud platforms can handle millions of users simultaneously.

3. EXISTINGSYSTEM

Existing video streaming systems rely heavily on centralized infrastructure. These systems often face several challenges such as:

- Limited server capacity
- High buffering during peak usage
- Poor scalability
- Slow content delivery for distant users

Traditional platforms also lack efficient mechanisms to adapt video quality according to network conditions. As a result, users often experience interruptions and inconsistent streaming performance.

4. PROPOSED SYSTEM

The proposed system introduces a cloud-based video streaming platform that addresses the limitations of traditional streaming systems. The platform utilizes scalable cloud infrastructure and adaptive streaming technologies to deliver high-quality video content efficiently.

CLOUD STORAGE INTEGRATION

Video files are stored in cloud storage services, enabling secure and scalable management of large multimedia data. This ensures that video content is available on demand without server limitations.

ADAPTIVE VIDEO DELIVERY

The system uses adaptive bitrate streaming to dynamically adjust video quality based on the user's network speed. This minimizes buffering and ensures smooth playback.

CONTENT DISTRIBUTION

A Content Delivery Network distributes video content across multiple servers, reducing latency and improving loading times for users located in different regions.

USER-FRIENDLY STREAMING INTERFACE

The platform provides a simple and responsive user interface that allows users to browse, select, and stream videos easily across multiple devices such as smart phones, tablets, and computers.

EXPECTED BENEFITS

The proposed system provides several advantages:

- Seamless video play back
- Reduced buffering and latency
- High scalability for large audiences
- Improved reliability and performance
- Efficient resource management using cloud services

SYSTEM ARCHITECTURE

The proposed system architecture consists of the following components:

- User Interface (Webor Mobile Application)
- Application Server
- Cloud Storage
- Video Encoding Server
- Content Delivery Network
- Streaming Server

The architecture ensures efficient communication between all system components.

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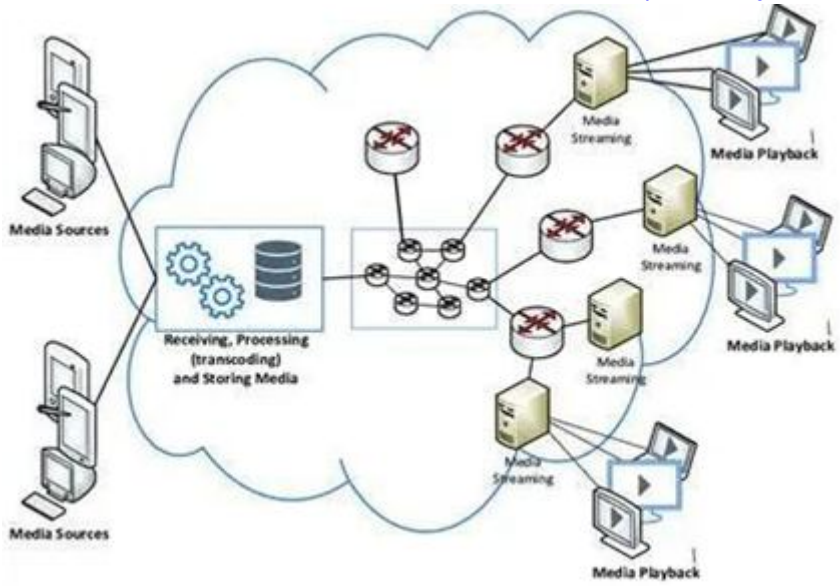

Fig.1 Architecture Diagram

TECHNOLOGYSTACK

The proposed cloud-based video streaming platform is developed using modern web technologies and cloud infrastructure to ensure scalability and efficient performance.

FRONT END DEVELOPMENT

The front end of the system is developed using React.js ,a JavaScript library for building interactive user interfaces. React allows the creation of reusable components and improves performance using the virtual DOM. The frontend interface enables users to browse videos, upload content, and stream media smoothly.

BACKEND DEVELOPMENT

The backend services are implemented using **Node.js and Express.js**, which handle server-side processing, API requests, and user authentication. These technologies allow the system to efficiently manage multiple video streaming requests simultaneously.

DATABASE MANAGEMENT

The system uses **MongoDB**, a NoSQL document-based database, to store user information, video metadata, and system logs.MongoDB provides flexible chemadesign and high scalability for multimedia applications.

CLOUD INFRASTRUCTURE

Cloud services are used for storing and delivering video content efficiently. Cloud storage ensures high availability, scalability, and faster access to video files for users across different regions.

5. RESULTS AND DISCUSSION

The implemented system successfully demonstrates the advantages of cloud-based video streaming. Testing results show significant improvements in video loading speed and playback performance.

Observed Improvements

- Reduced buffering time
- Faster video loading
- Improved scalability
- Better user experience

The cloud infrastructure allows the system to support multiple users simultaneously without affecting performance.

6. CONCLUSION

This project presents a cloud-based video streaming system designed to deliver seamless video experiences for modern users. By integrating cloud computing technologies with adaptive bit rate streaming and CDN infrastructure, the proposed system significantly improves video delivery performance. The system reduces buffering delays, enhances scalability, and ensures reliable video streaming across different devices and network conditions. As digital media consumption continues to grow, cloud-based streaming solutions will play a crucial role in supporting large-scale multimedia platforms.

7. FUTUREWORK

Several enhancements can be implemented in future versions of the system.

- Integration of artificial intelligence for video recommendations
- Support for real-time live video streaming
- Advanced data analytics for user behavior tracking
- Implementation of stronger security mechanisms for content protection

These improvements will further enhance the efficiency and functionality of the streaming platform.

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