

Survey on Elearning Video on Demand Systems

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Abstract

In recent years web based multimedia technologies has gained high popularity. There are many proposals for the application of new multimedia technologies in the area of elearning. There are many aspects for elearning. Some of them are providing study materials, teacher student interaction, timely distribution of information etc. Providing virtual classrooms with the help of multimedia technology is an advanced method in elearning. In the area of elearning an efficient way to provide effective elearning service is through delivering video and audio contents online. The recent technologies like screen casting is an example to show how effective are they. Here is a literature review of different existing systems of elearning.

1. Introduction

Elearning is defined as a structured learning that is carried out over an electronic platform. Elearning services can be split up in to two, they are Synchronous and Asynchronous services. In synchronous elearning system the students must be online at some specified time to use the service. Asynchronous elearning service is up to the students. Students are able to access the service whenever they need. Four main components are needed for effective elearning system. They are the participants, facilitator, course design and technology support. Elearning service is provided for one of two major intentions. That may be complete training or providing just in time information and expert guidance. [1]

Video on demand or on demand video streaming over internet is one of the advancements in the area of multimedia service through which the user can select the video of their choice. The technology must have low delay and free interactivity. The traditional client server architecture have stability issues. So peer to peer or hybrid peer to peer systems are preferred. Content Delivery Network is a popular solution. This comes under hybrid architecture. Movies on Demand, E-

commerce, Interactive advertisement etc are some of the applications of video on demand. There are three approaches for playing the video. They are download mode, in which the downloaded video is played only after the complete download. Second method is streaming, in which the video is downloaded in parts. Each part is decoded and played before the complete video is downloaded. The third method is progressive download or pseudo streaming. The video is downloaded as in download mode but the user can play the video if the download speed is sufficiently greater than the playing rate. There are two types of video on demand technologies. They are near video on demand and True video on demand. The first one delivers video using multiple video streams which have staggered start times. This provides the video provides users with requested content immediately.

The main issues in providing video on demand are cost, bandwidth limitation and security of video content. Cost comes in different forms. Some are cabling, network bandwidth, set top box and video server costs.

There are many techniques to provide internet video on demand. They are traditional web based technology, grid technology, cloud technology and mobile computing technology.

Grid Computing System is the system in which by the application of proper operating system and software can connect and integrate ideal system resources. By the collection of sufficient computing power grid is used as a supercomputer. [5]

Cloud is the technology which is used to supply computational services to a remote place through a tcp/ip network such as internet. In cloud service the user should pay money as their usage. The advancements in cloud computing opened a way for providing effective multimedia elearning as a service over internet. This takes the elearning to the new era of cloud learning. There are many challenges in the area of cloud learning. Some of them are charge, bandwidth, security, storage, and user management. [16]

Mobile computing technology is an emerging technology which is the interaction between human and

mobile. It consists of mobile communication mobile hardware and mobile software.

This paper explains the different challenges in the field of elearning while applying these technologies. Here the different technologies are compared.

2. Challenges

There are many challenges in providing a internet based elearning systems. They are timing, security, cost, bandwidth, storage and quality of service. Shall we look at each of them in detail?

2.1. Timing

As explained earlier there are two types of elearning systems called synchronous and asynchronous. In synchronous system timing of the video streaming is important. If the video is intended to be streamed at some particular time only those who are present at that specific time should be able to get that video. Those who are coming late should be able to watch the same content as others are watching. Another timing factor is whether the teacher and the students should be present at specific time. Some systems provide facility to upload prerecorded videos while others is live, in which the teacher and students should be present at specific time.

2.2. Security

Security of the video content is of prime importance in an elearning system. There should not be a chance of piracy of the elearning content. More over in a public cloud the video is stored in shared cloud storage. So the applications must provide intense security. The security needs are satisfied mostly by providing public and private key cryptographic methods.

Another point under security is providing authorization. There are users under different levels such as students, staff, administrator etc. Each one should be provided with their own level of access. Students must be allowed to view the elearning contents while staffs can modify. The administrator should be able to manage the complete application.

2.3. Bandwidth

This is one of the major challenges in providing an internet based multimedia elearning system. The main problem with bandwidth is we have to expect to provide service for more the actual

numbers. So we should pay for more resource than we require. But if we go for cloud based system this issue will get solved as cloud service providers provide bandwidth auto scaling. This facility provided by the cloud provider analyzes the traffic history and provides required amount of resources. This provides better quality of service at the same time low cost for bandwidth. [4]

2.4. Storage.

Another challenge in internet based multimedia elearning system is storage. Each data is stored with a large amount of Meta data which stores the location and other properties of each file. To avoid this many proposals are put forward. One popular method is a lightweight video-on-demand cloud storage engine. In this a lightweight storage area network is created for lightweight storage. Another method for providing storage efficiency is video compression technique. [15]

2.5. Quality of service.

If the web server is slow then there may be buffering in streaming method. To avoid this we should provide good Quality of Service (QoS). But we are not able to provide good QoS through an ip based internet. To for this purpose Content Delivery Network is provided. In CDN provide multiple servers for specific locations with URI assigned to each of them. The servers which are having the contents of the server act as a pseudo server for the end-users. [13]

3. Different approaches

There are many different internet based elearning video-on-demand systems proposed. They are traditional web based, grid based, cloud based and mobile computing based. Shall we have a detailed look at each of these systems?

3.1. Traditional Web Base Approaches

There are many proposed systems in this area. Some of them are threading based, RMI based, Service Oriented Architecture based and Component based. In multi threaded model different threads are running at the server for carrying out each functions of the vod system. For example there may be a thread running to stream the video bit by bit to the client. By using a remote procedure call (RPC) we can activate from a remote place to get the video which we wish to watch. [10][11]

In RMI based method the clients can access the media server at any time to get the media content they wish to access. The server sums up the contents for each and every request from the client. The server creates a new thread for each and every request for control and hence a distributed multimedia environment is created. [12]

In another system a new web based educational system based on Service Oriented Architecture (SOA) is created. This helped achieve interoperability of remotely and locally located homogenous and heterogeneous applications by using reusable service logic. This reduces the difficulties with the elearning system's standardisation needs. [13]

3.2. Grid Based Approach

In traditional system most technologies use single server as their structural foundation. But this produce high work load to them. So as a remedy we can use grid computing. This technology is having data grid and computational grid to fulfill the needs for video on demand system. Here the grid technology is used to integrate many on demand video nodes which solves the storage as well as computational defects of traditional single server approach. This uses multiple system to provide storage and 'video-on-demand distribution algorithm' to provide computational needs. The different components for its working are information service, file management, resource scheduling, grid portal and content storage. The heart of this system is the information service because it stores where the resources and what are the resources. Thus simply it provides information on multiple video-on-demand servers. The grid based approach has many advantages as well as disadvantages. As explained above the advantages as efficient usage of resources and delivery of high computing and storage. But at the same time it has many disadvantages also. Some of them are listed below. First there is no interactive job submission. Second the grid software standards are still evolving.[5] [6]

3.3. Cloud Based Approach

Cloud based e learning services make use of Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) for providing the service. Cloud provides a cost effective solution for elearning video-on-demand. Platform and the bandwidth cost is very cheaper than the traditional web based elearning approaches. The application is hosted on proved cloud service providers such as Microsoft so availability is assured. In an approach titled 'A Cost-Effective Cloud Service For E-Learning Video-on-demand' the staffs

and students can register with their details. Staffs can make the video and upload the video in to the cloud service. The students are able to view the videos for the registered content at particular time. The videos from the staffs are divided in to chunks and stored in the Microsoft azure storage blob. The user details are stored in azure table storage. Here authorization is provided. Security is provided by private key cryptographic algorithm. This method is very cost-effect because we have to pay less for bandwidth and also the cost for providing local infrastructure is very high that is compared to cloud. The main advantage of this system is that it fetch the video fast than other systems as the video is stored in chunks.[8][9]

3.4. Mobile Based Elearning VOD.

There are many mobile learning approaches available. Mobile computing based elearning technology uses any of the above described technology. Most of the proposed systems are asynchronous. Only very few of them deal with multimedia data. The main advantage of mobile elearning video-on-demand is the ease of portability of video. There are so many challenges in mobile on demand video learning. First how can we provide performance support for mobile device? Second, ease of use. There are many other challenges also such as the cost for equipment, differences in mobile platform such as blackberry, apple, android etc so comparability challenges are there. The limited resources of the device such as battery life and availability of internet connection is another challenge. Now let us have a look at a mobile video learning approach which is named as 'interactive mobile live video learning system in cloud environment'. In this approach the list of online teaches are populated. One can select a teacher according to his or her own wish. The video lecture is captured through a web cam. The video is split up into chunks while streamed in to the cloud from where the video is streamed to the student in a progressive download fashion. The instructor can get the replay and queries from the users through a sms channel provided. This method has the advantage of location independent access of the video content. But the problem is the teachers must be online. [7]

4. Comparison

Technology/Properties	Server Access Method	Bandwidth Efficiency	Start-up latency	Location Dependency.	Cost.
Traditional Web-Based	Most of the system uses SOAP API.	Low.	Normally high. But using techniques such as redundant multichannel streaming protocol we can reduce.	Location dependent.	The cost for infrastructure and cost is huge.
Grid Based	Grid protocols such as GRIP and GRRP	Low.	High.	Location dependent.	High.
Cloud Based	Uses HTTP with REST API.	Using multicast reduces bandwidth usage.	Low as the files is stored in chunks. Each chunk can be easily downloaded and played.	Can be accessed from anywhere in the world.	Comparatively low.
Mobile Computing	Piggybacked http protocols such as Extended Mobile HTTP (MHTTP) with Mobile Media API.	Low in most proposed systems.	Normally high. If we go for cloud based systems it will become low.	Can be accessed from anywhere and the device is portable.	Otherwise we adopt cloud technology it is huge.

Table 1: comparison of different technologies

5. Conclusion

Here reviewed about different techniques in elearning video-on-demand such as web based, grid-based, cloud based and mobile based. The normal web based system has many drawbacks. This led to the evolution of grid, which intern made its way to cloud. Now the new evolving mobile technology is clubbed with cloud techniques which have many advantages. In mobile based elearning video-on-demand system if cloud technology is not applied the cost will become very high, as the infrastructure cost for a mobile based elearning system is very high. So we can expect good research work and new systems in the field of mobile technology in cloud environments.

6. References

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