Research Article

An adaptive cache switching based video streaming using Buffer seeded multi checkpoint peer responder to improve the quality of service in WSN

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Abstract

The widespread of online video access by the various user become huge in recent days by direct streaming through the internet. However, video streaming in wireless networks consumes more delay due to response from the service provider. Due to high bandwidth consideration, the quality of streaming video consumes more buffer state to load the data. By this mitigation, the loss quality becomes problematic to access the service continually. To resolve this problem, we propose an On-Demand Service-Based Peer Switching (ODSBPS) for video streaming using Buffer seeded multi checkpoint peer responded to improve the quality of service in WSN. Initially, these methods verify the service request load based on the energy consumption in multi-channel service responder. Based on the Energy-Aware Traffic Flow Estimation (EATFE) verifies the buffer state from the nearest peer to create a checkpoint. This nearest checkpoint is estimated based on Streaming Service Intense Access Rate (SSIAR). Through this SSIAR checkpoint, the data is loaded on reserved cache points to create buffer points. Simultaneously the nearest peer responder checks the previous checkpoint to load the seed into the peer end. The peer end verifies the last buffer checkpoint to stream continuous service to make low energy level streaming provide the best video streaming service.

Keywords: Video streamingservices, quality of service, Peer to peer network, seeding connection, buffer handler, cache loader, energy-aware routing.

1. Introduction

The web service proved multimedia streaming service on web carried out by video service has become possible because of the home entertainment system. However, there is a problem while sending high-resolution video to the variation of the wireless channel. It supports High Definition video and supports higher data rates streaming from service providers that are considered. Also, Scalable Video Coding (SVC) is applied to extend the video streaming quality without delay time consumption depending on the service optimality.

Web services transfer the data based on Hypertext protocol streaming-process to transfer the video frames to support the HTTP service, it is generally optimal for configuring most of the video streaming network for providing the video. In instruction to encounter the interoperability needs of HTTP streaming video and services, Motion Picture Experts Group defines a framework for streaming via HTTP, the Dynamic Adaptive Streaming (DASH) over HTTP standard, have formulated.

A classical video streaming is transmitted from the server, by improving the video streaming rate. It allows the client to cache the video frames from the peer service of the network will be able to correct the deterioration of the state when it is in good condition. Network conditions may vary due to increased traffic caused by the movement of the user, network conditions such as congestion have network coverage, variations in channels, and the video buffer some of the factors that cause data output to re-buffering events.

P2P streaming technology is widely and has been used in such CoolStream, large-scale P2P video live broadcasting systems, such as a PPLive and SopCast. Peers are watching the same awarefrequency can be prearranged in the cooperation streaming service, then it can distribute the data blocks to bothsupplementary peer networks. For members of the service is essential for all of the other members, selfish behavior members, can be found in time, the additionalaffiliatesover simple and direct mutual transactions can be avoided. While download performance is still reliable, a node can provide considerable data in terms of the amount of content and service capabilities. However, the existing alliance method, will not be able to take the balance of synchronization and performance with extreme

To progress the influenceof video streaming flows efficiency and P2P service transmission performance of the smart devices, proposing to streaming services fromthe ad hoc network points the peer-based response service to utilize the video.

Internet of things has been attracting more and more attention, and based on the Internet of things, is also increasing the demand for a variety of multimedia applications. Advances in display technology in a variety of devices have led to the development of multimedia applications. Currently, the number of low-power camera that is used for monitoring activities or protection purposes in, has increased exponentially. Multimedia content accounted for most of the traffic that is sent over the Internet. Users can use the device with (smartphones, smartwatches, and Notepads) with different functions. Because of power, storage, and limitations of computing, a new protocol has been developed to be able to run on a resource of limited devices.

With the significant increase in mobile devices, video services, it has become the most demanding application of the wireless network. The new trend may lead to the development of dynamic adaptive streaming over HTTP alternatively recent video source is encoded in several different bit rates, and it is divided into segments for delivery to a client through HTTP connections. Selection of the version with different resolution and different bit rates representation can be based on to enable adaptive bitrate streaming, network status, capabilities, and user preferences of the device

Wireless data traffic reached extremely, is expected to increase significantly over the next few years. The growth is for video streaming, and the function of Video on Demand (VOD) via a multi-media device such as tablets and smartphones. Trends in mobile phone technology, will not be able to cope with the increase in traffic as long as the density of the wireless infrastructure is well understood and expanded accordingly.

Video stream if each segment contains a few seconds of playback, and the video is stored on the server-side. A multiple-bit rate for each segment is available. The rate adaptation algorithm is responsible for selecting the video bit rate of the segment. Thus, to achieve the conflicting goals, to maximize the quality of the video, attempts algorithms to improve the user's viewing experience.

2. Related work

Z. Deng, et al (2017) demonstrates the future of mobile video traffic has been predicted worldwide. Compared with other services, High-Definition (HD) video streams will have more bit rate, the biggest challenge is to transmit high-definition video over wireless networks. To overcome the Quality of Experience (QoE) prediction model it is preferable to control the problem of rate allocation and transmitted over the wireless access network and it transfers the rate allocation problems into an unconstrained optimization problem.

J. Wu, et al (2016) explains High-definition (HD) video, is difficult to achieve with a limited network, and high transmission rate. Accordingly, there is a solution that Content-Aware (CMT-CA) has been proposed. It schedules not the equal frame with the help of video parameters. It provides feedback on the channel state.

H. Lin, et al (2012) propose Quality of Service (QoS) for cross-layer adaptation scheme is used in High Definition (HD) to stream videos. Video-rate, payload length of the packet, Modulation and Coding Scheme (MCS), and cross-layer parameters to reduce the distortion video stream.

N. Eswara et al (2018) introduces the Quality of Experience (QoE) it calculates as an effective video stream. This provides a channel quality to the user, is an important process at the network with limited resources. QoE is evaluated by the effect of distortion that is occurred by the rate adaptation or interruptions in re-buffering events in Hypertext Transfer Protocol (HTTP) video stream.

J. Nightingale, et al (2014) describes Users' transportation equipment, expect high-quality video streams shortly. Video streaming, is used as the wide range it faces a challenge to provide reliable service providers. This clearly shows the challenges of wireless network bandwidth constraints and packet loss are common. High-Efficiency Video Coding (HEVC) has low bandwidth requirements to allow service providers potentially, but streaming high-quality video over low bandwidth networks, the packet loss that causes, damage with high compression ratio.

B. Rainer, et al (2017) describes Internet traffic will be increased nowadays Multimedia streaming is the main reason for the network traffic. Such streaming Quality of Experience (QoE), is the main features of the bit rate maximization is the main goal, in some instances, the requirements of customers and providers are conflicted. A new method of Statistical Indifferent Quality Variation (SIQV) is the solution the quality varies between the adjacent representations the higher bit rate can be replaced as low bit rate representation.

M. Leung et al (2007) explains Modern culture largest user access network from the server. Such a process leads to high streaming cost, and it may create issues in system scalability. To solve problems, Collaborative Streaming among Mobiles (COSMOS) is the proposed term that supports broadcasting and data, to share to meet the high-performance. In COSMOS, some peers pull the video from the base station. A free broadcast channel will be used to share the stream with nearby users. However, the COSMOS reduction cost and bandwidth is a failure of its power. Even though it will be used to evaluate a large number of users.

F. Wang, et al (2011) describes today, to support broadcast videos through network peer-to-peer streaming technology is suggested worldwide. It is the main challenge process to deal with the node dynamics of bandwidth and timing constraints. These challenges, effectively improve the quality of the video stream, reducing the control overhead, Peer-to-Peer PPLive that customize optimization.

J. Liu, et al (2008) explains Today, innovative technology and a huge effort, supports real-time video streaming, but cost-effective and video broadcast is the main purpose. Peer to Peer is proposed trusted technology it is cost-effective, and it is easy to expand with its advantages such as flexibility and effectiveness.

S. Zou, et al (2018) demonstrates today's Internet video service provider such as PPTV and iQiyi, build network-based video with Real-Time Media Flow Protocol (RTMFP) it contains different distribution strategies and different features on peer streaming behaviors potential system bottlenecks, and network dynamics. Video streaming technology, it supports that users and RTMFP to establish a better peer-assisted video system.

J. Zhang, et al (2020) demonstrates Free ride and redundant streams contain folded overlapping stream to reduce the playback quality and network performance of a peer-to-peer (P2P) network. A distance driven alliance, is proposed that prevent any of the utility gains from free-riding over constraints.

C. Lee et al (2018) describes Using the smart device has become a mainstream application in the large-scale wireless broadband network following the multi-media. Some users, share the same multimedia objects with nearby Bluetooth coverage over the Internet, and peer-to-peer (P2P) protocol Bluetooth users, need to download multimedia stream.

W. U. Rahman, et al (2019) demonstrates Internet of things (IoT), achieved a milestone of identifying intelligent services through interaction of smart things. Constraints Application Protocol (CoAP) is a transmission protocol in the IoT network.

C. Li, L. et al (2018) describes Streaming video over the wireless network is used that interacts with CoAP protocol between devices to evaluate the performance of the transmission parameters in CoAP protocol application. A slight increase in packet loss, may increase the risk of interruption to download time of the video. However, based on the state of the network is adjusted by the congestion control parameter.

M. Zhao, et al (2018) explains the current year has witnessed dynamic adaptive streaming through HTTP. RTSP / RTP / RTCP, automatically adjust the bandwidth based on the dynamically reuses HTTP communication to improve the DASH performance to design efficient scheduling of the media server. Using spatial reuse, it is the main challenge to ensure the video service satisfactory to all users. Based on the development of utility scheduling solving the above problems, to maximize the performance of DASH system DASH, selects a Multiple User Equipment (UEs), by sharing respective common network resources.

O. Kwon, et al (2010) describes Video, advanced technology, and global broadband Internet service as now popular in the Internet Protocol Television (IPTV). More complex combination of software in a video streaming service that supports IPTV for interactive services. A sophisticated system of this block-level refinement can improve the quality and performance of the service in IPTV video streaming.

D. Bethanabhotla, et al (2015) explains Scheduling strategy video stream designed over the wireless network is to combine multiple users and assistants. Video quality index that has been requested by the Network Utility Maximization (NUM) problem has been set as a queue. To achieve a high probability of effectiveness and dispersion in this state, the system is buffered in a smooth flow system for each user and operates using the method for calculating the re-buffering time.

S. Chen, et al (2016) demonstrates Scalable Video Coding (SVC) enables a flexible video transmission for mobile users, has become a reliable technology. Because, of low buffer occupancy of a low-quality level of the channel in an index that reflects the channel status. By introducing a perturbations-based layer exchange protocol for reducing quality fluctuations issues and perturbations viewers can improve the viewer's QoE.

J. Yang, et al (2019) explains today, uncontrolled growth of video traffic on the Internet leads to a high redundancy rate. Advanced network caching is an effective solution to eliminating duplicate traffic from the cache of the network node. Network Function Virtualization (NFV) is built on the support of network caching and streaming media capabilities.

M. N. Sadat (2020) Content-Centric Networking (CCN), the Internet architecture of the future, experience and brings new challenges to maintain the quality of video streaming. For universal Caching Capability CCN router will generally be streamed from multiple sources, and switching the content source, by inducing delayed, it can affect the playback of QoE and video. Therefore, QoE corresponding multi-source video stream system for CCN has been newly proposed. For different caching methods, as to calculate the content distribution of the video files between CCN nodes, the flow of the adaptive video streaming with distributed caching (ASDC) algorithm, it has been designed to ensure the QoE during switching processing between a content source.

3. On-Demand Service-Based Peer Switching for video streaming (ODSBPS)

Streaming video service based on peer switching concepts is stochastic complex nature in a wireless sensor network. Because there are various fluctuations occurred in the streaming bit rate. To resolve the problem, to propose an On-Demand Service-Based Peer Switching (ODSBPS) to improve the video streaming using Multicast checkpoint peer seeded access rate (MC2P2SAR). Initially, this identifies traffic flow conditions based on Energy-Aware Traffic Flow Estimation (EATFE), by this estimation streaming point response rate is analyzed based on the Lifetime Streaming Support Measure, this measure points to the service response rate by the average time of supporting service to provide the streaming rate.

Depending on the service response the peer ends the response errors are corrected using Adaptive Peer forward error correction, Finally the peer end makes error less streaming response from Multicast checkpoint at high response depending on peer seeded access. By this multicast point of Streaming Service provide a continuous streaming rate based on Intense Access Rate (SSIAR) to improve the video streaming performance.

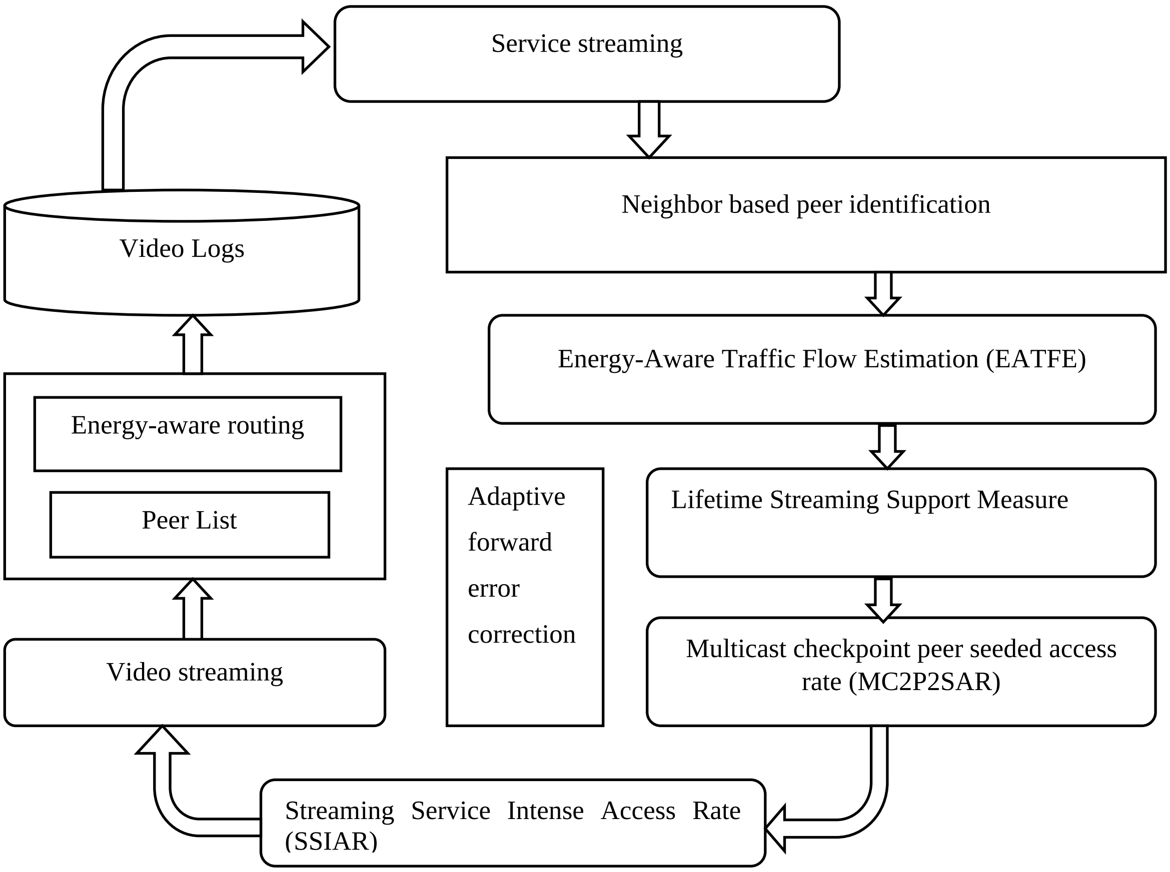

Figure 1: architecture diagram for proposed ODSBPS

Adaptive transmission read the routing table path delivery on neighbor coverage which response to changes shortest path estimation along with the support of route conjunction traffic flow by packet forwarding scheme. The inter-transition is estimated by energy constraints on relay routing protocols such as the Internet on-demand routing methods, and short-distance traffic. Includes Routing Information Protocol (RIP) to remains the shortest path routing protocols. Adaptive transmission read the routing table path delivery on neighbor coverage which response to changes shortest path estimation along with the support of route conjunction traffic flow by packet forwarding scheme. It uses multi-route dependencies to provide information about network traffic congestion and direct packet acceptance of reverse drivers, as well as road information

3.1 Energy-Aware Traffic Flow Estimation (EATFE)

In this stage, the collective information is carried from the nearest peers based on the data transfer over the WSN network medium. It captures the details of the next topology and flow of traffic details and details of the sensors in the first shared network with the support of neighbor distance discovery. The peer render contains the data information about the number of seeders present in the previous transmission responder and its state, the number of transactions by the duration is depending on the duty cycle. Such information floods the sensors in the network contains information about the data transfer rate. Now, if the traffic has fewer data to send, it calculates the duty cycle time of traffic flow based on the response from a certain amount of time.

Algorithm

Input: Route table RT, Dat flow rate Dfr
Output: Traffic flow
Step1: Start to compute the Routing information from transmission service Ts
Step2: Check Route Table Rt, packet P, source S, destination D
Step 3: compute Traffic log If coverage node =neighbor distance
Step 4: Check if neighbor node N from route table with response time T
Step 5: Check transmission rate Tr, Loss rate Lr from P delay
If (Tr>Lr) then check traffic rate
Return N→ N++
Update route table Rt
Return service transition Ts← N
End if
End
Step6: stop.

The above algorithm return traffic at each node during network time. Then, if any node pocket is to be retrieved by the device. Its specific packet type must be assigned to the data and then extracted at the source, destination, and change address. Based on which the relevant traffic record is created to describe the network, all address traffic records are generated based on traffic flow returns the closest service.

3.2 Lifetime Streaming Support Measure

At the time, the topology constraints are used to identify the list of peers that would be awake for the cycle and identify the routes available around the sensors. Now, with the routes identified, the value of LSSM (Lifetime Streaming Support Measure) is computed. According to the value of LSSM estimated, a single route with maximum LSM performs the data transmission to choose the enrich source of the closet support medium.

Consider the initial packet P received from the closest path based on the traffic and the location wise list of routes is to be identified as connective peers which are as follows

$$\text{peer List Nlist} = \int_{i=1,j=1}^{\text{size(Packet)}} \sum \text{PeerID, Location, NT, CS} \in \text{Payload(P)} \quad \text{--(1)}$$

Now for any peer nodes s, the node list contains the peer id, location, and several transmission NT done and the current state is collected.

With the details of N list, first, the list of the route which would be in wakeup mode are identified which are as follows:

$$\text{Wlist} = \int_{i=1}^{\text{size(Nlist)}} \sum \text{Nlist(i). State} == \text{Sleep} \quad \text{-- (2)}$$

The above equation identifies the list of wakeup nodes for the current duty cycle according to the previous state. If the sensor node is sleeping in the previous state, then it is considered for the current duty cycle. From the list of wakeup nodes, the possible routes available to reach a sink are identified with the consideration that the path of the IoT range remains the same sensor node in allover the transmission range.

$$\text{Neighbor list nl} = \int_{i=1}^{\text{size(Slist)}} \sum \text{Wlist(i). location} < s.location \;\&\; s.transmission\ range > \quad \text{--(3)}$$

The closest neighbor is identified as route list identified from a transmission medium

$$\text{List of route identification} = \int_{i=1}^{\text{size(nl)}} \sum \text{Routes(nl(i), Destination)} \in \text{Network} \quad \text{--(4)}$$

The list of routes identified by the source is used to perform video streaming.

Now for each route R, from RL, the method would compute the LMS value, and a route with maximum LMS is selected. The selected route is scheduled and the route list is given for scheduling the rest of the nodes.

3.3 Adaptive Peer forward error correction

From the traffic flow rate, the neighbor list is identified from the nearest peer's processes with fine-grained Adaptive forward Error Correction (FGA-FEC) is used for peer response from most iterative time of response. This reduces the closest neighbor peer response error rate by estimations theresponse time from the other peers. In our work, both the embedded source bitstream and the error control codes are identified based on the streaming bits to cover the video streaming rate. This estimates the error response based on the noise signal ratio PSNR depending on Max and minimum reprocess data rate. The response video frame rates are compared from spatial resolution get a response from peer different network connections should meet the diversity of users without loading stream bits. If the proposed FGA-FEC scheme is coded and a portion of the video source data is balance the stream rate based on the forward error correction from the alternative peers

Algorithm

Inputs: Neighbor Route List Route table R, Rmax, Rmin, Video streaming rate Vsr; Peer List Pl
Outputs: Seeded Peer List Pr
Step 1: Initialize video request to Start:
Step 2:Retain Route table Neighbor List of peers
Step 3 Check max Vsr← PL
    Stream video Rmax response
     Check if (Streaming rate VSr== Normal)
      Continue peer Response access Pra←max data rate
     Else
     Re-loop step 3
Step 4. Check video frame Vf→ stream of bits
    If(Error rate Er←Rmin) estimate PSNR
      Forward R→update Rt
    Check another peer response Csr
Step 5: Return another peer response
Step 6:stop

This finds Selected routing verifies the neighbor contact with clusters to substantiate the clusters, localized congestion in the area of each spontaneous route delay are begin to stop the traffic congestion and actively monitoring networks based on self-organization routing congestion.

3.4 Multicast checkpoint peer seeded access rate (MC^{2}P^{2}SAR)

Based on the forward error correction the response peer list is seeded based on the video streaming response depending on the served data packets. This selects the responses seeded list to create a multicast checkpoint to maintain multiple versions of each volume of media. When streaming, the server sends the same bitstream from the seeded checkpoint, which is it creates streaming index individual copies of different users. Alternatively, seed-based reactions are an effective way to simultaneously transfer set data from the closest seeded list. For multicast, the main driven step of the receiving system, a server sends an advanced video layer to separate the base layer and multilayer groups. The receiver then joins or leaves these groups, sometimes leading a plethora of PSNR signaling services on a dynamic network based on the network conditions**.**

Algorithm:

Inputs: Peer List Pl, forwards PSNR error rate, Emax, Emin, Seeded peer List Spr, videos response rate (Vrr)
Outputs: Max response packet streaming rate:
Step 1: start multicast streaming check Point Mcp
Step 2: Check PSNR error Rate ←Vrr
Step 3   Initialize Peer Responses seeded 1 and check EMim
        Responses.get streamed packet from Mcp
  Else
    Emax→chance Netxt peer; go to step 3;
    Return Bitstream data packets flow rate from min Time Dr
  Step 4 Check seeded peer list next Cast Spr→ Vrr
      Update Emin Seeded peer List
     Return Emin last response
Step 5: Check All Emin→Vrr rate
Step 6: Determine the number of List from seeded at closest range distance D
    For (Unitize peer i = node N − Cast; i++; to J of Route based node B) do
      Rate the seeded weight from the shortest distance
      Change the peer at Max seeded range
Step 7 Calculate the alternate response queuing bits Qj as i with N= I;
    For end j=1 α j Rj → B to llop

E[D(R)]I =I
j=0 at multicast seeded D(Rj);
Check continuously video streaming rate VSr==Vrr
If equals Vrr<-response
Return Max streaming seeded Vsr packet peer
Else
Vrr returns to check loopback another casting peer
End if
End for
End for
Step 6: stop

Depending on its data-related importance, each data source transfers the corresponding information flow system with extensive rate control and path immersion experience in terms of congestion en and is forced to control the speed. Cluster Head (CH) Denudated near Coverage node passes the packets to the Selected Clusters are very effective in preventing multiple flows and achieving higher distribution rates and lower inconsistencies compared to traditional approaches.

3.5 Streaming Service Intense Access Rate (SSIAR)

By continuing the multicast response from the seeded peer list, they provide continuous streaming servicewithout delay rate. This accessed streaming service is ended with total frames access based on the estimation of SSIAR at the receiving streaming bits. The response peer list at receive end has Max weight, the stream is well to utilize the link. So service access rate be estimated the peer Link selection function w (i, j) from the seeded peer list.

Algorithm

Input: Multiple cast seeded path packet Pr, utilize rate Ur, video-rate Vr and total nodes w,
Output: Optimized streaming video rate
Step 1: compute the multicast seeded peer List
Step 2: estimate the streaming packet Pr from casted switching Peer response rate Vr
Step 3: check the Rr > Pr delay at regular interval
Step 4: compute the Maximum access rate
Access rate Low margin streaming are neglected as delay
Step 5: Max weight multicast peer are created continues Link
Step 5.1: Check the Max response probability to connect continues Link
Step 6: Return Cast link streaming data Max rate
End

By including the time spent with distractions, the final node can be determined by the delay time current node Current response time given to acknowledgment. Transmission Time Metrics calculate the relative path and it is efficient to comprehensive a routine task or another task professionally send. This improves the video streaming rate without delay tolerance by consuming the time from the nearest multicast response based on the service improvement.

4. Results and Discussion:

The proposed real-time multi-factor video streaming algorithm has been implemented using Microsoft visual framework C#.net. The method has been evaluated for its performance under different simulation conditions. The performance results are compared with Multi-Factor Service Selection (MFSS)**,** Average-arrival-Time to Playback Rate (ATPR), and Automatic Mode Selection (AMS).The method has produced efficient results in various factors. The results produced by the method have been presented below.

Parameter	Value
Tool Used	MS visual studio C#.net
Number of nodes	200
Number of service peers	20
Average routes	5
Average mobility speed	2 meters/second

Table 1: Simulation Details

Table 1 presents the particulars of the mockup design environment being used to evaluate the performance of the proposed algorithm. The methods have been compared with various stages of access rate in various parameters. The evaluation parameters are measured as follows:

Streaming Efficiency:

The streaming efficiency is the measure that represents the performance of streaming the video from the available peers. It depends on the method which performs the selection of peer. If the selection of peers is performed efficiently, then the streaming efficiency will be higher.

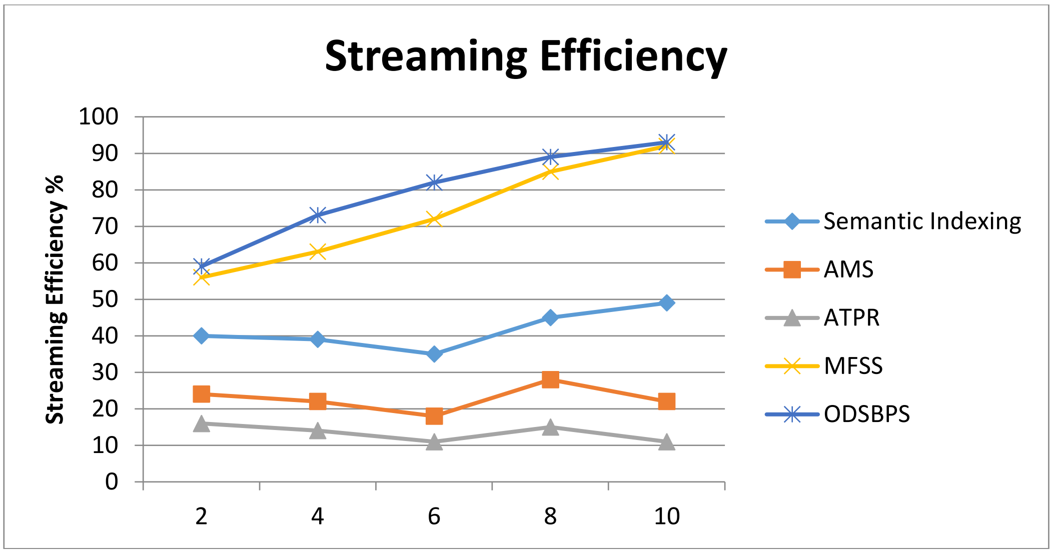

Figure 2: Comparison on streaming efficiency

The performance on streaming efficiency is measured for different systems under different time windows. The results produced by the methods have been compared and presented in Figure 2. The proposed algorithm has improved the performance of video streaming which is higher than other methods.

Video Retrieval Efficiency:

The video retrieval efficiency is the measure that represents the performance of the algorithm in retrieving the video from the peers available. It has been measured based on the number of videos that have been retrieved accurately among several trials. If the video has been retrieved without error, then it is considered complete. If there is frame loss identified, then its accuracy has been measured accordingly.

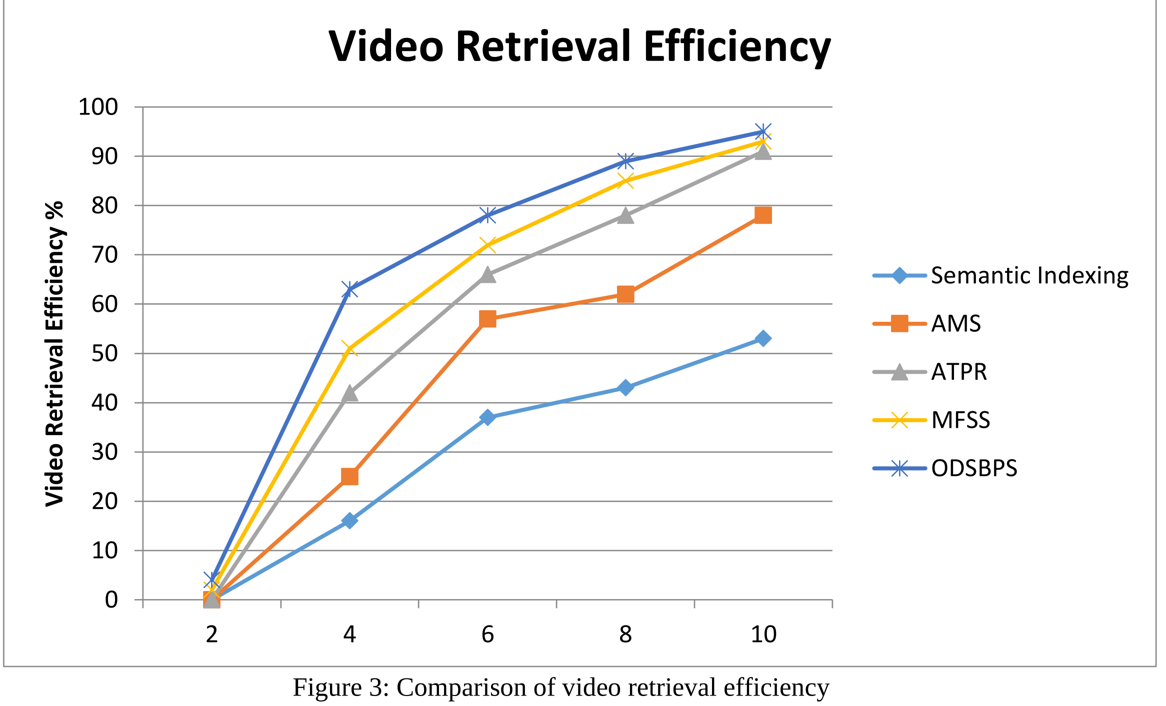

Figure 3: Comparison of video retrieval efficiency

The accuracy or efficiency of video retrieval has been restrained and associated with the results of additionalapproaches. The projected MFSS algorithm has improved the performance of video retrieval accuracy than other methods.

Time Complexity:

The time complexity is the measure that represents the time being taken by the proposed algorithm in video retrieval. The value of time complexity has been measured as follows:

D = (Tr –Ts), Where Tr is receiving Time and Ts is sent Time.

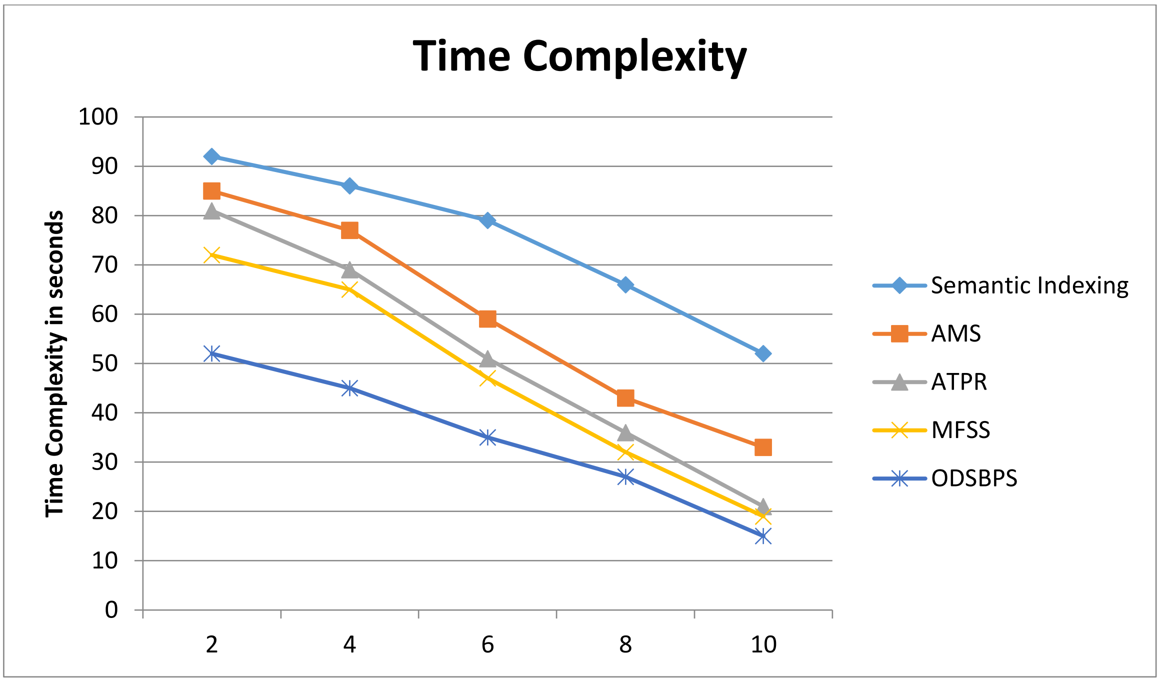

Figure 4: Comparison of time complexity

The time taken for video streaming by the different methods has been measured and associated with additionalapproaches. The proposed MFSS algorithm has produced less time complexity than other methods.

5. Conclusion

To conclude this implementation provide the best performance improvement by improving the video stream based on the proposed system. This reduces the streaming rate based on the nearest peer response with augmented seed support. The proposed On-Demand Service-Based Peer Switching (ODSBPS) produces the traffic-based energy-aware service accessing to reduce the buffering strategy of video response. This selects the seeded nearest peer identified from the peer list table make responsible depending on the forward error correction mode. This chooses the best energy-aware routing-based video streaming. The proposed system proves high performance up to 95.7 % streaming efficiency compared to the previous system as well.

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