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Efficient Parallel Framework For Adaptive Dual Video Stream Using Cloud–An Enhancement of Social Tv Experience

Dr. P. Balakumar,
Associate Professor, Dept of Computer Science,
psbalakumar@gmail.com,
HD.Arvindh,
Research Scholar, Dept of Computer Science,
arvindh1993@gmail.com,
S.Gopinath,
Research Scholar, Dept of Computer Science,
gopinathdk@gmail.com,
Prince Dr.K.Vasudevan College of Engineering and technology.

Abstract

The emergence of social TV has transformed social TV experiences, providing a unified media experience across different devices and different users. In response to this trend, a multiscreen social TV system, offering live streaming of channel teleportation as an attractive feature has been implemented. This Enabling technology developed contains **cloud clone**. The concept of coding with Html-5 has re-returned the social TV experience. As user shifts from one device to another, cloning occurs in cloud for providing live channel streaming for the new device, thus multiple session-id are created in cloud which causes a burden for the server. Thus we bring a drastic change to the concept of cloning with the help of **Video Tag**. It creates only one session-id in cloud and with the help of same session-id it provides life streaming of data across many devices. We are also going to enhance the teleportation by playing the video simultaneously in N-Number of devices with only one session ID. By enhancing the transmission of data such that **Quality of Service** (QoS) is achieved by using effective algorithms - Advanced Q-Learning, Session Similarity Matrix Algorithm (SSMA) and also with the CCMN Architecture s. There is also a security issue with cloud in the **traditional** system. When you stream the video, anyone can Teleport the channel when they have the respective application, hence without the knowledge authorized user pay for it. Thus **trusted device network** and friendly device concept is being used to enhance the security feature of Live Streaming.

Keywords: Self Similarity Matrix, Advanced Online Algorithm, Moore Graph, Trusted Device, Real Time Concept.

Introduction

LATELY, TV experience has been dramatically transformed, with the emergence of multi-screen social TV. It offers two essential features, initially it allows user to view the live streaming of video at any place any position according to the users comfort. Secondly, by enhancing the quality of service user demands are met.

In response to this trend we have designed and implemented a multi-screen social TV system over Cloud-Centric Media Network (CCMN) [7]. It offers video teleportation [3] as its salient feature. In particular instance one can easily migrate video session back and forth among different devices with intuitive human-computer interactions. As a result, a seamless multi- screen social experience is achieved.

Instead of calling the cloud for cloud cloning, we use the concept of Video Tagging, where each user device in a family network is registered with the proxy and their devices IMEI (International Mobile Station Equipment ID) number is being stored. So when a user wants to teleport the ongoing session the proxy checks for authorized user and based on the session-ID the ongoing session is being cloned and processed to the new devices by using the concept of Video Tag. Advertisement insertion function is also being added to the original video streaming, achieving a personalized multi-screen social TV experience for end-users in a scalable and flexible manner [1][7][10].

One critical design objective is to minimize the monetary cost by operating video teleportation, potentially making this service affordable to the general users. In this case, we need to intelligently manage rental cost of vendor-neutral provider [4]. In particular, the transmission cost is determined by the transmitted content size and its delivery path length.

So in order to effectively transmit the video source to the user (i.e.) end user CCMN architecture is being used. While providing service to the user the following things are to be considered.

a. Grouping the data based on user preference.
b. Cache block should be placed in such a position that signal propagate in all directions equally.
c. Teleportation should be undertaken at instance and there should not be any delay.
d. The requested video should be telecasted.
e. By this method we avoid long time buffering of the video while playing as we the user, use the Internet medium to view the live streaming.

In This paper, our contributions are multi-folder, including

- We formulate Self-Similarity matrix [2] experience to monitor user watching behaviour experience across TV and any hand held devices. The main objective is to minimize the monetary cost of operating the video teleportation service by migrating the cloud clone [9] and shifting the cache to the best location when the user teleports to new device or shifts to new destination.

- Under this framework we user the concept of Video tag which has the feature of **Auto buffer** and **Auto play** used to play the video at instance whenever you teleport the data to a new device.
- Finally we have proposed **Advanced Q-learning** [10] method to effectively place the transmitting device so that the live streaming of data reaches the Edge node user effectively.
- Thus compared to existing system, the method we have reduced about 25% of operational cost [1] and also reduced the time taken for teleporting the data.
- It also reduces the burden of server by creating a duplicate copy of the live streaming channel [5] without cloning in the server.

These insights would offer guidelines to deliver cost and time reduced effective multi-screen social TV experience over traditional method.

Related Works

This section surveys the related works on multi-screen social TV, adaptive video streaming, and cost minimization studies in the context of cloud based system.

Increasing Efficiency by Voice Authentication

In the Existing method we are using is Authentication via **user id /session id** and **Password**. It takes some amount of time for the user to enter the password and user id. In this time gap user can miss the important scenes in the program. So in order to avoid the drawback in existing method, we have provided a way to reduce time using Voice authentication. First time when the user signup, the password is set and each time when user tries to teleport, the current password is compared with the existing one stored in cloud and result is found out. Thus this reduces the time in teleporting to a new device.

Dispatcher is the one which transmit the user request to same server proxy for each and every time. So each time authentication process is not required .The major advantage of this project is **safety** and **security**, where in existing model whoever has the scanning application, can access the video that is being telecasted. In comparison to the existing model, proposed system is more secured in the way that only the authorized user can access the video.

Zee box application for social interaction

This application is used to provide training information regarding the theme of the story, its characteristics and the rating that is been provided by sites such as IMDB for the channel/video that is requested by the user. Thus a user before subscribing for any video can access this application and check the rating for each and every channel. Hence by this method it avoids unwanted cost that is being spent by the user.

Second screen application

This Application is being used when a person is watching a particular channel. For e.g. – when a user watches a football match and he decides to buy related stuff related to particular team which is currently playing, he can buy their related stuff at a ease.

He can just teleport to his secondary device and while teleporting the channel, he is shown an additional feature insisting him to connect with second screen application.

Second screen application is an **e-commerce** link where the cloud company acquires a tie-up with an e-commerce company, automatically the related stuff are displayed. Hence user can easily buy the related products. Thus this method avoids wastage of time for searching the products and sometimes due to additional complexity people won't be able to find it.

Setting up newsrooms

It is a process of sending Live Notification messages about a video being telecasted. Hence if the user has an interest over the show he can typically view the channel at the time prescribed instead of missing the event.

System Overview

This section first introduces the system implementations and then we focus on three system models, we formulate the minimum-cost cloud clone migration problem using SSMA and finally we provide future works associated with the cloud social TV.

System Architecture

We present a systematic end view of our cloud multi-screen social TV system. The system is built upon CCMN architecture [5], which provides on-demand live streaming video services, including content distribution via cache, media processing and content adaption over to any devices. End users with different devices are connected via residential gateways and networks to the cloud.

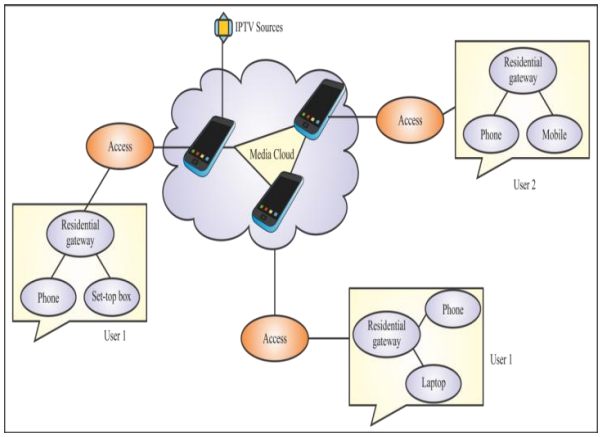

Figure 1:

User can request a live or on-demand TV program from a cloud source via virtual overlay content delivery network (CDN) [7]. Under this framework, the cloud resources can be dynamically operated in different servers (i.e., cloud nodes) on top of the overlay network, based on subscription of the user. Such cloud based CDN

paradigm has also been offered by a list of cloud service providers to operate media services in a more efficient manner, than the traditional CDN solution. In the traditional model whenever you teleport the data a duplicate clone will be produced in the server. Assume the server capacity can hold up to 10,000 users. When each user is teleporting to a new device it creates 20,000 copies and 20,000 session-ids, thus this increases the burden of the server. In order to avoid it we use the concept of **video tag**.

Key feature

Our system offers a highly-touted multi- screen experience via video teleportation. With this feature, one user can simultaneously operate multiple devices [4] (e.g., TV and Smartphone) and freely migrate video session back and forth from one device to another without any interruption [6]. As a result, the users can always stay connected to TV programs and social media.

Cloud Clone

This enabling technology for video teleportation is to deploy a cloud clone as shown in for each user. Specifically, every user is represented by a **Virtual Machine** (VM) [4], which serves as a proxy in the cloud to manage all the associated devices and real-time session information (e.g., on- going programs, information about the active devices, the updated viewing history, and most recent live video segments.

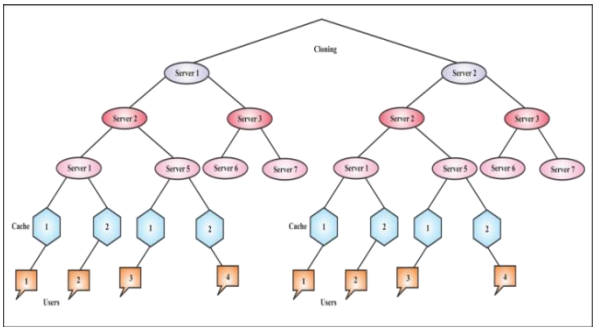

Fig. 2

The location of cloud clone plays an important role on the cost of operating video teleportation. Specifically the target stream size changes as the user moves around or shift sessions from one device to another. It leads to the changes in transmission cost and location, which further depends on the cloud clone location along the delivery path from the source to the user. Thus, there is an opportunity to reduce the operational cost by migrating the cloud clone to its best location.

Concept of Video Tag

The concept of **video tag** rewrites the code with HTML-5. The html5 language has an inbuilt feature of video tagging. Here we first capture the teleporting device with the

help of trusted device concept. For e.g. If 4 to 5 devices are registered with the cloud proxy then tagging can be done with those 4 to 5 devices. In the existing method when you clone for the new device, duplicates copies of session id will be created for each and every device. So it accommodates a lot of nodes in the server and it cause a burden to the server, but with the help of video tagging concept, we can teleport to many device with same session id.

The IMEI and IP address of the teleported device is added to the source code of video tag and thus videos are displayed without any delay to new device.

Video tag has an additional feature of **Auto play** and **Auto buffer**. When user gives request for teleportation, automatically the video tag fetches the remaining video that is left for streaming onto the buffer and starts playing to the teleported device at instance. Thus by this method we can instantiate playing to the new authorized device at instance.

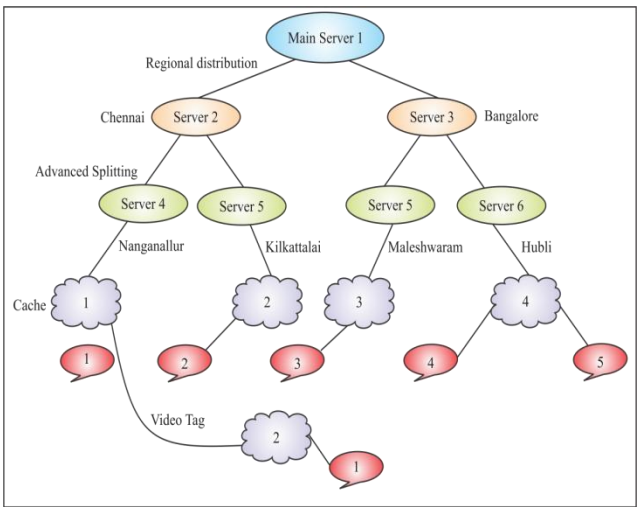

Figure 3:

System Models

In this subsection, we present three system models to drive the problem formulation on minimizing the operational cost on support the video teleportation feature.

a. Content Processing Model

In this paper, we assume the cloud clone performs two content processing functions, including advertisement insertion and video transcoding [1]. Through these processing procedures, a content of size will be changed to in the following two cases.

Case1: **Bo <= Bt**

When the user consumes the data on a bigger screen (e.g., TV), the display would be smaller than the teleported stream size. In this case, the cloud clone inserts a few preloaded video advertisements, by first picking the related advertisement video based on recommendation algorithms such as GCT algorithm, then combining the selected

video overlay with the targeted quality to the original content finally, the combined video streaming is delivered to the end user. Process of **uniform scaling [3]** is used to enhance the size of the display.

Case2: **Bo >= Bt**

When the user is consuming the content on a smaller screen (e.g., Smartphone), the teleported device would be larger than the original device.. In this case, the cloud clone transforms the original content into an appropriate format with much smaller resolution and lower bit rate,. As a result, regardless of the inserted advertisement with small resolution and low bit rate, there targeted stream size is still much smaller than the original one. Process of **inverse scaling [3]** is used to relocate the size of an image.

b. Self similarity matrix

Predicting the next request of the user as the user visits the web page has gained importance and predicted in the paper. In this method we use **high order Markov** model. In **lower order Markov [10]** process it does not capture the entire process and it is also difficult to find two kinds of information. We cluster user session based on pair-wise similarities [10] and display resulting cluster using click stream.

The user sessions are clustered based on the similarity of the user sessions.A recommendation set consists of 3 different pages which user is not visited is produced using best matched user sessions.For the 1st 2 request of an active user session all clusters are explored to find the one that best matches active user session.For remaining request the best matching user sessions is found by matching the highest N cluster value.

Thus we propose a method for calculating the similarities between all pairs of user sessions considering the order of pages. The distance between each page is considered since similarity between 2 user sessions. It also reflects the distance between identical pages as measured by no of user requests for the same page at the same time.

Here it eliminates the use of many algorithms such as Markov Chain. Here Grouping of Nodes is done based on 5 categories

1) User preference of videos.
2) Location of the streaming of channel.
3) Usage pattern of each and every individual.
4) Length of the video based on usage.
5) Quality of the video.

1) User preference – Preference of the user in watching the video. Some user may prefer watching football, other may prefer watching music related stuff.
2) Location of the Node – This refers to place where they reside. Setting up a common place for all the nodes in a network.
3) Usage pattern – Pattern in which they use, some prefer watching TV during nights and some may prefer it watching early morning.

4) Length of the video – Some people may prefer watching a particular video for a longer period of time and some may prefer watching the video for short period.
5) Quality of the video – Some may view the video at higher pixel rate and other may not.

Table 1:

	P1	P2	P4	P5
P4	**2**	**3**	**0**	**3**
P3	**-1**	**0**	**1**	**4**
P2	**-1**	**-2**	**4**	**5**
P1	**-4**	**3**	**2**	**5**

This matrix shows the relationship between different users. If two or more users are related with all the above 5 criteria then they are grouped together and data is transmitted effectively. The negative sign represents users are not related with each other and they are grouped in different network. Thus by this way the nodes are effectively grouped together and live streaming of data is done effectively.

c. Advanced Q-learning

It is a process of deciding where the cloned node should be placed so that data reaches the user efficiently. If the node is placed at a longer distance then the data reaches the user at a delayed rate .Hence it uses the concept of Scalable Media technique. Here data is first transferred using Base layer. Based on user preferences and signal strength additional layer are being added to enhance the quality of display.

d. Moore graph

It finds the exact location where the cache should be placed [7]. It first draws an imaginary graph surrounding the node. It finds the exact position where the device as to be placed so that when you transmit the data it propagates equally in all directions.

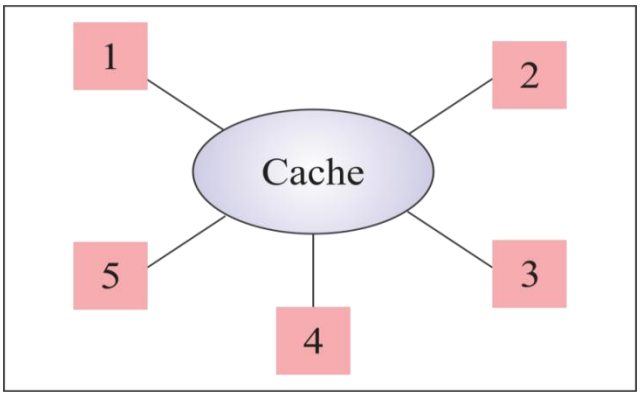

Figure 4:

Security

There is an issue in security in the existing system. the major issue in this is anyone can teleport the video which is telecasted in the TV to their mobile device. To avoid this method which we are going to introduce is the usage of authentication process. In this authentication process there are two options which will be displayed on the screen which the TV is scanned. The options are

- Trusted Device
- Friendly Device

a. Trusted device

Whenever a device scans the TV the information is sent to the proxy. The main objective of the proxy is to identify whether the device is already registered or not. If the device is not already registered a series of authentication process takes.

The major steps that are in the authentication process are.

1. Request the server for teleportation of the video
2. Check whether the device that is trying to access data is authenticated or not
3. If the device is not authenticated the invoke operation is used to start the registering process
4. The authentication process begins in the device which is requesting for authentication
5. Once the authentication is completed the session is established to the device
6. The result of the authentication is obtained as a result of response.
7. This step is used to check whether the correct device is accessing the data or not.
8. This step is done to check the device and the medium in which the video is teleported
9. Once the authentication is completed the invoke operation begins. The invoke operation invokes the teleportation.
10. Once the authentication is done the response is sent to the server.
11. The response that is obtained by the server is sent on to the mobile device for teleportation.

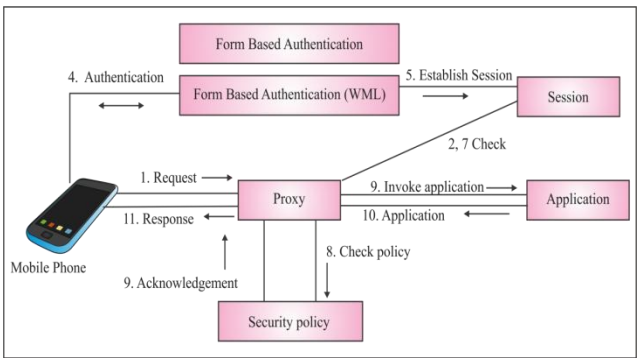

Figure 5:

Form based Authentication (WML)
Initially the data about the device is sent on to the form-based authentication (WML).This method takes place when the authentication process takes place via mobile. This is a Form Based Authentication the user is made to fill the details by means of editable form. The user name Password entered by the user is stored in the proxy along with this the IP address of the mobile is also stored. Thus when the user log in for the second time the server identifies the IP address of the mobile and so no authentication is needed.

Security policy
It contains details about list of devices and list of gateways and medium to access the data. Thus each time when a data is requested cloud compares with security policies and grand permissions.

Friendly device
This friendly device concept is used when a new user wants to view the video in his or her mobile and authentication should not be given to the new user. In such a case the friendly device concept is used. When the option is selected as a friendly device the specific mobile device is given a particular session to access the video. The connection between the server and the new device expires when the user divides to quit the application. This is the concept which is followed in friendly device concept.

Comparing with existing method

For comparison purpose, we regard the markov chain algorithm the standard method adopted by existing social TV. In addition, we also consider greedy algorithm inspired by, where the cloud clone always migrates to its best place once the user switches the active device. Now we compare the performance of our Advanced Q-learning based algorithm with those two existing algorithms. First, we find the proposed Q-learning method out performs the existing one in all the fields. This proves the effectiveness of our approach. Secondly, we compare the Self Similarity matrix with markov chain process. The self Similarity Finds the efficient way and also reduces the cost of transmitting the data.

Conclusion

This paper investigated the problem on minimizing monetary cost via cloud clone migration in multi-screen cloud social TV system. We formulated it as a Self-Similarity Process, to balance a trade-off between the transmission and migration cost [7]. Under this framework, we first considered a matrix where similarities between devices are found out and base on it grouping of edge-nodes are being done. We then proposed a Video-tag method and a more practical Advanced Q-learning method. We use both simulated data and real user traces to evaluate all the four algorithms. The results indicated, upto 25% monetary cost compared to traditional method [1]. The cost savings can be affected by the delivery path length, the VM migration size and

the user behaviour pattern. Moreover, we also found the optimal cloud clone location is either at the nearest or the furthest node to the user. Those insights would offer operational guidelines to deliver cost effective multi-screen social TV services over CCMN, potentially easing its adoption. We also proposed a method of reducing server's burden by just creating only one session-id but displaying the same video in multiple devices and also increasing the efficiency of delivery data at a quicker rate.

Future Work

The cloud social TV has provided a new dimension in TV experience. This uses cloud storage as a transmission medium. Since cloud resource is used to provide multiple resources at the same time, it can provide as a resource for connecting with E-Commerce website at a ease. While playing a channel, this can provide as a medium for connecting with E-commerce website to buy related stuff relating to the theme played in the channel, thus this method provides efficient way of purchasing the good at a ease and also reducing the complexity of searching the particular product that is requested by the user.

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