Performance Model for Media Streaming Bandwidth Allocation using p2p

K.Saranya, S.S.Rajasekar, C.Ramesh, M.Alamelu

Abstract*: Media streaming applications are becoming quite popular in the Internet due to the enhancements that are taking place in Internet Protocol (IP) networks to support the required Quality of Service (QoS) for multimedia applications. However, the centralized data center approach or a single Internet Service Provider (ISP) handling the load on its own is not a feasible solution to support the ever increasing number of users. In other words the conventional way of supplying the media content to the users suffers from scalability problem. This system follows the arrangement of a set of Internet Service Provider (ISP) that collaborate among them to utilize their resources optimally. This helps the content providers and the viewers to provide and view the videos without the bottleneck that may be caused by the centralized approach. Moreover the ISPs follow a non-linear time tariff pattern where it is necessary for the customers to pay a predetermined amount to the ISPs irrespective of the usage pattern. In this approach it is difficult to decide the time and the amount of bandwidth required optimally. However, the non-linear time tariff model permits the discount scheme. Hence this system follows the Prediction Based Resource Allocation (PBRA) algorithm that helps the ISPs to allot the right amount of bandwidth at right time to the content providers. The prediction based resource allocation algorithm and the collaborative approach among the ISPs help the ISPs and media providers to solve the scalability problem. However, a typical pay per use model cannot support any discount scheme. Hence, in this project work a hybrid approach has been followed

***Keywords* : Media streaming, Internet service provider, Resource allocation**

I. INTRODUCTION

1.1 MEDIA STREAMING

Recent development in media streaming applications has a tremendous growth. The streaming of data over the Internet is an expensive service in spite of resources since it requires high bandwidth. Users expect high definition videos from media streaming and this requires Quality of Service (QoS) guarantee from the providers. In multimedia services, Streaming media is sent over a network and played as it is being received by the end users, i.e. users do not need to wait to download the entire content. The video streaming sites like YouTube, hulu etc have become quite popular now- a-days. For such bandwidth intensive applications it is necessary to follow the suitable approach that is able to deal with the ever increasing demand from the customers.

However, providing the bandwidth is the responsibility of the Internet Service Provider (ISP). It is necessary for the ISPs to come up with an efficient bandwidth policy to ensure that the available bandwidth is effectively shared among the customers. In peak time, usage of bandwidth is higher, but in non peak time the requirement for the bandwidth is less. Hence, if the content provider provides the bandwidth by considering the peak hour demand, the upfront investment cost shoots up exponentially and during the non peak hours the resources are underutilized. Hence, the media providers can have a tie up with a set of Internet Service Providers (ISPs) who collaborate among themselves. The collaborating ISPs deploy intelligent decision support systems to allocate the required bandwidth to the customers optimally.

1.2 PEER TO PEER ON DEMAND MEDIA STREAMING

In spite of the fact that the interest forecast for CPU use and web applications have been considered for a generally extensive stretch of time, the expectation of required bandwidth for media streaming has picked up popularity recently.The access behavior of clients inpeer-to-peer (P2P) streaming will be predictedwith time-arrangement examination procedures utilizing non-stationary time-arrangement models. Even though the vast majority of the above investigations anticipate the averagestreaming limit requests. Just couple of works has been done to examine the issues likethe unpredictability of the limit request, the demand variance at any future point in timeetc. Moreover they do not focus on prediction of streaming bandwidth. The work issue has been planned by considering a given probability distribution function of expectation of future interest for streaming bandwidth. Notwithstanding request expectation for resource reservation, the proper joint reservation of resources is needed to increase the bandwidth utilization. The framework additionally incorporates with an adaptive resourcestipulating plan that optimizes the bandwidth utilization to satisfy the required levels of QoS. Everyday expenditure is also reduced by the service provider due to the bandwidth utilization.

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1.3 DELAY NATURE AND PROVISIONING PLANS

The postpone delicate nature of media streaming activity presents remarkable difficulties because of the requirement for ensured throughput (i.e., download rate cannot beless than the video playback rate) with the end goal to empower clients to easily watch video content on-line. Thus, the media content provider needs to allocatebandwidth in the ISPsuch that the demand for streaming limit can be supported at any moment of time. Most widely usedtype of streaming resource stipulating plans offered by manyservice providers arebased on resource reservation The pre- reservation plan, is allocating the resourcesin advance by the media content providerbased on the request received by the client.Fundamentally the reserved resources are the bandwidth provided by the service provider to convey assurances to the customers of the media content provider as indicated by the settled upon QoS parameters. On-demand plan is also additionally offered by the service provider which allows media content provider to buy the needed resource. However it is difficult, if not impossible, to implement discount scheme in the on demand plan.

1.4 HYBRID APPROACH

Consolidating the attractive highlights of both the plans prompts a hybrid methodology. This segment depicts aalgorithm for this hybrid provisioning approach that gives the advantages of time rebate offered in the reservation plan and the adaptability of pay per utilize plan. Whenever they offer both the reservation plan and the on demand plan, the media content supplier can hold the resources formore productively. This methodology is called as cross breed resource provisioning. This methodology disposes of the over-provisioning cost and the under-provisioning issue that may happen when utilizing the reservation plan. This methodology likewise takes out the powerlessness to execute alluring rebate plans when utilizing on interest/pay per utilize plot.

1.5 PREDICTION BASED RESOURCE ALLOCATION

The streaming capacity for the on demand resource allocation prediction based algorithm is designed to reduce the risk of wrong allocation of resourcesthis algorithm minimizes the financial expense of the resource reservation and maximizes the discount offer rate.Besidesminimizing the money related cost, the plan additionally while ensuresthat adequate resources are saved in theservice providerwith some dimension of trust in probabilistic sense.

II. LITERATURE SURVEY

This paper discusses the related works in conventional central server based media streaming and peer to peer on demand media streaming. Another area covered in this chapter is the prediction of resources, especially the bandwidth that enables the service providers and media content providers to offer the media streaming services at a reduced cost.

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2.1 CENTRAL SERVER-BASED SYSTEMS

Xu et al. (2006) have proposed a hybrid approach for CDN and P2P media streaming distribution. This model reduce the reservation cost without compromising the media quality. The contribution policies for P2P requested data has been proposed with limitations.

Huang et al. (2008) have quantified the gains obtained by hybrid CDN-P2P approach. At first topologies of CDN networks has been mapped with the measurement methodology, then they work with ISPs to localize traffic within the regions. These two were traced with the real world problem on video-on demand trace and large-scale software updates. This approach cost effective, while sharing the location within the regions. They have focused on measurement techniques of hybrid architecture and they have not included a detailed description for the design of a CDN-P2P hybrid mechanism.

2.2 PEER-TO-PEER VIDEO STREAMING SYSTEMS

Y. Liu et al. (2010) has proposed a live video streaming application which gains more popularity among the users. The P2P also provide the attractive solution for the live video streaming schemes with many deploy mental issue over the internet's. This also reduces the cost and increase the scalability from the multi cast IPs to Bit Torrent like abundant to scattered hash tables values. The provision of critical design choice from the future designers has their impacts on the system performance. The main objectives of a P2P live video streaming system is to distribute the packets from the source peer and the collective paths through which a packet traversal from the tree.

2.3 DEMAND FORECAST AND PERFORMANCE PREDICTION IN PEER-ASSISTED ON-DEMAND STREAMING SYSTEMS

An Auto-regressive Integrated Moving Average (ARIMA) model has been introduced to predict the population evolution in video streaming systems (Niu et al. 2011). They have proposed ARIMA models to predict non-stationary demand evolution at a fine granularity. However, most existing forecast methods for video demand assume a constant forecast error variance, and thus provision a constant amount of resource cushion for quality assurance.

D. Niu et al. (2011) have observed that the on-demand streaming services for peer-assisted system is suitable for the large scale distributed system. The proposed system controls the quality of the sufficient server bandwidth to increase the performance prediction. An automatic demand forecasting technique predicts the online population based on the learning acquired from the human factors and system dynamics from the online measurements. This system is evaluated based on the large dataset from the commercial internet based video on demand system.

III. PROPOSED SYSTEM

The objective of this project is to devise a framework that supports efficient media streaming applications with the required Quality of Service(QoS).

The major focus of the system is to manage the bandwidth resources, so that end users are able to view the media in a cost effective way. Figure 3.1 shows the bandwidth allocation framework of the project work. Media viewers or the end users forward the request to the media content provider. The media content provider examines the request made by the viewer and it sends the request for the desired bandwidth to the federation of the Internet Service Providers. These ISPs are located at different geographical locations. And they collaborate among themselves by applying a prediction based bandwidth allocation algorithm to estimate the required amount of bandwidth. The estimated bandwidth is reservedon behalf of the mediaprovider so that the tariffto be paid by themedia viewer to media provider andthe tariff to be paid by the media provider to the ISPs are minimized.

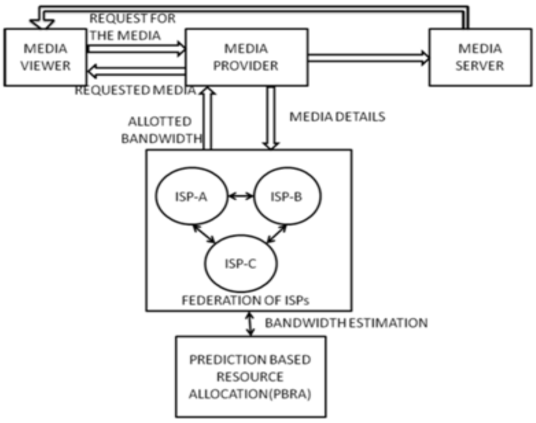

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Figure 3.1: Bandwidth Allocation Framework

3.1 MODULEDESCRIPTION

3.1.1 ResourceAllocation

Once the request arrives from the resource allocation on behalf of the media provider the resource is allocated by means of grouping of the service providers. If the bandwidth is the only resource which explore into the relationship among the services provider and the CDN. The service provider guaranteed the data rate for the media content provider which is situated in the different regions. The multiple data centre has a connection provider to access the networks inside the service provider to locate the appropriate locations.

3.1.2 Charging Scheme and Tariffs

The service provider is charged for the resources reservation made by the media provider. Once the request is processed by the media provider it cannot be revoke, cancel or change the requested resources. Therefore, it required time series reservation time for the allocation of resources in the ISPs.

3.1.3 On Demand Resource Schema

The future demand Prediction is required to optimize the reserve resources for the media provider. As a special case the functions of on demand future streaming video channel has been formulated analytically. Specifically, a private network locates the VoD provider for the video channel available for streaming the demand media.

3.1.4 Resource Provisioning

Resource provisioning plan offered by service providers in this project work is referred to as on-demand plan. The plan allows the media content provider to purchase resources upon needed. The services provider resource based reservation offers many on-demand plans for the streaming resource provisioning plan based on pricing model. With the reservation plan, the media content provider allocates (reserves) resources in advance and pricing is charged before the resources are utilized (upon receiving the request by the service provider, i.e., prepaid resources). The Internet Service Provider (ISP) has to allocate the bandwidth for the media content provider can deliver the media to the content viewers at the desired rate. The desired rate depends on the agreed Quality of Service (QoS) parameters. However the flexibility of on demand provisioning is not possible in resource planning. Hence a hybrid approach is followed for provisioning resources.

3.1.5 JMF API

The improvement of media streaming framework comprises of one station as a media server and alternate stations as customers. The programming language used to build up the application programs is Java Media Framework (JMF) as a result of its sight and sound abilities. JMF is an augmentation of Java language and it offers a start to finish arrangement, beginning with the production of sight and sound introductions and permitting their on-request transmission. It is an Application-Programming Interface (API) for consolidating time sensitive media into Java applications. JMF is developed by Sun Microsystems, Intel Corporation, Silicon Graphics and IBM. The jmf library has the following jar files and required libraries for this project are 1) jmf.jar 2) sound.jar 3) customizer.jar 4) mediaplayer.jar and 5) multiplayer.jar.

3.2 MULTIPLE DESCRIPTION CODING

One of the capable solutions for live video delivery over lossy networks is MDC. This coding technique fragments a single media stream into n sub streams with referred hash values. MDC can be seen as another way of enhancing error resilience without using complex channel coding schemes. Once one or more hash value received from the different provider to the receiver, there is a chance of packet loss while displaying the content. The corresponding packets which represent the lost packet will be available in another packet and decoded successfully.

3.3 FLOW DIAGRAM

Media provider has to upload the video file into the Internet so that the media viewer can view it. For this, the media provider has to check the available bandwidth with the federation of ISPs. If sufficient bandwidth is available then the media provider has to store the requested media in the servers that are physically close to the media viewer. However the servers should be able to satisfy the QoS parameters. If the media provider is not able to get the required bandwidth from the federation of ISPs then it has to wait till the federation is able to allot the requested bandwidth.

Figure
3.2 shows the sequence of events.

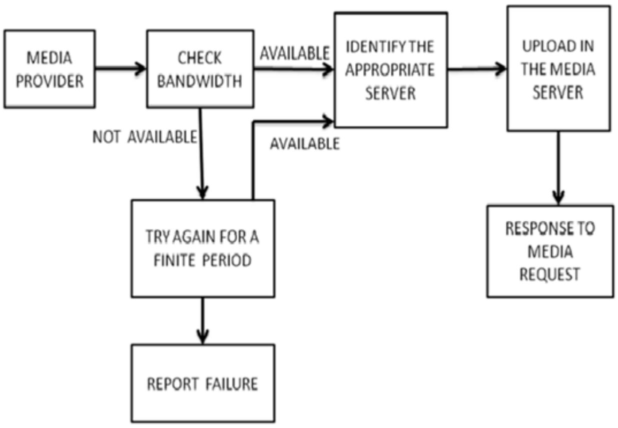


Figure 3.2:SequenceofEvents

3.4 PBRA ALGORITHM

In the PBRA algorithm, if the client has no limitation, it works on save bandwidth upstream service provider. Here, end-user act as a sender and server act as a receiver which stores the chunk values. This algorithm enables the prediction size by sending several successive prediction commands.

3.4.1 Receiver based Algorithm

Algorithm 3.4.1 predAttemptAdaptive()
Input:Set to a minimal value
Output:Receiver increases the virtual window with each prediction
success
1: code for Adaptive
2: if RC() ∞ sent P then 3: if RC() = P then
4: PS.Exponent()
5: else
6: PS.Reset()
7: end if
8: end if
9:if RC = signature cache then 10:if found Chain(FC) then 11:Set P = PS
12:send TCP ACKs with all P 13: exit
14: end if
15: else
16: store FC 17:Set FC = current C 18: end if
19: send TCP ACK only

Algorithm 3.1 isperformed at the receiver side. The code from lines
2 to 8 describes PRED ACKbehavior when a data segment arrives after its prediction was sent and the virtual window is doubled.

Algorithm 3.4.2 processPredAckAdaptive()
Input:Receiverreads the data from the local chunk store
Output:Piggybacked with the new prediction
1:for all offset € PRED-ACK do
2:∑ D € Disk
3∑ D ∞ TCP input buffer
4: end for
5: code for Adaptive
6: PS.Exponent
6: predSizeExponent

Algorithm 3.4.2 .illustrate the successful transaction (PRED-ACK) from the sender. If the receiver understand the data from the local chunk store, then it increase the value by 1 and sends the next TCP ACK, piggybacked with the new prediction. Finally, the virtual window is doubled.

3.5 Hybrid based Algorithm

Algorithms 3.4.1 and 3.4.2 achieve the desired enhancement. An additional command (DISPER) for dispersion is introduced.Using this command, the receiver periodically sends its estimated level of dispersion, ranging from 0 for long smooth chains, up to 255.

Algorithm 3.5.1 Receiver Segment Processing Hybrid
Input:Video files are readfrom the chunk store
Output:Send the prediction segment to users
1:if segment carries payload data then 2: calculate chunk
3:if reached chunk boundary then 4:code for Hybrid
5:if detected broken chain then
6: calcDispersion(255)
7: else
8: calcDispersion(0)
9: end if
10: end if
11: elseif PRED-ACK segment then 12: processPredAck()
13: activate predAttempt()
14: end if

Algorithm 3.5.2 processPredAckHybrid()
Input:Receiver reads the data from the local chunk store
Output:Process the data in TCP stack and send back the PRED-ACK to the users using dispersion command
1: for all offset € PRED-ACK do 2: ∑ data € disk
3: put ∑data ∞ TCP input buffer 4:for all chunk offset do
5: calcDispersion(0)
6: end for

IV. RESULT

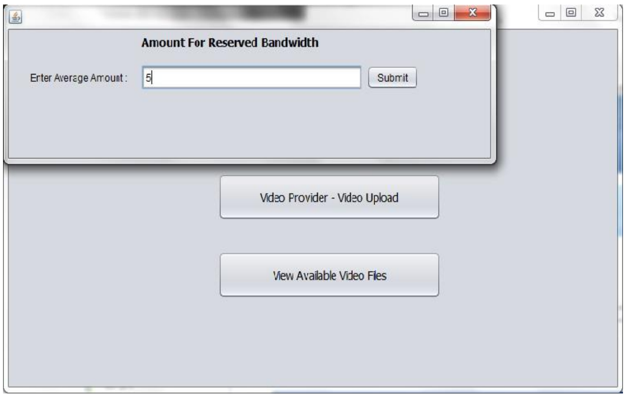


Figure 1:Amount of Reserved Bandwidth

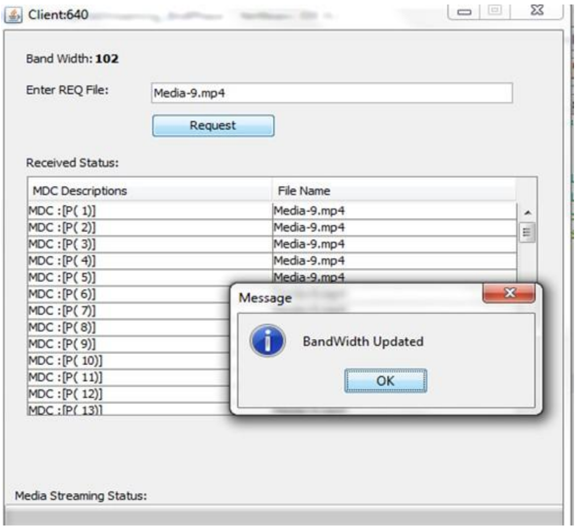


Figure.2: Media File Request

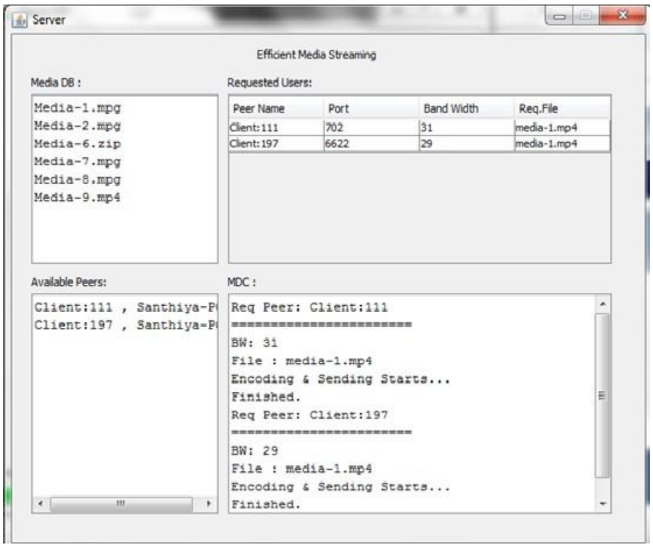
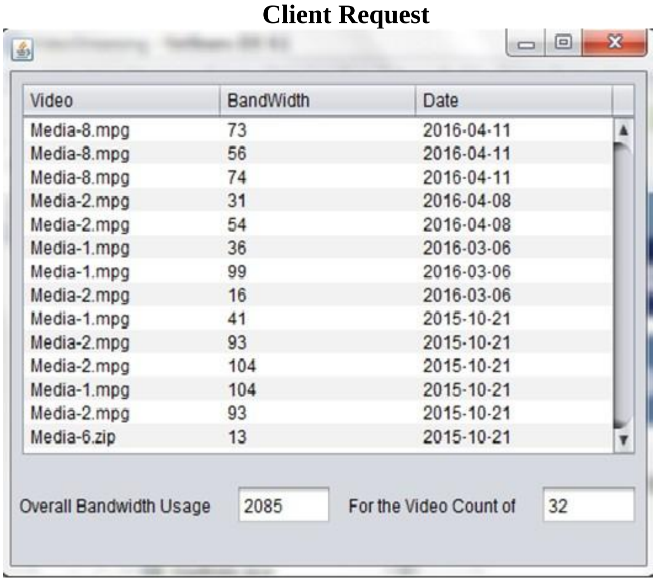


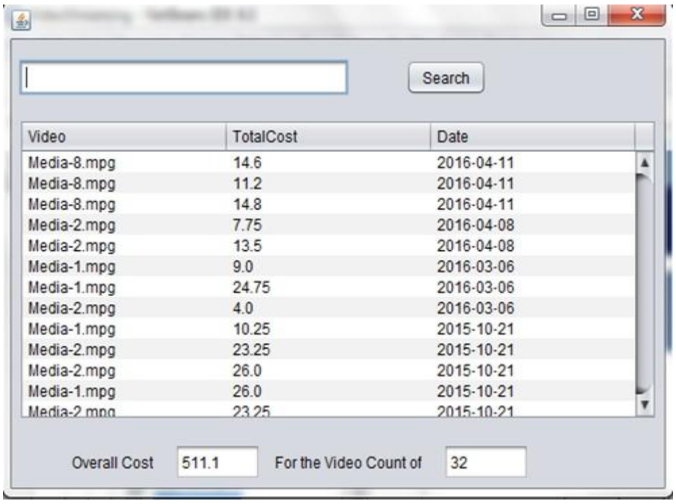
Figure 3: Efficient Media Streaming with Multiple Client Request



Video	BandWidth	Date
Media-8.mpg	73	2016-04-11
Media-8.mpg	56	2016-04-11
Media-8.mpg	74	2016-04-11
Media-2.mpg	31	2016-04-08
Media-2.mpg	54	2016-04-08
Media-1.mpg	36	2016-03-06
Media-1.mpg	99	2016-03-06
Media-2.mpg	16	2016-03-06
Media-1.mpg	41	2015-10-21
Media-2.mpg	93	2015-10-21
Media-2.mpg	104	2015-10-21
Media-1.mpg	104	2015-10-21
Media-2.mpg	93	2015-10-21
Media-6.zip	13	2015-10-21

Overall Bandwidth Usage 2085 For the Video Count of 32

Figure 4: Overall Bandwidth Usage

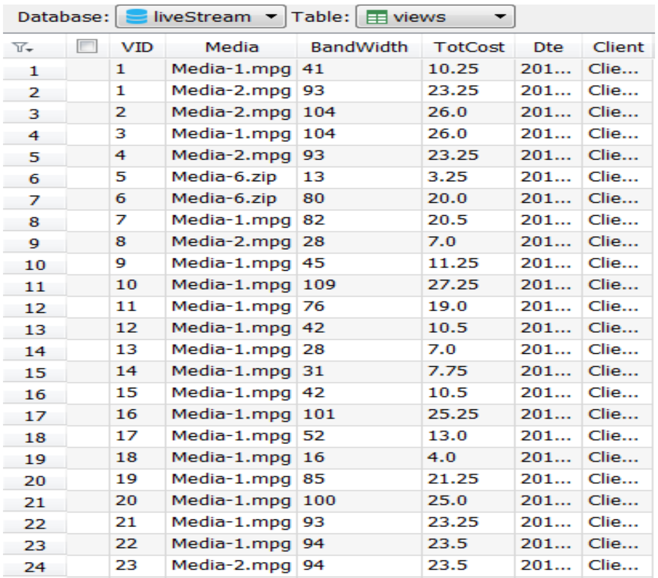


Search

Video	TotalCost	Date
Media-8.mpg	14.6	2016-04-11
Media-8.mpg	11.2	2016-04-11
Media-8.mpg	14.8	2016-04-11
Media-2.mpg	7.75	2016-04-08
Media-2.mpg	13.5	2016-04-08
Media-1.mpg	9.0	2016-03-06
Media-1.mpg	24.75	2016-03-06
Media-2.mpg	4.0	2016-03-06
Media-1.mpg	10.25	2015-10-21
Media-2.mpg	23.25	2015-10-21
Media-2.mpg	26.0	2015-10-21
Media-1.mpg	26.0	2015-10-21
Media-2.mpg	23.25	2015-10-21

Overall Cost 511.1 For the Video Count of 32

Figure 5: Overall Cost



Database: liveStream Table: views

	VID	Media	BandWidth	TotCost	Dte	Client
1	1	Media-1.mpg	41	10.25	201...	Clie...
2	1	Media-2.mpg	93	23.25	201...	Clie...
3	2	Media-2.mpg	104	26.0	201...	Clie...
4	3	Media-1.mpg	104	26.0	201...	Clie...
5	4	Media-2.mpg	93	23.25	201...	Clie...
6	5	Media-6.zip	13	3.25	201...	Clie...
7	6	Media-6.zip	80	20.0	201...	Clie...
8	7	Media-1.mpg	82	20.5	201...	Clie...
9	8	Media-2.mpg	28	7.0	201...	Clie...
10	9	Media-1.mpg	45	11.25	201...	Clie...
11	10	Media-1.mpg	109	27.25	201...	Clie...
12	11	Media-1.mpg	76	19.0	201...	Clie...
13	12	Media-1.mpg	42	10.5	201...	Clie...
14	13	Media-1.mpg	28	7.0	201...	Clie...
15	14	Media-1.mpg	31	7.75	201...	Clie...
16	15	Media-1.mpg	42	10.5	201...	Clie...
17	16	Media-1.mpg	101	25.25	201...	Clie...
18	17	Media-1.mpg	52	13.0	201...	Clie...
19	18	Media-1.mpg	16	4.0	201...	Clie...
20	19	Media-1.mpg	85	21.25	201...	Clie...
21	20	Media-1.mpg	100	25.0	201...	Clie...
22	21	Media-1.mpg	93	23.25	201...	Clie...
23	22	Media-1.mpg	94	23.5	201...	Clie...
24	23	Media-2.mpg	94	23.5	201...	Clie...

Figure 6: Cost Allocation

V. CONCLUSION

The resource allocation problem is analyzed conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

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