Multilevel Caching In Carrier Core Network

[1]Ashwinee Chavan, [2]Prof. Vilas S. Gaikwad
Department of Computer Engineering JSPM NTC, Pune,India.

Abstract- *The work under consideration aims to increase the video capacity and user experience of mobile networks by caching videos at the gateways of the core network in distributed manner. Content delivery network can store the millions of videos over relatively large size caches. This causes the delay in video streaming and impact adversely on the user experience on mobile devices. To avoid this drawback of CDN, the system proposes RAN-aware reactive and proactive caching policies that utilize the user preference profile of the users.*

In this work system presents a hierarchical caching of video contents in radio access network. The proposed caching technique improves cache hit ratio. Finally the proposed scheme results in the low end to end delay.

Keywords: RAN, Content Delivery network, Video aware Scheduling, hierarchical caching.

1. INTRODUCTION

Caching can give you more control of your resources, whether you run an extranet, intranet, or Internet site. Learn what hardware you need and what caching software to consider. Like the mass transit systems that move groups of people between popular destinations. Caching has the same for URL requests for popular Web sites. You can use Web caches to put users on the express track to their destinations.

Caching stores local copies of popular Web pages so users can access them faster. A cache system receive all the individual requests for a Web page and sends a single request as their proxy to the origin site, at a same time called the web service[4]. (There is difference between a Web cache and a proxy server. The later serves as bridge between network users and the outside world. A proxy server makes your outgoing network connection more self, but drawback is which is decrease minimum network traffic.) When the cache receives its copy of the contents, transfer them on to the requesting users.

Therefore, there may be a problem with enabling high cache hit ratio for the RAN micro-caches. This erodes the benefits of caching at the edge of the wireless network [1]. To solve this challenge existing system proposed novel caching policies based on the preference of current video users in a cell along with what videos are least likely and most likely to be viewed by the users [2]. The videos which cannot be found in RAN and need to be fetched from the CDN, for such cases a multilevel caching approach requests is used.

The proposed method is based on the video the hierarchical caching at the CN. The proposed hierarchical caching is much effective than the caching based on the most popular videos. We are not are of the caching policies based on the preferences of users in a RAN cell.

VIDEO PREFERENCE OF USERS IN A CELL SITE

We first reviewed previous research on video popularity characteristics and users video access patterns [3]. We lead to the conclusions that define our user preference- based approach for video caching.

- Popularity of Online Videos and Video Categories

Much study is done on the popularity of the online videos using empirical analysis, [1] also studied several characteristics of videos from popular online video sites such as YouTube and Daum. Overall popularity distribution and distribution within each video category correlate between age of a video and its popularity, and temporal locality of the videos.

- Cell Site Video Preference

In order to find the video popularity in the cell site, the proposed system defines the active user set of cell at any given time as the subset of users in the cell at that time may have an active video session. AUS changes as users enter or leave the cell site [1]. Related to UPP in which each individual user, which we define as the probability that the user uk requests videos of a specific video category ucj, p (ucj/uk) all available video categories [6].

CELL-SITE-AWARE CACHING ALGORITHMS:

Different caching algorithms have been proposed: MPV and LRU are used proposed system. Hierarchical caching approach is based on preferences of active users in a cell, P-UPP and R-UPP.

- A. MPV

MPV is a proactive caching policy used to cache the “most popular videos”. MPV does not updates the caches based on the user requests. Also it does not implement any cache replacement policy. The term of changes means it require cache update are change in the video popularity distribution [. The number of videos of cache depends on the cache size. The performance of MPV which is occurred in terms of cache hit ratio can be high if implemented for large caches possible for Internet CDNs.

- LRU

LRU is a reactive caching policy used to fetch the video from the Internet CDN and caches it if there is a cache miss. In case of cache is full the LRU replaces the video in the cache which has been least recently used. The micro-cache has cache hit ratio which uses LRU provide some facility which is depends upon overlap of the video requests of the active users in the cell and influenced by the degree of overlap of their UPP. Backhaul bandwidth and delay needed which gives the videos for the cache and which depends on hit ratio as there is no prefetching bandwidth.

- R-UPP

In our proposed work we proposed R-UPP as a reactive caching policy based on the UPPs of the active users in a cell. R-UPP caching algorithm fetches the video from the Internet CDN which are not present in the cache and caches it. In case the cache is full, R-UPP replaces videos inside the cache which feed UPPs of the active users and which is using the LLR set.

- P-UPP

We propose P-UPP as a proactive caching policy. In this policy it preloads the cache with videos that are most likely to be requested based on the UPP of the active users. Fig. 4 describes the P-UPP caching algorithm. The AUS changes due to user arrival or departure at the beginning. The video request probabilities are calculated, and then videos belonging to the Most Likely Requested set are loaded into the cache. If the AUS changes frequently proposed proactive policy in which high computational complexity and high backhaul bandwidth is achieve, for that reason, we propose a hybrid solution that update cache if the expected cache hit ratio exceeds a preset threshold.

2. RELATED WORK

Radio Access Network (RAN) have the base station, which is called as Caching of video. To ensure effectiveness of the massively distributed but their available minimum-sized RAN caches, unlike Internet content delivery networks (CDNs)[5] that can store millions of videos in a relatively minimum big-sized caches, we propose RAN-aware reactive and proactive caching facility which is use User Preference Profiles (UPPs) of active users in a cell.

Furthermore, we use new techniques called as scheduling techniques that, in conjunction with edge caching, ensure the end-to-end network which use the maximizing number of sequentially video sessions that can be supported by the end-to-end network.

RAN caches using UPP-based caching policies which is shown in existing system has drawbacks. The results in our proposed system also demonstrate that can significantly improve the probability using e.g. UPP-based RAN caches that video requests experience low initial delays. The CDN does not consider the problem of delay and capacity for video delivery in wireless network. In [10] authors find the effectiveness of the cashing most popular videos. Last recently used policy and combination of these two using traces is also proposed. The authors of [11] uses temporal similarities during different times of the day to improve the performance of LRU.

The paper [7] proposes a rank based caching technique using combination of video popularity along with the cost to the server and video size. This strategy does not address the problem of delay and video capacity in cellular network. The conventional techniques such as MPV and LRU consider large caches and may not be more effective for the smaller and distributed RAN micro-caches [8].

Research is done in the caching web contents in wireless network and on mobile devices. A study on traffic collected in a cellular network shows the benefits of caching data in the core network [11]. Many of these techniques does not consider the challenges of video caching and delivery. They also neglects caching at (e)NodeBs at the edge of the RAN [1]. A promising caching approach has been proposed in [9] which improve the video capacity of CNs. This approach uses most popular videos for caching.

3. PROBLEM STATEMENT

In proposed work we plan to extend RAN caching approach to hierarchical caching at the gateways of the core network.

4. PROPOSED WORK

In proposed work figure. 1 we plan to extend our RAN caching approach to hierarchical caching at the gateways of the core network to support mobility of users across cells and increase network capacity. In our proposed work we improve the mobility of users in cells. Also by using hierarchical caching we increase the hit ratio.

We will propose RAN-aware reactive and proactive caching policies which utilize User Preference Profiles (UPPs) of active users in the cell. This ensures increasing the number of sequentially video sessions that are supported by the end-to-end network with satisfaction of initial delay requirements and minimize stalling.

In existing video caching at the RAN to address congestion improves delay.

5. METHODOLOGY

They cause some issues:

1. High cache miss ratio because of small caches partially addressed by new UPP based caching.
2. Cache miss ratio at large extent due to user mobility.

In our proposed work, we develop new ideas for increasing cache hit ratio at CN rather than at CDN.

Hierarchical video caching in wireless cloud includes,

1. Relatively large caches at the CN nodes to supplement RAN caches.
2. UPP based caching policies.
3. QoE aware scheduling.
4. Extended framework.
5. Hierarchical video catching.
6. Hierarchical caching at gateway.

Hierarchical caching within the wireless network:

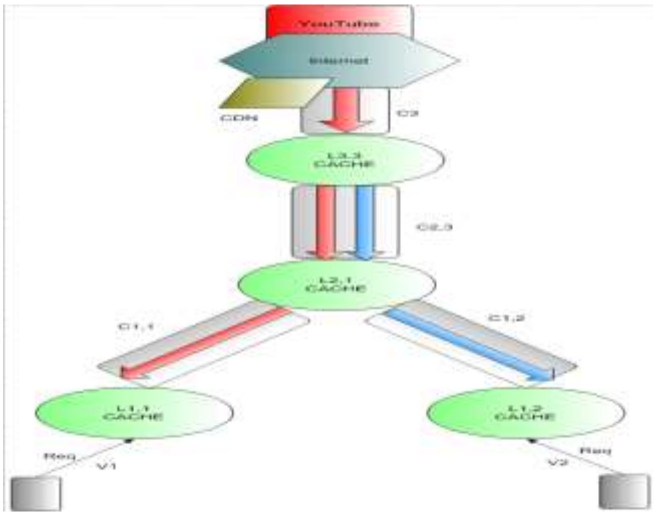

Figure 1. Proposed Architecture.

In our hybrid approach; each cache makes its caching decision independently based on its AUS, e.g. if AUS of L21 favors VC2 category, L21 caches more videos of that category. To improve coverage, intersections of all the 1st layer caches are removed from the 2nd layer cache. And it is suitable for mobility and improves coverage.

Policies for hierarchical caching:
Extended RAN-only UPP caching policies to higher layer caches. In the hierarchical settings, the union of all AUSs of the layer nodes is connected to each other and is defined as higher layer node.

H-MPV
-Each cache in the hierarchy stores videos according to the MPV ranking. A higher layer cache excludes the intersection of all the lower layer caches.

H-LRU
-H-LRU is defined as Hierarchical LRU is a straight-forward extension of the single-layer LRU. LRU has built-in exclusivity with no further optimization.

H-P-UPP
-Proactively caches video based on the UPP of the AUS of each cache. The parent cache is main cache and child cache is extended from parent cache.

H-R-UPP
-Reactively caches each video associated with a miss and the video is going towards the child node (leaf) in the hierarchy tree. Each cache on the way to the leaf decides whether to cache the video based on its AUS.
- LLR list is used to select candidate for eviction.

6. OBJECTIVE

Hierarchical video caching in wireless cloud includes,
1. Relatively large caches at the CN nodes to supplement RAN caches by keeping total cache size same.
2. UPP based caching policies extended to hierarchical caches.
3. QoE based scheduling of RAN backhaul and CN resources for video fetches from CDN.
4. To extend framework to include video requests from multiple cells, and mobility of users between cells.
5. Hierarchical catching of video contents in the CN to supplement RAN caches.
6. Hierarchical caching at the gateways of the core network to support mobility of users across cells and increase network capacity.

7. RESULT & DISCUSSION

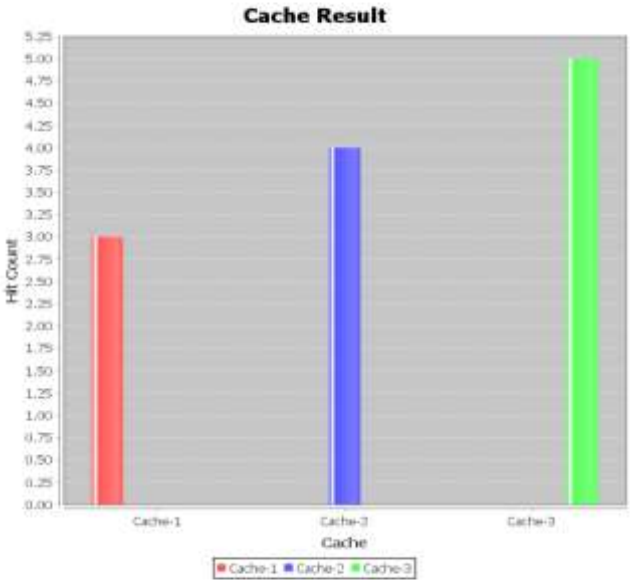

Figure2. Cache Result

Above fig. 2 shows the cache result. The graph shows relation between Hit Count and Cache. In cache-1 the Hit Count occurred 3, cache-2 the Hit Count 4 and the Hit Count of cache-3 is greater than above two cache.

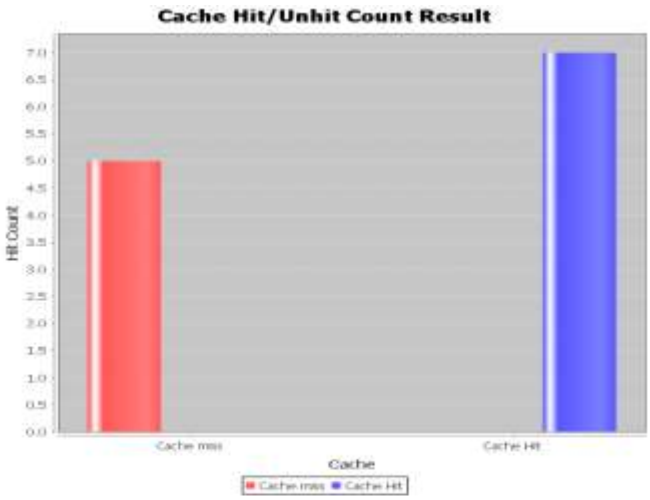

Figure 3. Cache Hit/Unhit result

Above figure 3 show the cache Hit/Unhit result. The graph shows relation between Hit Count and Cache. The graph show how many number of cache miss and cache hit is occurred.
Cache Miss:- Cache miss is a state where the data requested for processing by a component or application is not found in the cache memory.
Cache Hit:- A cache hit is a state in which data requested for processing by a component or application is found in the cache memory. So, the cache miss shows 5 hit count and cache hit shows 7 hit counts.

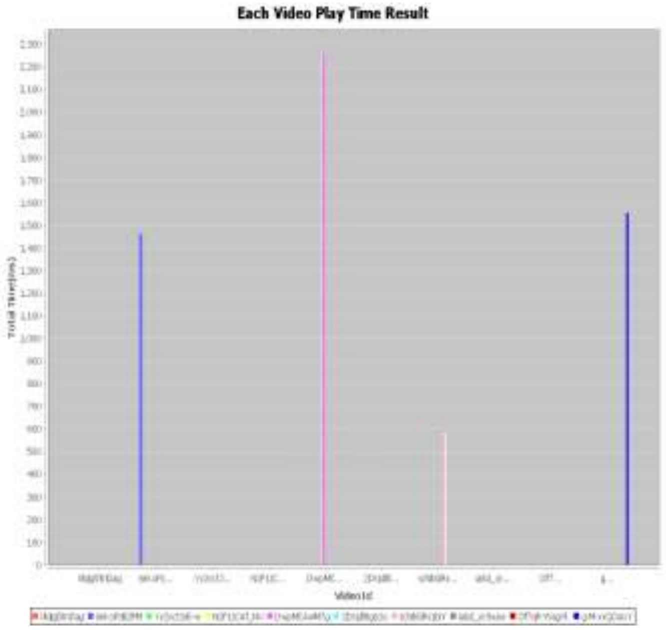

Figure 4. Video Play Time Result

Above figure 4 shows each video play time result. The graph shows relation between Total time and video Id. The video Ids present in cache hit require minimum time for fetching video.
Below figure 5 shows the Each video Hit count result. The graph shows relation between Hit count and video Id

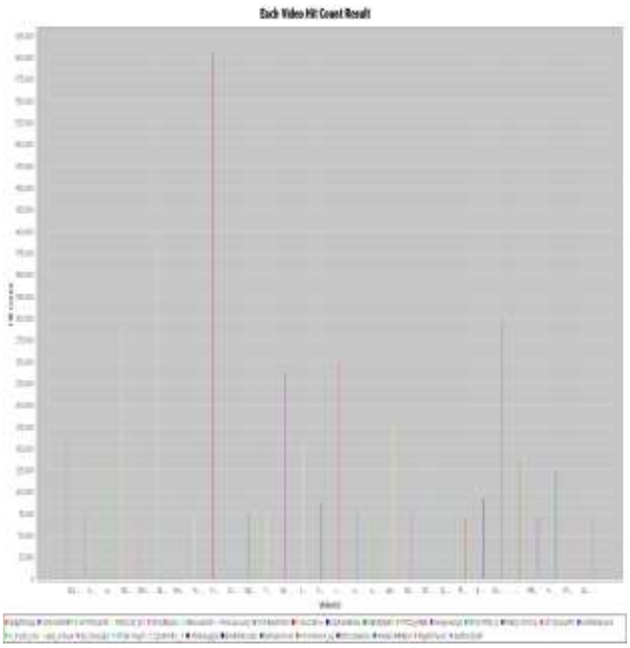

Figure 5. Each Video Hit Count

8. CONCLUSION

The paper presents hierarchical caching of video contents in the CN to supplement RAN cache. HC can significantly improves cache hit ratio and improve capacity under mobility conditions. PWG caching can significantly improve cache hit ratio. The method also results in the higher RAN and CN backhaul BW with much lower end-to-end capacity due to bottleneck in CN backhaul.

9. REFERENCES

[1] Hasti Ahlehagh and Sujit Dey ,"Video-Aware Scheduling and Caching in the Radio Access Network ", IEEE/ACM TRANSACTIONS ON NETWORKING, VOL. 22, NO. 5, OCTOBER 2014.

[2] D. Marinca, A. Hamieh, D. Barth, and K. Khawam, "Cache management using temporal pattern based solicitation for content delivery," in Proc. 19th ICT, 2012, pp. 1–6.

[3]G. Nair and P. Jayarekha, "A rank based replacement policy for multimedia Server cache using Zipf-like law," J. Comput., vol. 2, no. 3,Mar. 2010.

[4]Cisco, San Jose, CA, USA, "Cisco visual networking index: Global mobile data," White Paper, 2010–2015.

[5]G. Pallis and A. Vakali, "Insight and perspectives for content delivery networks," Commun. ACM, vol. 49, no. 1, pp. 101–106, Jan. 2006.

[6]M. Pathan and R. Buyy, A Taxonomy of CDNs, Content Delivery Networks. Berlin, Germany: Springer-Verlag, 2008.

[7]S. S. Krishnan and R. K. Sitaraman, "Video stream quality impacts viewer behavior: Inferring causality using quasi-experimental designs," in Proc. ACM Conf. Internet Meas. Conf., 2012, pp. 211–224.

[8]A. Wierzbicki, "Internet cache location and design of content delivery networks," Web Eng. Peer-to-Peer Comput., vol. 2376, Lect. Notes Comput. Sci., pp. 69–82, 2002.

[9]A. Balamash and M. Krunz, "An overview of Web caching replacement algorithms," Web Eng. Peer-to-Peer Comput., vol. 2376, Lect. Notes Comput. Sci., pp. 44–56, 2002.

[10]M. Cherniack, E. F. Galvez, M. J. Franklin, and S. Zdonik, "Profile driven cache management," in Proc. 19th ICDE, 2003, pp. 645–656.

[11]Krishnappa, S. Khemmarat, L. Gao, andM. Zink, "On the feasibility of prefetching and caching for online TV services: A measurement study on Hulu," in Proc. 12th PAM, Mar. 2011, pp. 72–80.