BLOCK LEVEL BUFFER REPLACEMENT SCHEME FOR IPTV SERVICES

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***Abstract*--IPTV provides variety of interesting and interactive services. In order to support to such services software should be designed effectively.In this paper an algorithm is proposed for the buffer cache management known as block level buffer replacement scheme. The scheme contains two units, main cache unit and prefetch unit. The blocks are fetched in one block look ahead principle for prefetching. The replacement depends on the most recently accessed block. For prefetching unit FIFO algorithm is used. Using this scheme we can reduce buffer cache misses.**

Keywords*-Buffer replacement, Prefetching, IPTV (Internet Protocol Television)

I. INTRODUCTION

Internet Protocol Television (IPTV), the convergence services of television and Internet,is being rapidly developed around the world. IP-based technology is being used by the majority of service providers to support such video services, commonly known as IPTV services.The users growing demand has increased the complexity of accessing the video streaming services.IPTV offers services such as Live TV, Video on Demand (VoD),and Personal Video Recorder(PVR).IPTV (Internet Protocol Television) is a method of distributing television content over broadband that enables a more customised and interactive userexperience. IPTV will mean a fundamental change in viewing habits. Viewers will be able to watch what they want, when they want to. Interactive TV services will be a key differentiator for the multitude of IPTV offerings that are emerging. Interactivity via a fast two-way connection will lift IPTV ahead of today's television. IPTV brings together the television, internet and telephone. Much like cable or satellite television, IPTV uses a set-top box (STB) that allows viewers to watch hundreds of channels and order movies through video-on-demand (VOD).It consist of Pre-recorded TV programs, movies that are stored in the storage server. The user can request for the particular content and serviced in on-demand manner. All the contents are passed via the streaming server to the IP network from there it is passed into the set-top box and then displayed in the TV.Many algorithms have been proposed to improve the buffer cache management.With the capacity limit, a lot of cache managementalgorithms focus on two problems. Firstly which pages are to be prefetched into cache? Secondly which pages are to be swapped out of cache?Generally speaking, the cache is for reducing the read latency, while the buffer is for aggregating discrete writing operations. Meanwhile, the cache works between CPU and RAM and buffer works between RAM and external storage.The caching of video contents can significantly reduce the startup delay of the video contents. The placement/replacement of the block depends on the block with the maximum number of miss count.The replacement policy occurs when a cache miss occurs; data is copied into some location in cache. Cache performance is greatly affected by properly choosing data that is unlikely to be referenced again.

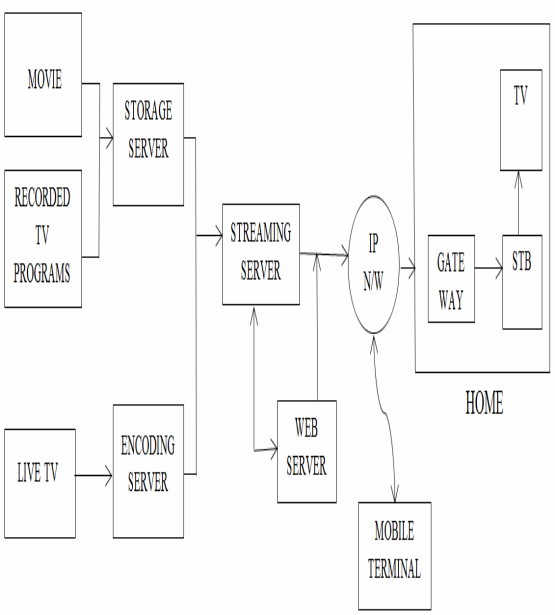

Fig.1 Architecture of an IPTV system.

The fig.1 shows the architecture of an IPTV system. It consists of movie,recorded TV programs that are stored in the storage server. Live TV which is encoded through the encoding server and passed to the streaming server. A web server manages the user information such as authentication and makes up accounts and deliverers the requested content to the user via the IP network. Finally the delivered contents are passed into the set top box and displayed in the TV.

II. RELATED WORKS

The various buffer mechanisms have been studied in terms of buffer caching. Dan et al proposed the Interval Caching (IC) [1] scheme maintains only the data in the interval between two successive requests such that the following request can be serviced directly from the buffer cache without I/O operations. Kim et al. proposed the PIC (Popularity aware Interval Caching) [2] scheme that extends ICby considering different popularity of multimedia objects. It estimates the popularity of multimedia objects based on the request intervals of each object and exploits the estimated popularity in predicting future request times. Kim et al proposed the PRIC (Popularity and streaming Rate aware Interval Caching) [3] scheme it is a generalized version of PIC to support heterogeneous resolution display in home VOD services.It extends the PIC by considering the different streaming rate of video objects to provide QoS to the heterogeneous appliances.Sarhan and Das proposed the DIC (Distributed Interval Caching) [4] scheme which utilizes the on-disk buffers for caching intervals between successive streams for the network attached disk (NAD) architecture.Almeida et al proposed two level caching architecture for the Streaming objects at the proxy servers [5]. They deployed the interval caching scheme at the buffer cache layer and the LFU at the disk cache layer. Cho et al. presentedthe HBM (Hybrid Buffer cache Management) scheme [6]. HBM detects the accesspattern of each multimedia file and then employs the intervalcaching or LRU algorithm appropriately for file accesses. Lee et al proposed a new caching scheme namely PSIC (Pre-emptive but Safe Interval Caching) scheme [7] that provides services with saved disk bandwidth. Fernandez et al proposed the ISC [Iteration Set Caching] that evolves [8] from the interval caching that dynamically changes the ordering of caching blocks to support variable bit rates. Kwon et al recently proposed the B-PIC(Block Level Popularity aware Interval Caching)[10] scheme retains the prefix blocks of popular objects in the memory buffer even though time progresses and caches the prefix of popular objects before they are actually requested. It reduces the start-up delay of popular objects.

III. EXISITINGCACHE REPLACEMENT ALGORITHMS

In OPT (Optimal) algorithm is an offline replacementalgorithm. This algorithmassumes that the entire access sequence is availableahead of time and, therefore cannot be used online.LRU (Least Recently Used) has been used widely for buffer cache management .When thecache is full; it replaces the block that is the least recentlyused. It is designed to take advantage of the temporallocality exhibited in accesses.MRU (Most Recently Used)MRUreplaces the most recently used block. It was designed to deal with situations like sequential scans.LFU (Least Frequently Used) replaces the block that is leastfrequently used. The frequency of a block is its referencecount. FBR (Frequency Based Replacement) algorithm .It considersboth recency and frequency to capture the benefit of bothLRU and LFU. It does not increment referencecounts in the new section and replaces least frequentblocks in the old section.LRU-k (Least Kth-to-last Reference) algorithm. Itreplaces the block with the least recent Kth-to-last access. When K islarge, it discriminates the frequent and infrequent blocks. When K is small, it removes cold blocks quickly.LFRU (Least Frequently Recently Used) algorithm was usedto cover a spectrum ofreplacement algorithms that include LRU at one end and LFU at the other end. It replaces the blocks thatare the least frequently used and not recently used. 2Q (Two queue) the

algorithm utilizes one FIFOqueue and two LRU lists. On re-reference its likely to be referenced again.LIRS (Low Inter-Reference Recency Set) algorithm.It uses Inter-ReferenceRecency (IRR) history instead of just access recency formaking a replacement decision. Blocks with smaller IRRvalues are favoured than those with larger IRR values.

IV. CONCLUSION

A new block level buffer replacement scheme is proposed in this paper. The algorithm is based on the number of hit counts and number of miss counts on every block that is referenced and non-referenced on every access. The block with maximum miss count that is not the most recently accessed is used for replacement in case of conflict.

REFERENCES

[1] A. Dan and D. Sitaram, "A Generalized Interval Caching Policy for Mixed Interactive and Long Video Environments," Proc. SPIEMultimedia Computing and Networking Conf., San Jose, CA, 1996.

[2] T. Kim, H. Bahn, and K. Koh, "Popularity-Aware Interval Caching for Multimedia Streaming Servers," Electronics Letters, Vol.39, No.21, pp. 1555-1557, 2003.

[3] T. Kim, H. Bahn, and K. Koh, "Buffer Management for Heterogeneous Resolution Display in Home VOD Services," IEEE Trans. ConsumerElectronics, Vol.52, No.3, pp.1112-1117, 2006.

[4] N. J. Sarhan and C. R. Das, "Caching and Scheduling in NAD-Based Multimedia Servers," IEEE Trans. Parallel and Distributed Sys.Vol.15, No.10, pp.921-933, 2004.

[5] J. M. Almeida, D. L. Eager, M. K. Vernon, "A Hybrid Caching Strategy For Streaming Media Files," Proc. SPIE/ACM Conf. MultimediaComputing and Networking, 2001.

[6] K. Cho, Y. Ryu, Y. Won and K. Koh, "A Hybrid Buffer Cache Management Scheme for VOD Server," Proc. IEEE Int'l Conf.Multimedia and Expo (ICME 2002), Vol.1, pp.241- 244, 2002.

[7] K. Lee, Y. Y. Park, H. Y. Yeom, "Pre-emptive but Safe Interval Caching for Real-time Multimedia System," Int'l Journal of ComputerSystems Science and Engineering, Vol.18, No.2, pp.87-94, 2003.

[8] J. Fernandez, J. Carretero, F. Garcia-Carballeira, A. Calderon, and J. Perez-Menor, "New Stream Caching Schemes for Multimedia Systems," Proc. IEEE Int'l Conf. Automated Production of Cross Media ContentFor Multi-Channel Dist., 2005.

[9] T. Kim and H. Bahn, "Implementation of the Storage Manager for an IPTV Set-Top Box," IEEE Trans. Consumer Electronics, Vol.54, No.4, pp.1770-1775, 2008.

[10]O.Kwon, T.Kim, H.Bahn, "Block Level Buffer Management for Video Streaming Services in ITPV Environments," IEEE Transactions on Consumer Electronics, Vol. 56, No. 3, August,2010.

[11] Q. Yang, H. H. Zhang and H. Zhang, "Taylor Series Prediction: A Cache Replacement Policy Based on Second-Order Trend Analysis," Proc. 34th Hawaii Conf. System Science,2001.

[12] S. Hosseini-khayat, "On Optimal Replacement of Nonuniform Cache Objects," IEEE Trans. Computers, vol. 49, no.8, Aug. 2000.

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[13] L. A. Belady, "A Study of Replacement Algorithms for a Virtual Storage Computer," IBM systems J. vol. 5, no.2, pp.78-101, 1966.

[14] S. Irani, "Page Replacement with Multi-Size Pages and Applications to Web Caching," Proc.29thAnn, ACM symp. Theory of Computing, pp. 701-710, 1997.

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