MJRET
Open Access
Multidisciplinary Journal of Research in Engineering and Technology
Journal homepage: www.mjret.in
ISSN:2348 - 6953

DISTRIBUTED CO-OPERATIVE CACHING IN SOCIAL WIRELESS NETWORK (SWNET)

S.Inamke[1],V.Randhire[2],G.Lahare[3], N.Shejole[4]
Department of Computer Engineering, University of Pune
Imperial College Of Engineering and Research
Pune, India
[1]snehal.inamke@gmail.com, [2]vrandhire@gmail.com,
[3]gaurilahare125@gmail.com, [4]nagesh.shejole@gmail.com

Abstract: *This paper introduces co-operative caching policies for reducing electronic content provisioning cost in Social Wireless Networks (SWNET). SWNET are formed by mobile devices such as laptops, modern cell phones etc. sharing common electronic contents, data and actually gathering in public places like college campus, mall etc. Electronic object caching in such SWNET are shown to be able to minimize the content provisioning cost which mainly depend on service and pricing dependencies between various stakeholders including content provider(CP),network service provider, end consumer(EC). This paper introduces practical network service and pricing model which are used for creating two object caching strategies for minimizing provisioning cost in networks which are homogeneous and heterogeneous object demand. The paper develops analytical and simulation design for analyzing the proposed caching strategies in the presence of selfish user that deviates from networks-wide cost-optimal policies.*

Keywords*- Social wireless networks, co-operative caching, cost optimal policies, selfish users*

1. INTRODUCTION

1.1 Motivation

Modern appearance of data enabled mobile devices and wireless enable data applications have fostered new content dissemination models in today's mobile eco-system wireless devices have scarcity of resources such as storage capacity and processing power. A list of such devices includes apple's iPhone, Google's android, amazon's kindle and electronic books readers from other vendors. The array of data application includes electronic book and magazine and mobile device applications.

With the conventional download model, a user download contents directly from a content provider (CP) server, over a communication service provider (CSP) network. Downloading data through CSP's involves cost which must be paid either by customer or by the CP. So for minimize this effort we take on amazon's kindle electronic book delivery selling model in which the content provider(CP) pays to sprint, the CSP, for the cost of web usage due to downloaded EBook by kindle user.Social Wireless Networks (SWNETs) can be formed using wireless connections between the mobile devices.

1.2 Optimal Solution

For contents with unpredictable level of acceptance, a greedy approach for each node would be to store as many distinctly common contents as its loading allows.
This approach sums to noncooperation and can grow to heavy network-wide data photocopying. In the other excessive case, which is fully cooperative, a fatal would try to make the top of the total number of single contents put in storage within the SWNET by avoiding photocopying. In this Paper, we show that none of the above extreme approaches can decrease the content provider's burden. We also show that for a given rebate-to-download-charge ratio, there is recent an item placement policy which is somewhere in between those two ends, and can growth the content provider's cost by striking a constancy between the greediness and full support.

1.3 User Selfishness

The probability for producing peer-to-peer allowance may encourage selfish activities in some clients. A selfish client is one that swerves from the network-wide finest policy in order to receive more allowances. Any distinction from the optimal policy is predictable to incur higher network-wide provisioning cost. In this work, we study the impacts of such selfish behavior on objective provisioning cost and the earned refund within the context of a SWNET. It is given that out there a threshold selfish node population, the amount of per-node allowance for the selfish users is lower than that for the selfless users. In additional terms, when the selfish terminal population overdoes a certain point, selfish actions discontinue producing more advantage from a refund viewpoint.

1.4 Contributions

First, based on a practical service and rating case, a stochastic model for the content provider's cost computation is established. Second, a cooperative caching strategy, Split Cache, is proposed, numerically analyzed, and theoretically confirmed to provide optimal object placement for networks with homogenous content demands. Third, a benefit-based strategy, Distributed Benefit, is proposed to reduce the Provisioning cost in heterogeneous networks involving of nodes with different content demand rates and patterns. Fourth, the impacts of user selfishness on entity provisioning cost and earned rebate is analyzed.
Finally, numerical results for both strategies are authorized using virtual reality and related with a series of outdated caching policies.

2. NETWORK, SERVICE AND PRICING MODEL

2.1 Network Model

Fig.1 describes a model SWNET within a University area. People carrying mobile devices form SWNET partitions are the end users, which can be multi-hop (i.e. MANET) as shown for partitions 1, 3, and 4, or single hop approach point based as shown for partition 2. A mobile device can download some information (i.e., content) from the CP's server station using the CSP's cellular network, or from its own SWNET partition. In the left over paper, the terms object and content are used synonymously.

We scrutinize as two types of SWNETs. The prime one involves static SWNET partitions. Meaning, after a partition is formed, it is preserved for suitably long so that the cooperative object caches can be formed and reach still states. We also scrutinize a second type to explore as to what happens when the unmoving postulation is relaxed. To investigate this effect, caching is applied to SWNETs formed using human interaction traces obtained from a set of real SWNET nodes.

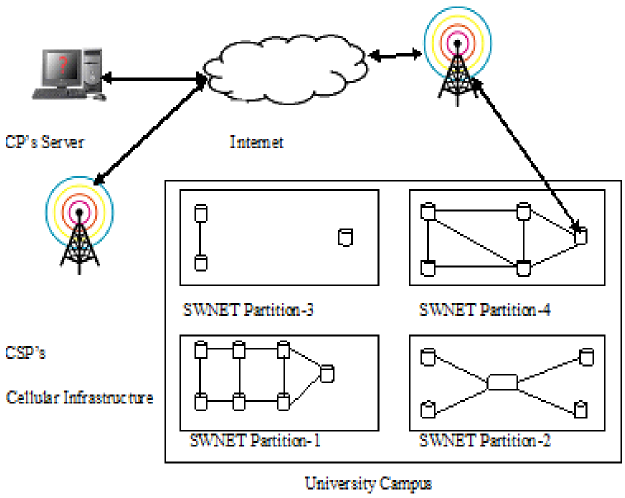

Fig. 1. Content access from a SWNET in a University Campus

2.2 Search Model

After an object demand is originated by a mobile gadget, it first examines in its local cache. If the local search fails, it searches the object within its SWNET separate using limited forward message. If the search in division also fails, the information is downloaded from the CP's server using the CSP's 3G/4G cellular chain. In this paper, we have produced objects such as electronic books, music, etc., which does not differ with the time, and therefore cache constancy is not a censuring issue. We first consider that all objects are of even size and each terminal is able to store up to "C" distinct information in its cache. Later on, we let go this presumption to assist objects with fluctuating size. We also presume that all objects are popularity-tagged by the CP's server [3]. The popularity-tag of an object expresses its cosmic recognition; it also indicates the possibility that a random request in the network is created for this specific object.

2.3 Pricing Model

We use a pricing model similar to the Amazon Kindle business model in which the CP (e.g., Amazon) pays a download cost Cd to the CSP when an End-Consumer downloads an object from the CP's server through the CSP's cellular network. Likewise, at any time an EC provides a nearby cached object to another EC within its own SWNET partition, the supplier EC remunerates an allowance Cr by the CP. Optionally, this allowance can also be distributed among the provider EC and the ECs of all the intermediate mobile devices that take part in content forwarding. Cd corresponds to the CP's object delivering cost when it is delivered through the CSP's network, and Cr corresponds to the allowance given out to an EC when the object is found within the SWNET (e.g., node A receives allowance Cr after it provides a content to node B over the SWNET).

3. REQUEST GENERATION MODEL

We study two request age group models, namely, homogenous and heterogeneous. In the homogenous case, all moveable devices maintain the same content demand rate and pattern which follow a Zipf distribution. Zipf distribution is widely used in the literature for exhibiting popularity based online entity request distributions [5]. According to Zipf law, the popularity of the ith popular object out of N different objects can be expressed as the parameter α ($0 < \alpha < 1$) is a Zipf parameter that defines the skewness in a appeal pattern. The quantity pi indicates the probability that an arbitrary request is for the ith popular object ($p1 > p2 >$ _ _ _ $> pN$). As α increase, the access pattern becomes more concentrated on the popular data items.

In the heterogeneous request model, each movable device follows an individual Zipf distribution. This means popularity of entity j is not necessarily the same from two different nodes standpoints. This is in dissimilarity to the homogenous model in which the popularity of object j is same from the outlook of all network nodules. Also, the object invitation rate from different nodes is not automatically the same in the heterogeneous model.

4. SPLIT CACHE REPLACEMENT

To realize the optimal object appointment under homogeneous entity request model we propose the following Split Cache policy in which the available cache space in each device is at odds into a duplicate segment (_ fraction) and a unique segment.

In the first segment, nodes can store the most popular objects without worrying about the object repetition and in the second segment only unique objects are allowed to be stored.

With the Split Cache additional policy, soon after an object is downloaded from the CP's server, it is regarded as as a unique object as there is only one copy of this object in the network. Also, when a node copies an object from another SWNET node, that object is categorized as a duplicated object as there are now at least two copies of that object in the network.

For placing away a new unique object, the least popular object in the whole cache is selected as a applicant and it is replaced with the new object if it is less popular than the new incoming object. For a duplicated object, however, the evictee candidate is selected only from the first duplicate segment of the cache. In other words, a unique object is never evicted in order to put up a duplicated object. The Split Cache object replacement mechanism realizes the optimal strategy recognized in Section 4. With this mechanism, at steady state all devices' caches maintain the same object set in their duplicate areas, but distinct objects in their unique areas.

5. PROPOSED SYSTEM

In this paper drawing motivation from Amazon's Kindle electronic book delivery business, this paper develops practical network, service, and pricing models which are then used for creating two object caching strategies for minimizing content provisioning costs in networks with homogenous and heterogeneous object demands. The paper constructs analytical and simulation models for analyzing the proposed caching strategies in the presence of selfish users that deviate from network-wide cost-optimal policies. It also reports results from an Android phone based prototype SWNET, validating the presented analytical and simulation results.

6. ADVANTAGES OF PROPOSED SYSTEM

- Based on a practical service and pricing case, a stochastic model for the content provider's cost computation is developed.
- A cooperative caching strategy, Split Cache, is proposed, numerically analyzed, and theoretically proven to provide optimal object placement for networks with homogenous content demands.
- A benefit-based strategy, Distributed Benefit, is proposed to minimize the provisioning cost in heterogeneous networks consisting of nodes with different content request rates and patterns.
- The impacts of user selfishness on object provisioning cost and earned rebate is analyzed.

7. CONCLUSION

The objective of this paper was to develop a cooperative object caching Approach for provisioning cost minimization in social wireless networks. The key contribution was to determine that the best cooperative caching for provisioning cost reduction requires an optimal split between object replication and uniqueness. The paper analytically develops this optimal split point and afterward develops the caching performance using a practical network, service and cost formulation that is motivated by Amazon's Kindle electronic book delivery model. It constructs analytical and simulation models for analyzing the proposed caching strategies in the presence of selfish users that deviate from network-wide cost optimal policies. Based on a practical service and pricing case, a defined model for the content provider's cost computation is developed. A co-operative caching strategy, split cache, is proposed numerically analyzed, and theoretically proven to provide optimal object placement for networks with homogeneous content demands. It also report results from an Android phone based prototype SWNET, validating the presented analytical and simulation results. Cooperative caching in mobile surroundings and propose a cooperative caching scheme for mobile systems. It extends beyond these populations to distributed cooperative caching behavior in regions with millions of clients. Overall, system demonstrates that cooperative caching has performance benefits only within limited population bounds.

ACKNOWLEGEMENT

We would sincerely like to thank Mrs.Sonali Tikde, our guide, for her guidelines and support.

REFERENCES

[1] M. Zhao, L. Mason, and W. Wang, "Empirical Study on Human Mobility for Mobile Wireless Networks," Proc. IEEE Military Comm. Conf. (MILCOM), 2008.

[2] "Cambridge Trace File, Human Interaction Study," http:// www.crawdad.org /download/ cambridge/ haggle/ Exp6.tar.gz, 2012.

[3] E. Cohen, B. Krishnamurthy, and J. Rexford, "Evaluating Server-Assisted Cache Replacement in the Web," Proc. Sixth Ann.European Symp. Algorithms, pp. 307-319, 1998.

[4] S. Banerjee and S. Karforma, "A Prototype Design for DRM Based Credit Card Transaction in E-Commerce," Ubiquity, vol. 2008, 2008.

[5] L. Breslau, P. Cao, L. Fan, and S. Shenker, "Web Caching and Zipf- Like Distributions: Evidence and implications," Proc. IEEE INFOCOM, 1999.

[6] C. Perkins and E. Royer, "Ad-Hoc On-Demand Distance Vector Routing," Proc. IEEE Second Workshop Mobile Systems and Applications,1999.

[7] S. Podlipnig and L. Boszormenyi, "A Survey of Web Cache Replacement Strategies," ACM Computing Surveys, vol. 35, pp. 374-398, 2003.

[8] A. Chaintreau, P. Hui, J. Crowcroft, C. Diot, R. Gass, and J. Scott, "Impact of Human Mobility on Opportunistic Forwarding Algorithms," IEEE Trans. Mobile Computing, vol. 6, no. 6, pp. 606-620, June 2007.

[9] "BU-Web-Client - Six Months of Web Client Traces," http:// www.cs.bu.edu/techreports/1999-011-usertrace-98.gz, 2012.

[10] A. Wolman, M. Voelker, A. Karlin, and H. Levy, "On the Scale and Performance of Cooperative Web caching," Proc. 17th ACM Symp. Operating Systems Principles, pp. 16-31, 1999.

[11] S. Dykes and K. Robbins, "A Viability Analysis of Cooperative Proxy Caching," Proc. IEEE INFOCOM, 2001.

[12] M. Korupolu and M. Dahlin, "Coordinated Placement and Replacement for Large-Scale Distributed Caches," IEEE Trans. Knowledge and Data Eng., vol. 14, no. 6, pp. 1317-1329, Nov. 2002.

[13] L. Yin and G. Cao, "Supporting Cooperative Caching in Ad Hoc Networks," IEEE Trans. Mobile Computing, vol. 5, no. 1, pp. 77-89,Jan. 2006.

[14] Y. Du, S. Gupta, and G. Varsamopoulos, "Improving On-Demand Data Access Efficiency in MANETs with Cooperative Caching," Ad Hoc Networks, vol. 7, pp. 579-598, May 2009.

[15] Mahmoud Taghizadeh,Member, IEEE, Kristopher Micinski, Member, IEEE, Charles Ofria, Eric Torng, and Subir Biswas,Senior Member, IEEE "Distributed Cooperative Caching in Social Wireless Networks"-IEEE TRANSACTIONS ON MOBILE COMPUTING, VOL. 12, NO. 6, JUNE 2013.