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Experimental Evaluation of Distributed Cooperative Caching in Social Wireless Networks

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Abstract:

Cooperative caching policies are introduced in this paper for reducing electronic substance/content provisioning price in SWNET (Social Wireless Networks). Social Wireless Networks are produced by mobile devices, like, electronic book readers, data enabled phones etc., sharing familiar interests in electronic substance, and physically assembling together in public spots. Caching electronic object in those Social Wireless Networks are shown have capable to decrease the content/ substance provisioning price which depends deeply on the service and expenditure dependences among different stakeholders including CP (content providers), End Consumers (EC) and network service providers.

From Electronic book delivery business of Amazon's Kindle Drawing motivation, this paper build up practical networks, service, and expenditure models which are then utilized for making couple of strategies which are object caching for decreasing content/ substance provisioning prices in networks with heterogeneous and homogenous object demands. The paper develops simulation and analytical models for analyzing the projected caching strategies in the existence of selfish clients that turn aside from network-wide price-optimal rules. It also gives results from an Android phone depended prototype Social Wireless Networks, authenticating the presented simulation and analytical results.

Index Terms:

Social wireless networks, cooperative caching, content provisioning,

INTRODUCTION:

Wireless devices have scarcity of resources such as storage capacity and processing power. For WANETs, cooperative caching strategies are proposed in this paper to improve efficiency in information exchange in peer –to-peer fashion. The caching strategies such as small sized caches and large sized caches depend on the estimation of density off information being flown in the network. In the former strategy content replacement takes place when new information is received while in the latter a decision is made as to whether the information is to be cached and for how long. In either case every node is capable of deciding as per the content in the caches of nearby nodes. This is to ensure that each node has different content that is content diversity and share the content of other nodes thus managing memory efficiently.Data enabled mobile devices present usage and wireless-enabled data apps have promoted new content broadcasting models in present mobile ecosystem.The data applications array contains mobile phone Apps and magazine readers and electronic book.

A user with the conventional download model downloads contents/substances directly from a CP (Content Provider's) server over a CSP (Communication Service Provider's) network. Downloading substance/content via Communication Service Provider's network engages a price which should be paid either by the content provider or by end users. In this work, we take up electronic book delivery business model of Amazon Kindle in which the Content Provider's (Amazon), pays to Sprint, the Communication Service Provider's, for the price of network usage cause of Kindle users downloaded e-books. When mobile devices carrying physically by clients get together in settings like work place, University campus, Airport, Mall and other public spots, SWNETs

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(Social Wireless Networks) can be formed by utilizing the devices adhoc wireless connections. With the subsistence of such Social Wireless Networks, substitute approach to content/substance access by a mobile device would be to initially search the local Social Wireless Network for the demanded content before retrieving it from the Content Provider's server. The estimated content provisioning price of such an approach can be appreciably lesser since the download price to the Communication Service Provider's would be neglected when the content/substance is found within the local Social Wireless Networks.

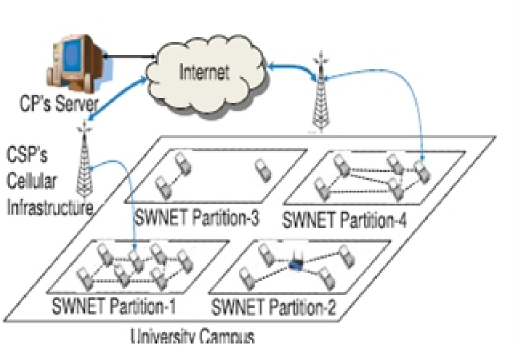

Fig.1. Architectural Diagram.

This mechanism is named as cooperative caching. In order to cheer the EC's (End-Consumers) to cache formerly downloaded content/substance and to distribute it with other EC's (end-consumers), a peer-to-peer reimbursement mechanism is projected. This mechanism can utilize as an incentive so that the EC's (end-consumers) are attracted to partake in cooperative content caching rather than the energy and storage prices.

In the way for cooperative caching to offer price benefits, this peer-to-peer reimbursement must be dimensioned to be lesser than the substance download price paid to the Communication Service Provider. This reimbursement should be factored in the CP's (content provider's) overall expenditure. Because of their limited storage, mobile handheld devices are not estimated to preserve all downloaded substance for lengthy.

That indicates after downloading and utilizing a paid electronic content, a device may decrease it from the storage. As per above cost and information storage model a key query for cooperative caching is: The procedure to preserve contents in nodes like that the average substance provisioning price in the network.

PROBLEM STATEMENT

Existing system:

With the existence of such Social Wireless Networks, an alternative approach to substance access by a device would be initially search the local Social Wireless Network for the demanded content before retrieving it from the Content Provider's server. The estimated content provisioning price of such an approach can be appreciably lesser since the download price to the Communication Service Provider's would be neglected when the content/substance is found within the local Social Wireless Networks. This mechanism is named as cooperative caching. In order to cheer the EC's (End-Consumers) to cache formerly downloaded content/substance and to distribute it with other EC's (end consumers), a peer-to-peer reimbursement mechanism is projected. This mechanism can utilize as an incentive so that the EC's (end-consumers) are attracted to partake in cooperative content caching rather than the energy and storage prices. Cons: Due to their limited preservation/storage, the speed main server could become slow. That means after buffering and utilizing substance, a substance to be preserved in local cache.

Proposed System:

From Electronic book delivery business of Amazon's Kindle Drawing motivation, this paper build up practical networks, service, and expenditure models which are then utilized for making couple of strategies which are object caching for decreasing content/ substance provisioning prices in networks with heterogeneous and homogenous object demands. The paper develops simulation and analytical models for analyzing the projected caching strategies in the existence of selfish clients that turn aside from network-wide price-optimal rules. Pros:

•Based on a pricing case and practical service, a stochastic replica for the CP's (content provider's) price calculation is developed.
•A Split Cache, cooperative caching strategy, is proposed, theoretically proven and numerically analyzed, to offer finest object placement with homogenous substance demands for networks.
• A Distributed Benefit, benefit-based strategy, is projected to reduce the provisioning price in heterogeneous networks containg of nodes with various substance request patterns and rates. The user selfishness impacts on object provisioning price and received rebate is analyzed

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RELATED WORK:

The existing literature is rich[10], [11] on several aspects of cooperative caching including object replacements, reducing cooperation overhead [12], Analysis of rebate and object provisioning cost in steady state. Cooperation performance in traditional wired networks. The Social Wireless Networks explored in this paper, which are often formed using mobile ad hoc network protocols, are different in the caching context due to their additional constraint and limited resources. As a result, most of the available cooperative caching solutions for traditional static networks are not directly applicable for the SWNETs. Three caching schemes for MANET have been presented in [13]. In the first scheme, CacheData, a forwarding node checks the passing-by objects and caches the ones deemed useful according to some predefined criteria. This way, the subsequent requests for the cached objects can be satisfied by an intermediate node. A problem with this approach is that storing large number of popular objects in large number of intermediate nodes does not scale well. The second approach, CachePath, is different in that the intermediate nodes do not save the objects; instead they only record paths to the closest node where the objects can be found.

The idea in Cache Path is to reduce latency and overhead of cache resolution by finding the location of objects. This strategy works poorly in a highly mobile environment since most of the recorded paths become obsolete very soon. The last approach in [13] is the Hybrid Cache in which either Cache Data or Cache Path is used based on the properties of the passing-by objects through an intermediate node. While all three mechanisms offer a reasonable solution, it is shown in [4], [5], and [6] that relying only on the nodes in an object's path is not most efficient. Based on a pricing case and practical service, a stochastic replica for the CP's (content provider's) price calculation is developed. A Split Cache, cooperative caching strategy, is proposed, theoretically proven and numerically analyzed, to offer finest object placement with homogenous substance demands for networks. A Distributed Benefit, benefit-based strategy, is projected to reduce the provisioning price in heterogeneous networks contains of nodes with various substance request patterns and rates. The user selfishness impacts on object provisioning price and received rebate is analyzed. This paper completely build up practical network, service, and expenditure models which are then utilized for making couple of strategies which are object caching for decreasing content/ substance provisioning prices in networks with heterogeneous and homogenous object demands. The paper develops simulation and analytical models for analyzing the projected caching strategies in the existence of selfish clients that turn aside from network-wide price-optimal rules. From a user selfishness standpoint, Laoutaris et al. [10] investigate its impacts and mistreatment on caching. Our work in this paper has certain similarity with the above works as we also use a monetary cost and rebate for content dissemination in the network. However, as opposed to using game theoretic approaches, we propose and prove an optimal caching policy. Analysis of selfishness in our work is done in a steady state over all objects whereas the previous works mainly analyze the impact of selfishness only for a single data item. Additionally, the pricing model of our work which is based on the practical Amazon Kindle business model is substantially different and practical compared to those used in [11] and [12].

CACHE DEPLOYMENT OPTIONS:

Although mobile devices have improved much in processing speed, memory and operating systems, they still have some serious drawbacks. The major challenge for a mobile device in cloud computing is the data transfer bottle neck. Battery is the major source of energy for these devices and the development of battery technology has not been able to match the power requirements of increasing resource demand. The average time between charges for mobile phone users is likely to fall by 4.8% per year in the near future. As the cloud grows in popularity and size, infrastructure scalability becomes an issue. Without scalability solution, the growth will result in excessively high network load and unacceptable service response time.

Data caching is widely used in wired and wireless networks to improve data access efficiency, by reducing the waiting time or latency experienced by the end users. A cache is a temporary storage of data likely to be used again. Caching succeeds in the area of computing because access patterns in typical computer applications exhibits locality of reference. Caching is effective in reducing bandwidth demand and network latencies. In wireless mobile network, holding frequently accessed data items in a mobile node's local storage can reduce network traffic, response time and server load. To have the full benefits of caching, the neighbor nodes can cooperate and serve each other's misses, thus further reducing the wireless traffic.

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This process is called cooperative caching. Since the nodes can make use of the objects stored in another node's cache the effective cache size is increased. In this paper we discuss a cooperative cache based data access frame work for mobile cloud computing. There are two main cache deployment options: those which are deployed in the strategic points in cloudlet based on user access pattern and those which are deployed between the cloudlets. In this paper we consider the first option, deploying cache in different points (virtual machines) in the cloudlet. The cooperative cache frame work for cloudlet architecture. The cloudlet consists of virtual machines which are temporary customization of software environment for each client for their use. The virtual machines separate the transient client software environment from the permanent host software environment. A local cache can reduce virtual machine's synthesis delay by caching virtual machine states that are likely be used again. In a cloudlet we can have more than one virtual machine with a local cache. If we are able to share the cache states, availability and accessibility of different states can be improved. Fig.2 shows the different components of cache layer.

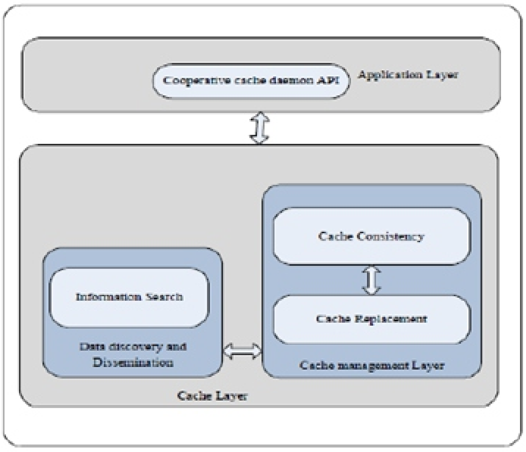

Fig.2. Different components of cache layer.

The cooperative cache daemon API acts as an interface between the application layer and the cache layer. The core system consists of two modules: data discovery and dissemination and the cache management. The information search module in the data discovery and dissemination layer locates and fetches the required object from the cache module. The cache management layer includes the cache replacement and consistency modules. Cache consistency module is designed to be configurable to maintain data synchronization with the original data. The cache replacement module handles the replacement of objects when the cache is full.

The efficiency of a distributed cache depends on three services, discovery, dissemination and delivery of objects. Discovery refers to how the clients locate the cached object. Dissemination is the process of selecting and storing objects in the cache i.e., deciding the objects to be cached, where they are cached and when they are cached. Delivery defines how the objects make their way from the server or cache site to the client. A query based or directory based approach can be used for information discovery. Dissemination may be either client initiated or server initiated. In client initiated dissemination, the client determines what, when and where to cache. The advantage of this scheme is that it automatically adapts to the rapidly changing request pattern. In server initiated dissemination the server chooses the object to be cached.

Here the server can maintain a historical data to make the dissemination decision. This approach can provide strong consistency compared to client driven approach. For the proposed approach as the mobile devices act as thin client dissemination decision can be taken by the cloudlet. Another issue we must look into is how to replace the objects from the cache when it is full. A number of cache replacement policies are proposed in literature for wired and wireless networks.

The important factors that can influence the replacement process are access probability, regency of request for a data item, number of requests to a data item, size, cost of fetching data from server, modification time, expiration time, distance etc. Based on these parameters we can propose different cache replacement policies suitable for mobile cloud computing. Cooperative caching achieves high hit rates and low response time only if caches are distributed, cache sharing is wide spread and discovery overhead is low.

IMPLEMENTATION

Network Model:

We consider two types of SWNETs. The first one involves stationary SWNET partitions. Meaning, after a partition is formed, it is maintained for sufficiently long so that the cooperative object caches can be formed and reach steady states. We also investigate a second type to explore as to what happens when the stationary assumption is relaxed. To investigate this effect, caching is applied to SWNETs formed using human interaction traces obtained from a set of real SWNET nodes .

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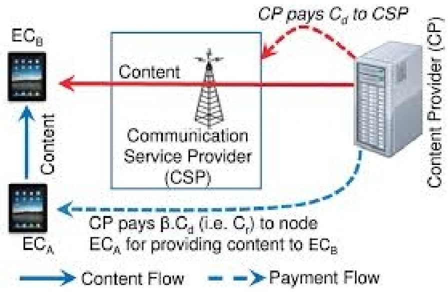
Search Model:

We search the file means, it first searches its local cache. If the local search fails, it searches the object within its SWNET partition using limited broadcast message. If the search in partition also fails, the object is downloaded from the CP's server. In this paper, we have modeled objects such as electronic books, music, etc., which are time non varying, and therefore cache consistency is not a critical issue. The popularity-tag of an object indicates its global popularity; it also indicates the probability that an arbitrary request in the network is generated for this specific object.

Pricing Model:

We use a pricing model similar to the Amazon Kindle business model in which the CP 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. Also, whenever an EC provides a locally cached object to another EC within its local SWNET partition, the provider EC is paid a rebate Cr by the CP. Optionally, this rebate can also be distributed among the provider EC and the ECs of all the intermediate mobile devices that take part in content forwarding .The selling price is directly paid to the CP by an EC through an out-of-band secure payment system. A digitally signed rebate framework needs to be supported so that the rebate recipient ECs can electronically validate and redeem the rebate with the CP. We assume the presence of these two mechanisms on which the proposed caching mechanism is built.



CONCLUSION:

The aim of this work was to build up a cooperative caching approach for provisioning price decrement in SWNET. The main involvement is to reveal that the most excellent cooperative caching for provisioning price decrement in networks withhomogeneous substance demands needs an optimal crack between entity uniqueness and duplication. Like a split substitution policy was projected and calculated utilizing ns2 simulation and on an investigational test bed of 7 android mobile devices. Additionally, we analytically (using simulation) and experimentally examined the algorithm's presentation in the existence of client selfishness. It was revealed that selfishness can raise client reimbursement only when the count of selfish nodes in Social Wireless Network is not as much of critical number. It was explored that with heterogeneous requirements, a advantage based heuristics policy gives better presentation compared to split cache which is projected especially for homogeneous demand. Current work on this theme contains the development of proficient algorithm for the heterogeneous demand circumstances, with a goal of connection between the performance gap of the centralized greedy mechanism and the Benefit Based heuristics which was verified to be most favorable. No-collusion assumption removal for client selfishness is also being processing on.

FUTURE ENHANCEMENT:

We are concluding our research work with efficient routing approach for cooperative communication and cache implementation for frequently accessed information. It leads to optimal of usage of bandwidth, reduces the network traffic and improves in terms of time complexity. We can enhance our approach by reducing the time complexity issues in the split cache replacement and by implementing in our current approach.

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/cambrid ge/haggle/Exp6.tar.gz,2012.

[3] E. Cohen, B. Krishnamurthy, and J. Rexford, "Evaluating Server-Assisted Cache Replacement in the Web," Proc. Sixth Ann.EuropeanSymp. 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.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

[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 OnDemand 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] C. Chow, H. Leong, and A. Chan, "GroCoca: Group-Based Peerto-Peer Cooperative Caching in Mobile Environment," IEEE J. Selected Areas in Comm., vol. 25, no. 1, pp. 179-191, Jan. 2007.

[16] F. Sailhan and V. Issarny, "Cooperative Caching in Ad Hoc Networks," Proc. Fourth Int'l Conf. Mobile Data Management, pp. 13-28, 2003.

[17] C. Chow, H. Leong, and A. Chan, "Peer-toPeer Cooperative Caching in Mobile Environments," Proc. 24th Int'l Conf. Distributed Computing Systems Workshops, pp. 528-533, 2004.

[18] A. Schrijver, Theory of Linear and Integer Programming. Wiley-Interscience, 1986.

[19] H.K. Kuhn, "The Hungarian Method for the Assignment Problem," Naval Research Logistics, vol 52, no. 1, pp. 7-21, 2005.

[20] N. Laoutaris et al., "Mistreatment in Distributed Caching: Causes and Implications," Proc. IEEE INFOCOM, 2006.

[21] B. Chun et al., "Selfish Caching in Distributed Systems: A Game-Theoretic Analysis," Proc. 23th ACM Symp. Principles of Distributed Computing, 2004.

[22] M. Goemans, L. Li, and M. Thottan, "Market Sharing Games Applied to Content Distribution in Ad Hoc Networks," IEEE J. Selected Areas in Comm., vol. 24, no. 5, pp. 1020-1033, May 2006.

[23] National Laboratory of Applied Network Research, Sanitized Access Log, ftp://ircache.nlanr.net/Traces, July 1997.

[24] NASA Kennedy Space Center, WWW Server Access Log, ftp://ita.ee.lbl.gov/traces/NASA_access_log _Jul95.gz, 2012.

[25] Univ. of Saskatchewan, WWW Server Access Log, ftp://ita.ee.lbl.gov/traces/usask_access_log.g z, 2012.

[26] M. Taghizadeh, A. Plummer, A. Aqel, and S. Biswas, "Optimal Cooperative Caching in Social Wireless Networks," Proc. IEEE Global Telecomm. Conf. (GlobeCom), 2010.

[27] A. Almohamad and S.O. Duffuaa, "A Linear Programming Approach for the Weighted Graph Matching Problem," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 15, no. 5, pp. 522-525, May 1993.