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Heterogeneous Networks Consisting of Nodes in Social Wireless Network

TELLAPURAM RAGHU RAM[1], K.SWAPNA DEVI[2], A.RAVI KUMAR[3]
[1]PG Scholar, Dept of CSE, Sri Sai Jyothi Engineering College, India, E-mail: raghu.1314@yahoo.com.
[2]Assistant Professor, Dept of CSE, Sri Sai Jyothi Engineering College, India.
[3]HOD, Dept of CSE, Sri Sai Jyothi Engineering College, India.

Abstract: This paper introduces cooperative caching techniques for reducing electronic content provisioning cost in Social Wireless Networks (SWNET).SWNETs are formed by mobile devices, such as modern cell phones etc. sharing common takings in electronic content, and actually meeting together in public places. Electronic object caching in such SWNETs are shown to be able to reduce the content provisioning cost which depends heavily on the service and pricing dependences among various stakeholders including content providers (CP), network service providers, and End Consumers (EC).This paper develops practical network, service, and pricing models which are then used for creating two object caching strategies for reducing content provisioning costs in networks with homogenous and heterogeneous object demands. The paper develops analytical and simulation designs 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.

Keywords: Cooperative Cache; Cost-Optimal Policies; Distributed Search Engines; Selfish Users.

I. INTRODUCTION

Motivation Modern appearance of data enabled mobile devices and Wireless-enabled data applications have fostered new content dissemination models in today's mobile ecosystem. A record of such devices includes iPhone, Android phones Amazon's kindle and electronic book readers from additional vendors. The set of data applications includes mobile phone apps. The level of proliferation of mobile applications is indicated by the example fact that as of October 2010, apple's app store offered over 100,000 apps that are downloadable by the smart phone users. With the conventional download model, a user downloads contents directly from a content providers' (CP) server over a communication service providers' (CSP) network. Downloading data through CSP's group involves a price which must be paid either by customers or by the content provider. In this effort we take on Amazon kindle electronic book delivery selling model in which the CP (Amazon) pays to sprint, the CSP, for the cost of network usage due to downloaded electronic books by kindle clients.

Optimal Solutions For contents with changeable level of popularity, a greedy approach for each node would be to store as many distinctly popular contents as its storage allows. This approach sums to noncooperation and can grow to heavy network-wide data duplications. In the other excessive case, which is fully cooperative, a terminal would try to make the best of the total number of single contents stored within the SWNET by avoiding duplication. In thispaper, we show that none of the above excessive approaches can reduce the content provider's charge. We also show that for a given rebate-to-download-charge ratio, there is present an object placement policy which is somewhere in between those two ends, and can increase the content provider's cost by striking a stability between the greediness and full cooperation. This is referred to as optimal object placement policy in the rest of this paper. The proposed cooperative caching algorithms strive to attain this best object placement with the target of reducing the network-wide content provisioning price.

User Selfishness The probability for earning peer-to-peer rebate may encourage selfish activities in some clients. A selfish client is one that diverges from the network-wide finest policy in order to receive more rebates. Any distinction from the optimal policy is expected to incur higher network-wide provisioning cost. In this work, we revise the impacts of such selfish behavior on object provisioning cost and the earned refund within the context of a SWNET. It is given that beyond a threshold selfish node population, the amount of per-node rebate for the selfish users is lower than that for the unselfish users. In supplementary terms, when the selfish terminal population exceeds a certain point, selfish actions discontinue producing more advantage from a refund standpoint.

II. NETWORK, SERVICE AND PRICING MODEL

Fig.1 describes a model SWNET within a University grounds. People carrying mobile devices form SWNET partitions are the end consumers, which can be whichever multi-hop (i.e. MANET) as shown for partitions 1, 3, and 4, or single hop contact point based as shown for partition 2. A movable device can download some data (i.e., content) from the CP's server using the CSP's cellular system, or from its home SWNET partition. In the remaining paper, the terms object and content are used synonymously. We regard as two types of SWNETs. The foremost one involves motionless 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 fixed states. We also consider a second type to explore as to what happens when the still 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.

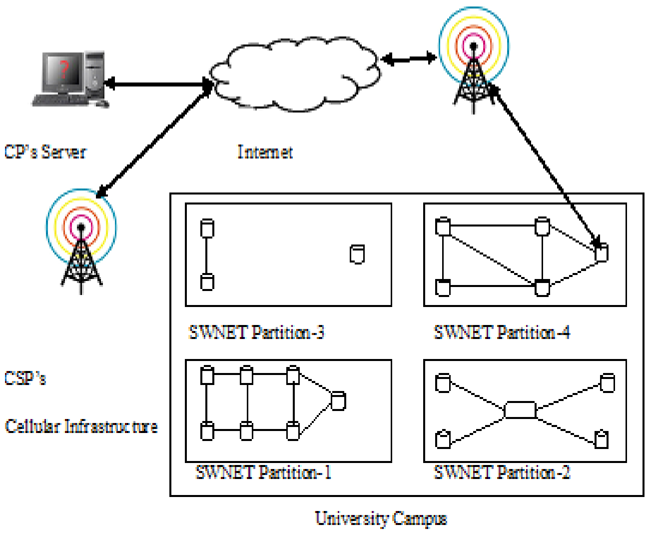

Fig.1 Content access from a SWNET in a University Campus.

III. SEARCH MODEL

After an object call is originated by a mobile tool, it first finds in its local cache. If the local search fails, it searches the object within its SWNET division using limited transmit note. If the search in division also fails, the data is downloaded from the CP's server using the CSP's 3G/4G cellular arrangement. In this paper, we have designed objects such as electronic books, music, etc., which does not vary on time, and therefore cache constancy is not a serious issue. We first suppose that all objects have the equivalent size and each terminal is able to store up to "C" dissimilar data in its cache. Later on, we let go this supposition to sustain objects with variable size. We also believe that all objects are popularity-tagged by the CP's server. The popularity-tag of an object points out its universal recognition; it also indicates the chances that a subjective request in the network is produced for this specific object. 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.

Moreover, at any time an EC provides a nearby cached object to another EC within its home SWNET division, the supplier EC is rewarded a refund Cr by the CP. Optionally, this return 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 rebate given out to an EC when the object is found within the SWNET (e.g., node A receives rebate Cr after it provides a content to node B over the SWNET).

IV. CACHING FOR OPTIMAL OBJECT PLACEMENT

Split Cache Replacement To understand the optimal object placement under homogeneous object request model we propose the following Split Cache policy in which the available cache space in each device is divided into a duplicate segment and a unique segment. In the first segment, nodes can store the most popular objects without worrying about the object duplication and in the second segment only unique objects are allowed to be stored. Among the Split Cache replacement policy, almost immediately following an object is downloaded from the CP's server, it is categorized as only one of its kind object as there is only one copy of this object in the network. In addition, when a node downloads an object from another SWNET node, that object is categorized as a replica object as there are now at least two duplicates of that object in the network. For storing a new exclusive object, the least popular object in the whole cache is selected as a candidate and it is replaced with the new object if it is less popular than the new received 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 dispossessed in order to put up a duplicated object. The Split Cache object replacement mechanism realizes the optimal strategy. With this mechanism, at steady state all devices' caches preserve the same object set in their duplicate areas, but distinct objects in their unique areas.

V. PROPOSED SYSTEM

In this article depicting motivation from Amazon's Kindle e-book delivery commerce, this paper builds up practical system, service, and pricing models which are then used for generating two object caching approach for limiting content provisioning expenses in networks with homogenous and heterogeneous object requests. The paper creates logical and imitation models for analysing the designed caching approaches in the happening of selfish consumers that diverge from system-wide cost-optimal plans. It also informs outcomes from an Android cell phone based model SWNET, validating the presented logical and imitation outcomes.

A. Advantages of Proposed System

Based on a convenient service and pricing case, a stochastic model for the content provider's cost calculation is developed. A cooperative caching approach, Split Cache, is proposed, numerically analysed, and theoretically proven to provide best possible object placement for systems with homogenous content demands. A benefit-based strategy, Distributed Benefit, is proposed to reduce the provisioning cost in heterogeneous networks consisting of nodes with different content request rates and patterns.

VI. EXPERIMENTAL RESULT

Eexperimental result is as shown in bellow Figs.2, 3, 4 and 5.

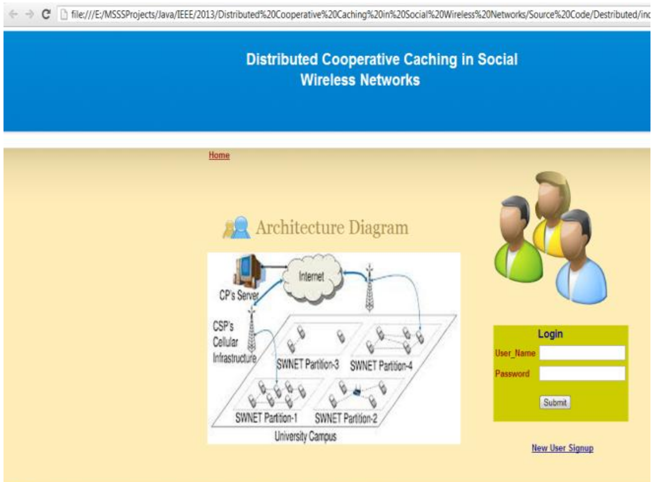

Fig.2. Login Page.

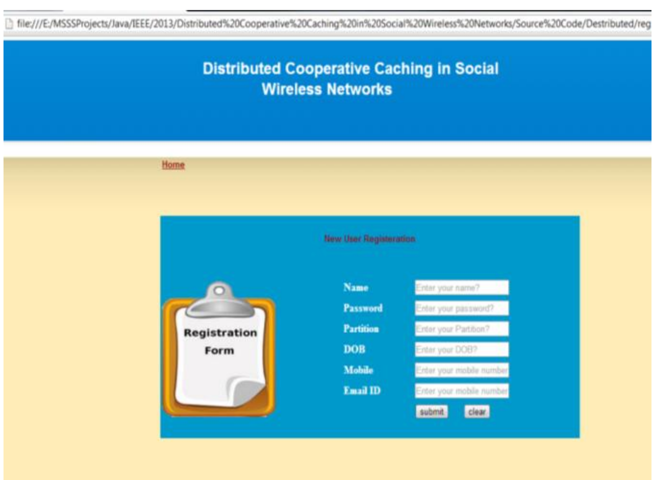

Fig.3. Registration Page.

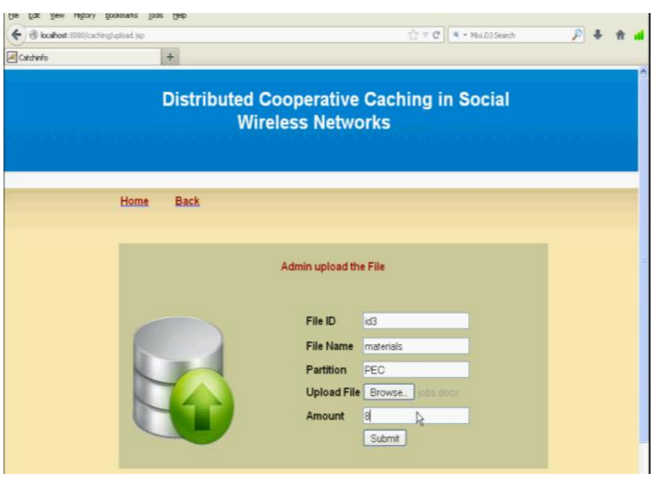

Fig.4. File upload.

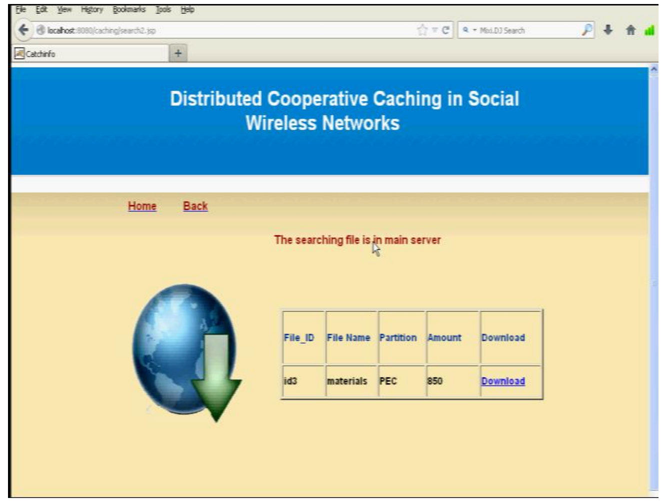

Fig.5. File Download.

VII. CONCLUSION

The objective of this work was to develop a cooperative caching strategy for provisioning cost minimization in Social Wireless Networks. The key contribution is to display that the best cooperative caching for provisioning cost reduction in networks with homogeneous content demands requires an optimal split between object duplication and individuality. Furthermore, we experimentally (using simulation) and analytically evaluated the algorithm's performance in the presence of user selfishness. It was shown that selfishness can increase user rebate only when the number of selfish nodes in an SWNET is less than a critical number. It was shown that with heterogeneous requests, a benefit based heuristics strategy provides better performance compared to split cache which is proposed mainly for homogeneous demand. Ongoing work on this topic includes the development of an efficient algorithm for the heterogeneous demand scenario, with a goal of bridging the performance gap between the Benefit Based heuristics and the centralized greedy mechanism which was proven to be optimal Removal of the no-collusion assumption for user selfishness is also being worked on.

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