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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 n/w, 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.***

I. INTRODUCTION

Data enabled mobile devices present usage and wireless-enabled data apps have promoted new content broadcasting models in present mobile ecosystem. Those devices list includes Apple's iPhone, Google's Android, Amazon's Kindle, and other vendor's electronic book readers. The data applications array contains mobile phone Apps and magazine readers and electronic book. Mobile applications proliferation level of is point out by the sample case fact that Apple's App Store presented over one hundred thousand apps that are downloadable with the help of smart phone clients as of October 2010.

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 (Social Wireless Networks) can be formed by utilizing the devices ad hoc 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. 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.

Let us take a simple case of Amazon Kindle clients an archive mode is obtainable utilizing which a client simply decreases a book after finishing it, any have it stays archived as a paid item in cloud server of Amazon's. 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 is decresed?

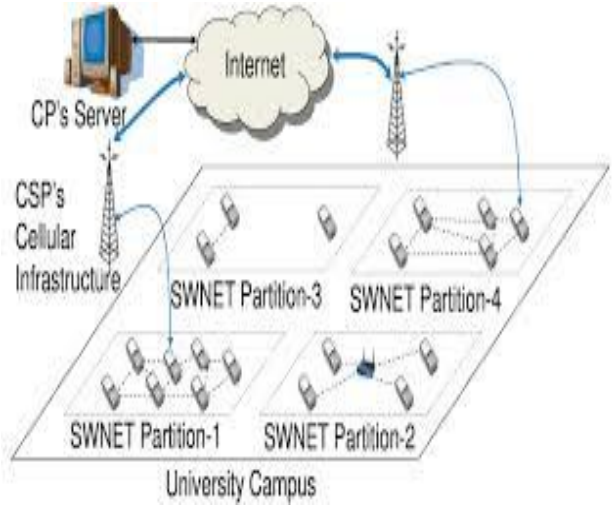

Figure 1: Social Wireless Networks architecture

II. 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 n/w, 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.

III. SYSTEM DEVELOPMENT

Implementation Modules:

1. Model of Network
2. Model of Search
3. Model of Pricing

Model of Network: We consider Social Wireless Networks two types. The initial one involves stationary Social Wireless Network partitions. That means, after a partition is created, it is managed for satisfactorily long so that the cooperative entity caches can be created and arrive at steady states. We also examine a next type to discover as to what occurs when the stationary statement is relaxed. To examine this effect, caching is used to Social Wireless Networks formed utilizing human interaction traces attained from a set of real Social Wireless Network partitions nodes.

Model of Search: We look for the file means; it initially searches its local cache. If we fail in local search, it hunts for the object within its Social Wireless Networks partition with the help of broadcast message which is limited. If the failure occurs in partition search also the entity is downloaded from the content provider's server. In this thesis we have objects like music, electronic books, etc., which are time non unstable, and so cache steadiness is not a serious issue. The object popularity-tag indicates its global fame; it also point outs the possibility that an arbitrary request in the network is created for this particular object.

Model of Pricing: We utilize a pricing model alike to the Amazon Kindle business model in which the content provider pays a download price Cd to the Communication Service Provider's when an End-Consumer downloads an object from the content provider's server via the Communication Service Provider's cellular network. Also, whenever an EC gives a locally cached entity to another EC within its local Social Wireless Networks partition, the EC provider is paid a rebate Cr by the content provider. 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.

IV. 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 constraints such as topological insatiability 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 CachePath 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 HybridCache in which either CacheData or CachePath 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 n/w, 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. A mistreated node is a cooperative node that experiences an in which each user tries to minimize its individual access cost by replicating a subset of objects locally (up to the storage capacity), and accessing the rest from the nearest possible location. Using a game theoretic formulation, the authors prove the existence of a pure Nash equilibrium under which network reaches a stable situation. Similar approach has been used in [12] in which the authors model a distributed caching as a market sharing game.

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].

V. 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 N/W's with homogeneous 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.

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