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Novel Cellular traffic offloading delay tolerant using Wi-Fi access points in Trace-driven simulation

Dr. N. Chandra Sekhar Reddy[1]; AleswaramSandeep Kumar[2]& MSharadha Varalakshmi[3]

[1]Professor and HOD Dept. of CSE St.Peter's Engineering College, Hyderabad, TS, INDIA
Email Id: - naguchinni@gmail.com
[2]M-Tech Dept. of CSE St.Peter's Engineering College, Hyderabad, TS, INDIA
Email Id: -sandeepkumar.a504@gmail.com
[3]Assistant ProfessorDept. of CSE St.Peter's Engineering College, Hyderabad, TS, INDIA
Email Id: -sharadha@stpetershyd.com

Abstract

Cellular networks are currently facing the challenges of mobile data explosion. High-end mobile phones and laptops double their mobile data traffic every year and this trend is expected to perpetuate given the rapid development of mobile gregarious applications. It is imperative that novel architectures be developed to handle such voluminous mobile data. In this paper, we propose and evaluate an integrated architecture exploiting the opportunistic networking paradigm to migrate data traffic from cellular networks to metropolitan WiFi access points (APs). To quantify the benefits of deploying such an architecture, we consider the case of bulk file transfer and video streaming over 3G networks and simulate data distribution utilizing authentic mobility data set of 500 taxis in an urban area. We are the first to quantitatively evaluate the gains of citywide WiFi offloading utilizing astronomically immense scale authentic traces. Our results give the numbers of APs needed for different requisites of quality of accommodation for data distribution in sizably voluminous metropolitan area. We show that even with a sparse WiFi network the distribution performance can be significantly ameliorated. This effort accommodates as a paramount feasibility study and provides guidelines for operators to evaluate the possibility and cost of this solution.

Keywords-Cellular traffic offloading; delay tolerant; Wi-Fi access points; trace-driven simulation

1. INTRODUCTION

Subsisting offloading studies have not considered the gratification loss of the users when a longer delay is caused by traffic offloading. Not considered the contentment loss of the users when a longer delay is caused by traffic offloading. Only provide intermittent and opportunistic network connectivity to the users. Non-negligible data downloading delay. In this paper, we fixate on investigating the trade-off between the amount of traffic being offloaded and the users' gratification, and propose a novel incentive framework to incentivize users to leverage their delay tolerance for traffic offloading. Users are provided with incentives; i.e., receiving discount for their accommodation charge if they are inclined to wait longer for data downloading. During the delay, a component of the cellular data traffic may be opportunistically offloaded to other networks mentioned above, and the utilizer is assured to receive the remaining part of the data via cellular network when the delay period ends. To incentivize the mobile users with high delay tolerance and immensely colossal offloading

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potential to offload their traffic to other intermittently connected networks such as DTN or Wi-Fi hotspots. To capture the dynamic characteristics of users' delay tolerance. To presage users' offloading potential predicated on their mobility patterns and the geographical distribution of Wi-Fi hotspots in the Wi-Fi case

2. RELATED WORK

Subsisting system:

Subsisting offloading studies have not considered the contentment loss of the users when a longer delay is caused by traffic offloading.

Disadvantages

Not considered the contentment loss of the users when a longer delay is caused by traffic offloading. Only provide intermittent and opportunistic network connectivity to the users. Non-negligible data downloading delay.

Proposed system

In this paper, we fixate on investigating the trade-off between the amount of traffic being offloaded and the users' contentment, and propose a novel incentive framework to incentivize users to leverage their delay tolerance for traffic offloading. Users are provided with incentives; i.e., receiving discount for their accommodation charge if they are disposed to wait longer for data downloading. During the delay, a component of the cellular data traffic may be opportunistically off-loaded to other networks mentioned above, and the utilizer is assured to receive the remaining part of the data via cellular network when the delay period ends.

Advantages

To incentivize the mobile users with high delay tolerance and astronomically immense offloading potential to offload their traffic to other intermittently connected networks such as DTN or Wi-Fi hotspots. To capture the dynamic characteristics of users' delay tolerance. To presage users' offloading potential predicated on their mobility patterns and the geographical distribution of WiFi hotspots in the WiFi case.

3. IMPLEMENTATION

Bidding

To obtain coupon, the users annex bids with their data requests to reveal their delay tolerance. For each utilizer, the upper bound tbound of its delay tolerance can be viewed as the resources that it wants to sell. The utilizer can divide tbound into multiple time units, and submit multiple bids b = {b1, b2, ••• , bl } to denote the value of coupon it wants to obtain for each adscititious time unit of delay, where l equals tbound e , and e is the length of one time unit. By receiving these bids, the network operator kens that the utilizer wants to obtain coupon with value no less than ki k=1 bk by waiting for ki time units. The length of time unit e can be flexibly determined by the network operator. Shorter time unit results in more immensely colossal bids with more information, which increases the performance of the auction, but it additionally induces more communication overhead and higher computational intricacy. To simplify the presentation, in the rest of the paper delay t is normalized by time unit e

Auction algorithms

Win-Coupon is run periodically in each auction round. Customarily, the auction would result in an extra delay for the bidders to wait for the auction outcome. However, different from other long-term auctions, such as the FCC-style spectrum leasing, the auction round in our scenario is very short, since hundreds of users may request cellular data accommodation concurrently. Withal, because the bidders who are inclined to submit bids are supposed to have a certain degree of delay tolerance, the extra delay caused by auction can be neglected. Next, we describe two main steps of the auction: allocation and pricing

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Allocation

In traditional reverse auction, the allocation solution is pristinely decided by the bids; i.e., the bidders who bid the lowest price win the game. However, in our scenario, besides the bids which express the bidders' delay tolerance, the offloading potential of the bidders should additionally be considered. Let {t1, t2, ••• ,t|N |} represent the allocation solution, where ti denotes the length of delay that network operator wants to buy from bidder i.

Pricing

The VCG-style pricing is generally utilized in forward auction, which involves single seller with constrained resources for sale, and multiple buyers. The bidders who have the highest bid win the game, and each winning bidder pays the "opportunity cost" that its presence introduces to others. It is proved that this pricing algorithm provides bidders with the incentives to set their bids veraciously. Predicated on the rudimentary conception, in our pricing algorithm, the network operator withal pays bidder i the coupon with value equipollent to the "opportunity cost" exerted to all the other bidders due to i's presence. Given the offloading target vˆ0, let c1 = Cvˆ0 B\{bi} denote the total value of coupons requested by all the bidders under the optimal allocation solution without the presence of i. Let c2=(Cvˆ0 B − ti k=1 bk i) denote the total value of coupons requested by all the bidders except for i under the current optimal allocation solution

Reserve

Price In forward auction, the seller has the option to declare a reserve price for its resources. The reserve price designates that the seller would rather withhold the resources if the bids are too low (lower than the reserve price). In WinCoupon, to ensure the network operator obtaining non-negative profit, we additionally provide it with the option to set a reserve price to betoken the highest incentive cost it is inclined to pay for offloading one traffic unit. If the value of coupon asked by the bidders exceeds the reserve price, the network operator would rather not trade with them. Suppose that the network operator sets a reserve price c0, which betokens that it is inclined to spend at most c0 for offloading one traffic unit. Integrating the reserve price c0 can be understood as integrating a virtual bidder in the auction round. The bids sent by the bidder is {c0, c0, ••• , c0}, and it can offload one traffic unit per one time unit of delay.

4. EXPERIMENTAL RESULTS

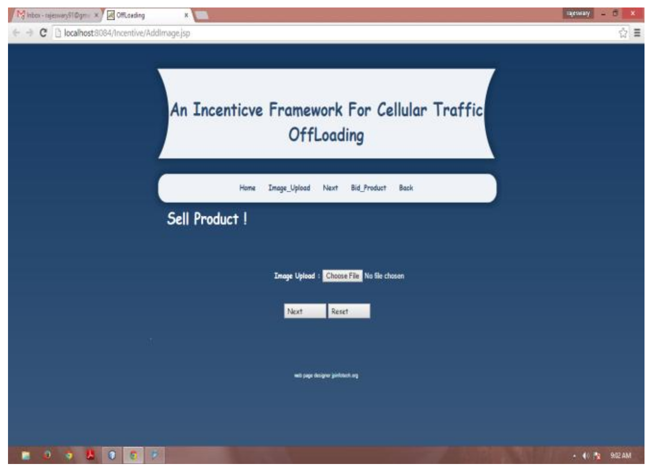

Fig:-1 Data Upload

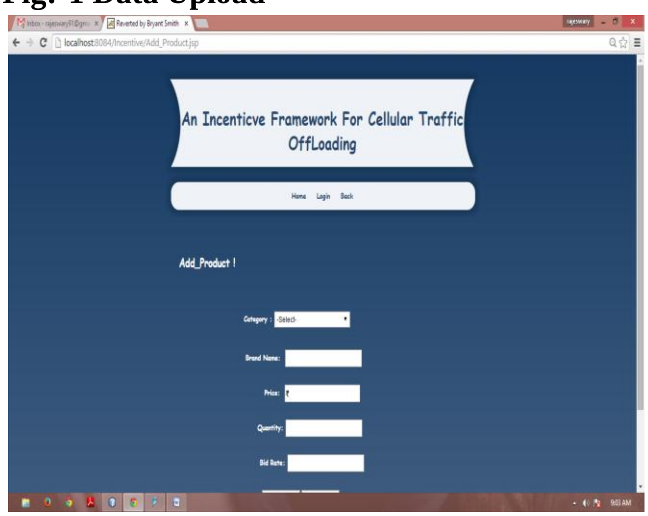

Fig:-2 New Product

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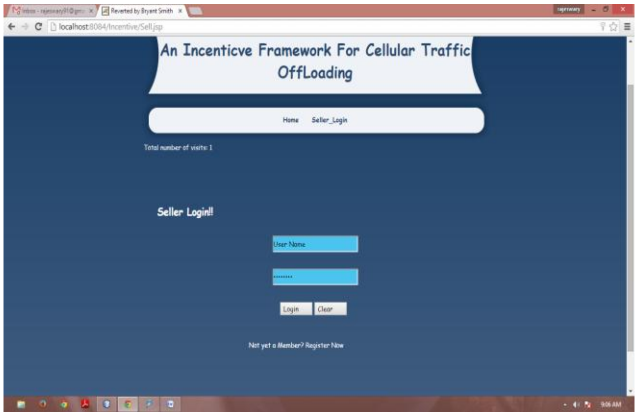

Fig:-3 Secure Login

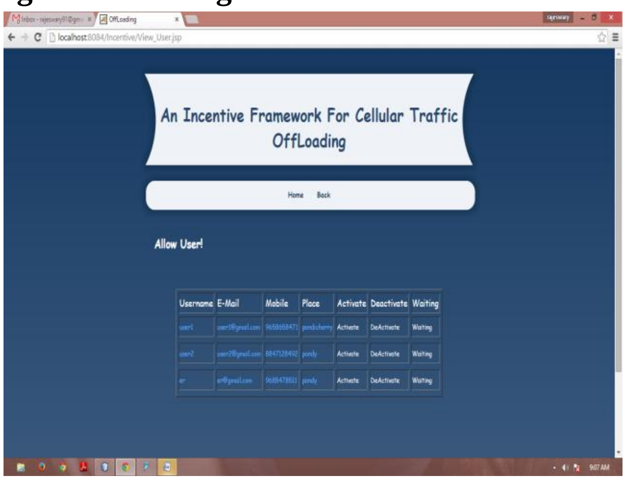

Fig:-4 Result

5. CONCLUSION

In this paper, we proposed a novel incentive framework for cellular traffic offloading. The rudimentary conception is to incentivize the mobile users with high delay tolerance and sizably voluminous offloading potential to offload their traffic to other intermittently connected networks such as DTN or WiFi hotspots. To capture the dynamic characteristics of users' delay tolerance, we design an incentive mechanism predicated on reverse auction. Our mechanism has been proved to assure veracity, individual rationality, and low computational involution.

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