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TSP: A Traffic Sharing Platform for Mobile Networks

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1 Introduction

With the explosive development of mobile Internet, Many people choose to become wireless Internet users. Wireless Service Providers (WSPs) provide various traffic plans to meet smartphone users requirements. These plans are mainly based on the flat-rate and usage-based pricing policy.

To subscribers, the policies are too simple to consider the actual requirements of heterogeneous subscribers. To society welfare, the network resource configuration cannot achieve the Pareto optimality.

To solve the problems discussed above, we design and implement a Traffic Sharing Platform (TSP) for smartphone users. Through TSP, providers can easily share their unused traffic and obtain certain rewards. Meanwhile, consumers can easily obtain traffic by paying certain cost. We take pricing function as an example to demonstrate the effect of the incentive mechanism on TSP and analyze the relationship among providers, consumers and server. At last, we propose some constraints should comply with.

2 Primitive Design

The original system design is composed by three modules: Provider Access Module (PAM), Consumer Access (CAM), and Sharing Module (SM).

PAM is deployed on provider side, and is capable of creating a Wi-Fi Hotspot, namely AP. A consumer terminal is able to connect the AP. The SM consists of a mesh network and an authentication server.

The mesh network is interconnected by a number of wired and wireless routers. The APs achieve bridging connection via a wireless router at the end of the SM, and are switched through the mesh network in the SM. The authentication server is to manage the authentication and behavior of users as well as the traffic sharing records. The system architecture is shown in Figure 1.

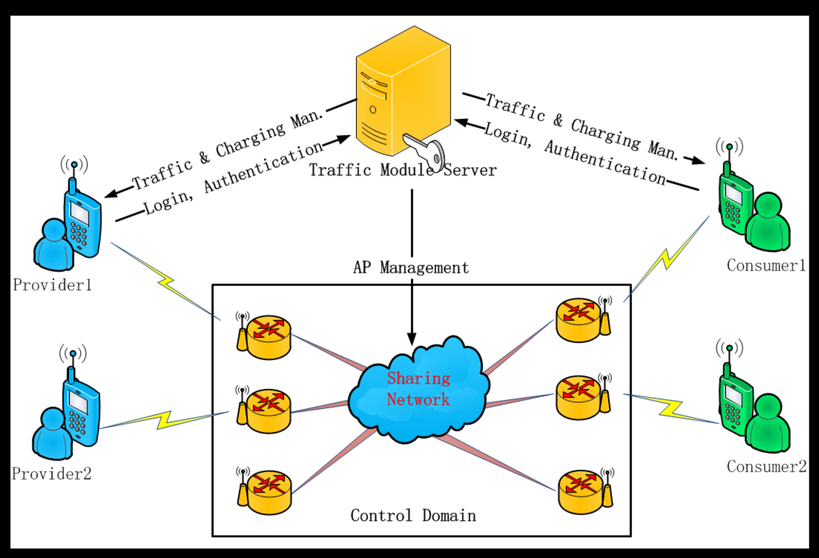

Fig.1 System architecture

3 Distributed System

In this section, a P2P service framework is discussed. There is no need to deploy a shared mesh network in the SM, but only to persist the authentication server.

The original system design is applicable to the scenario that the providers and consumers are not in the same local area. Here, it is the traffic sharing platform which implements the connection between them. The improved distributed system presented below meets the requirement of less deployment costs, improved performance and better scalability. And the system is designed primarily for the scenario that providers and consumers are relatively closed and within the same wireless hotspot coverage. The Improved distributed system architecture is shown in Figure2.

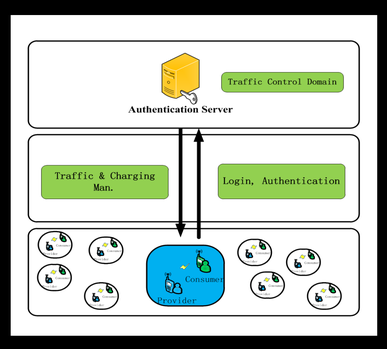

Fig.2 Improved system architecture

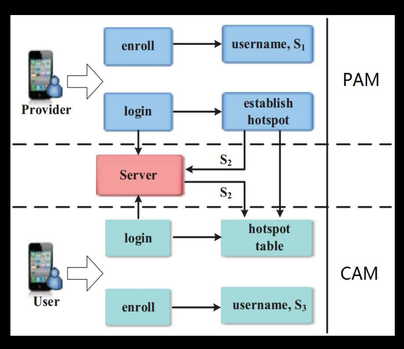

Fig.3 TSP workflow

4 Traffic Management

Running on terminals of providers and consumers, the access management module conducts the traffic monitoring, which can identify the traffic consumed by users through the traffic sharing platform. The traffic rate is transmitted in real time to the platform module and stored in the database of the authentication server, which results in easier management and billing.

The access management module can also set the traffic caps, providers can set the upper limit of traffic contributions, to prevent the traffic shared from exceeding the total amount.

In our model, providers can decide the upload traffic at any time, but we design that the unit price of upload traffic in 1st to 10th day of a month is k1, while the price in 11th to 20th day is k2, and that in 21th to the last day of a month is k3, where k1>k2>k3. In this way, providers have incentive to upload the shared traffic beforehand, so as to serve the consumers in time.

Firstly, providers decide whether to share their 2G or 3G traffic. The traffic price is set to p1 and p2, where p1<p2; Secondly, providers set their upper bounds of traffic by the client.

5 TSP Workflow

For a new provider, he should start the PAM on his terminal to register in the authentication server. Once joining in the sharing platform, he will obtain a user ID as well as a login key S1. In order to provide access for the consumers nearby, a hotspot is created with an access key S2 by the PAM. The key is generated according to the user ID and key S1.

Similarly, a consumer should also register in the sharing platform to obtains a user ID and a login key S3. He can login with S3, and then the CAM will conduct the AP searching process. After that, an AP list is returned to the consumer by a recommended strategy. The workflow of TSP is shown in figure 3.

6 Implementation

We implement the TSP for Android system and the apk program is named NiuNiu. The system interfaces are shown in figure 4-6.

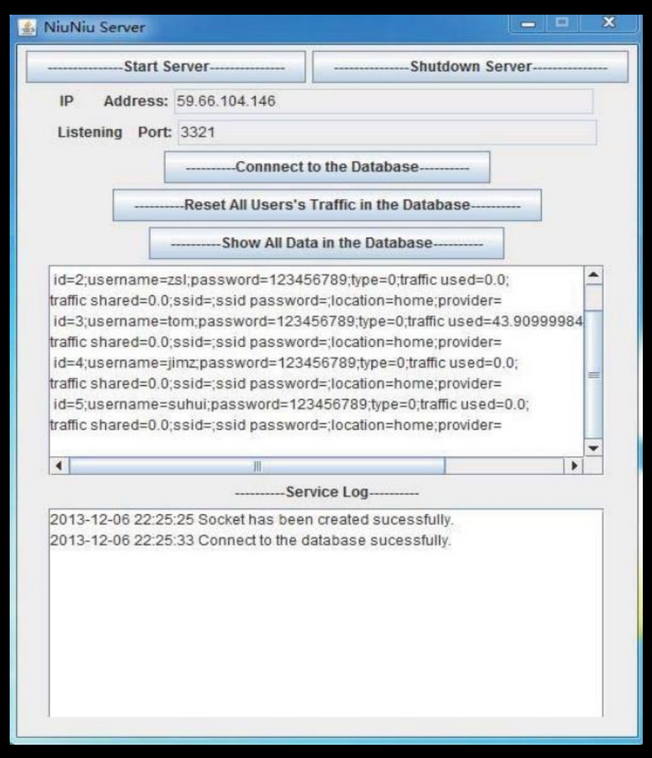

Fig.4 Server Demo

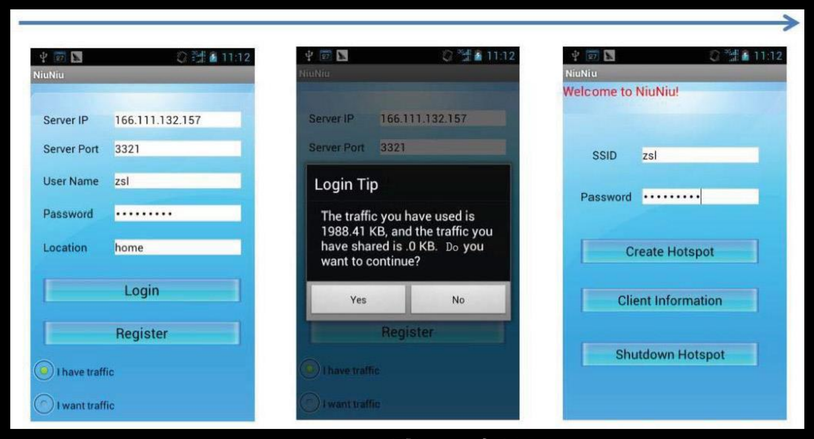

Fig.5 Client of PAM

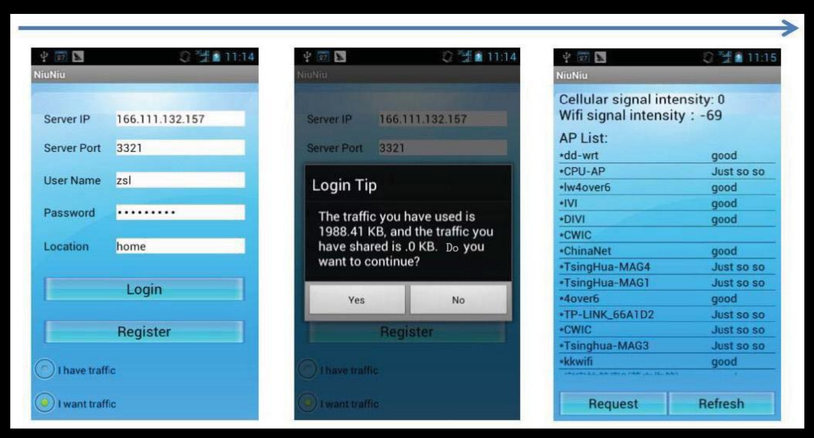

Fig.6 Client of CAM

7 Conclusion

In this paper, we described the design and implementation of TSP, a platform for mobile users to share traffic with each other. The motivation of our work is based on the observation that mobile user's surplus traffic is wasted. They cannot share the traffic to the ones who need it. The simulation shows that the incentive mechanism does play an important role in changing traffic provider distribution. The results could provide some beneficial insights to system managers.