Pricing policies for competing wireless service providers

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As stated in our proposal[1] the first stage is the construction of a model of competitive network access. Using the model, we study the characteristics of congestion control through pricing on two levels: first, when users try to obtain communication resources from competing providers, and second when providers attempt to maximize revenue through price and market share gains. Optimal pricing policies - in the form of social welfare or network revenue - will be derived by the solution of the proposed model.

One of the issues that has received little attention in the network pricing community is the case of providers in competition. We would like to highlight two questions that guide our research:

1. How should providers set prices so that they can attract demand from competitors and increase their revenue?
2. Does this price war lead to a Nash equilibrium?

We have investigated the case when time is decomposed into slots and each provider has a fixed capacity. If demand exceeds capacity, the provider can only serve up to its capacity and each (infinitesimally small) user is rejected with the same probability. This approach constitutes a major difference with the literature where the externality is latency rather than loss.

As a result of the first stage we have been able to characterize the Wardrop demand equilibrium for any given price combination. Given the demand distribution and mild conditions on costs incurred by providers, we have proved and expressed in closed form the existence and uniqueness of a Nash equilibrium for the price competition. Remaining questions that should be addressed still within the scope of the proposed model are:

- First we wish to compute the price of anarchy expressing the ratio between optimal revenue with cooperative network and the one we have found in the non-cooperative case.

- Second, we are especially interested in the case where some providers share a given capacity (such as in WiFi for instance).

Next step is the refinement in of the modelling of user and provider preferences. For this reason, the quality of service to users needs to be precisely estimated. This part of the work may involve some specific computational tools to evaluate wireless networks performance.

The last stage will deal with the problem a user faces when given the choice of a pricing policy for his profile; the latter means that demand characteristics for a given user profile can be optimally matched to pricing menus. Being able to achieve the latter is the purpose of our research collaboration.

[1] "Pricing policies for competing wireless service providers" submitted to Royal Society – ISAT Linkages programme