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Cost-Function-Based Network Selection Strategy in Heterogeneous Integrated Wireless

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Abstract: Enabling users to connect to the best available network, dynamic network selection scheme is important for satisfying various quality of service requirements, achieving seamless mobility and load balancing in heterogeneous wireless networks. In this paper, we formulate the network selection problem in heterogeneous wireless networks with incomplete information as a Bayesian game. In general, the preference of a mobile user is private information. Therefore, each user has to make the decision of network selection optimally given only the partial information of the preferences of other users. To study the dynamics of such network selection, the Bayesian best response dynamics and aggregate best response dynamics are applied. Bayesian Nash equilibrium is considered to be the solution of this game, and there is a one-to-one mapping between the Bayesian Nash equilibrium and the equilibrium distribution of the aggregate dynamics. The numerical results show the global convergence of the aggregate best response dynamics for this Bayesian network selection game. This ensures that even with incomplete information, the equilibrium of network selection decisions of mobile users can be reached.
Keywords: Aggregate, response dynamic, Bayesian, Network selection, heterogeneous.

I. INTRODUCTION

Heterogeneity has been introduced to be one of the most important features in the next generation wireless network. In heterogeneous wireless networks, different wireless access technologies are integrated to complement each other in terms of coverage area, mobility support, bandwidth, and price. In such heterogeneous wireless networks, dynamic network selection scheme is required not only to achieve seamless mobility, but also to support quality of service (QoS) enhancement and load balancing. Network selection in heterogeneous wireless networks can be categorized into two approaches, i.e., network-driven and user-driven selections. With a network-driven approach, the selection decision is made from the network-side (i.e., service provider). Therefore, it is suitable for tightly integrated environment in which a central controller distributes the traffic flows among different networks. In contrast, with a user-driven approach, users make decisions to select the network in distributed fashion. Therefore, it does not require any modification and coordination among different networks. A few works have proposed the designs of network selection algorithm. In [1], analytic hierarchy process (AHP) was used to weight the evaluation factors. Also, grey relational analysis was used to select the best network. In [2], compensatory and non-compensatory multi-attribute decision making algorithms were jointly used to assist the terminal in selecting the most suitable network. A cost function based network selection strategy was proposed in [3] from the system perspective. However, the dynamics of network selection was not considered in these papers. Evolutionary game approach based on replicator dynamics was used in [4] and [5] to study the dynamics of network selection with complete information and to model the user churning behavior in heterogeneous wireless networks. In [6], a Markov Decision Process based control scheme was proposed for flow assignment among different networks. However, the incomplete information of utilities and the handover cost are not considered. To achieve the best performance with minimum cost, mobile users in heterogeneous wireless networks can perform network selection iteratively. The decisions will evolve to the equilibrium point at which the payoff of every user is maximized given the decisions of others and no one can benefit by choosing other networks unilaterally. Compared with the perfect rationality assumption in traditional game theory, it is more realistic to consider the users to be with bounded rationality. We assume that the users are able to perform best response to current state but these users lack the ability to predict the behaviors of others based on previous behaviors. Therefore, considering the dynamics of network selection and bounded rationality of users, evolutionary game approach is more suitable to investigate the decisions of users over time. In this paper, we investigate the dynamics of network selection with incomplete information in heterogeneous wireless networks. In particular, a Bayesian game is formulated by considering users with different bandwidth requirements. Since the preference of the mobile user is private information, each user has to make the decision of network selection optimally given only the distributions of the preferences of other users. Though traditionally considered unsuitable for cellular networks, one approach is to distribute the network selection decisions over the users, as the device is the only entity aware of actual connectivity conditions and real-time conditions in the device.

II. BRIEF LITERATURE SURVEY

Majed Haddad, member, IEEE, Piotr Wi˛ecek, member, IEEE "An Automated Dynamic Offset for Network Selection in Heterogeneous Networks," 1536-1233 (c) 2015 IEEE IEEE Transactions on Mobile Computing.In order to provide optimal use of RAN resources and best end user experience, 3GPP is also working on the integration of SC to include radio access technology (RAT) selection, addressed through per user and real time based decisions (e.g., network load and users' radio conditions). For example, when the cellular network is somewhat congested, the operator who controls both the MC and the SC networks may want to steer mobile users that experience bad radio conditions on the cellular network (e.g., poor Received Signal Reference Power (RSRP) for LTE) from the MC to the SC (assuming SCs are available). Most existing work so far have assumed that each BS or mobile user has all others' dynamics information whenever making its resource allocation decisions. Nevertheless, this might not be realistic in HetNets due to the limited capacity of the backhaul links and varied ownership. J. G. Andrews, H. Claussen, M. Dohler, S. Rangan, and M. C. Reed, "Femtocells: Past, Present, and Future," IEEE Journal on Selected areas in Communications, vol. 30, no. 3, pp. 497–508, Apr. 2014. This paper considers load-aware network selection solutions, in which partial asymmetric information is available. Partial because the information available in making optimal network selection decisions is incomplete, and asymmetric because the information at the MC depends on the load, whereas the information available at the SC depends on the radio conditions. This contributes to the design of automated dynamic offset which optimizes network's global utility while intelligence is split between the MC and mobile users. A. Damnjanovic, J. Montojo, Y. Wei, T. Ji, T. Luo, M. Vajapeyam, T. Yoo, O. Song, and D. Malladi, "A survey on 3gpp heterogeneous networks," Wireless Communications, IEEE, vol. 18, no. 3, pp. 2011. Scenarios where such a situation is met, notably situations with priority among users. For example, when resource allocation rules correspond to those of primary users in cognitive radio or spectrum pooling networks, in which each user enjoys only a limited access to the spectrum. The rationale behind this stems from the fact that primary users maximizing their own spectral efficiency independently of the others can result in suboptimal usage of the spectrum.

III. RESEARCH METHODOLOGY

To reach the equilibrium distribution, many iterations of network selection need to be performed to construct the convergence trajectory. Within an epoch, describes the path from the initial distribution state to its best response distribution. And at next selection epoch, this best response distribution is considered as the initial state. Therefore, the network selection distribution at network selection epoch m can be obtained from The impact of system parameters on the equilibrium distributions will be analyzed analytically in next section.

IV. PROPOSED SYSTEM

The A heterogeneous wireless environment consisting of multiple access networks with the. Without loss of generality, we consider service area a with three access networks

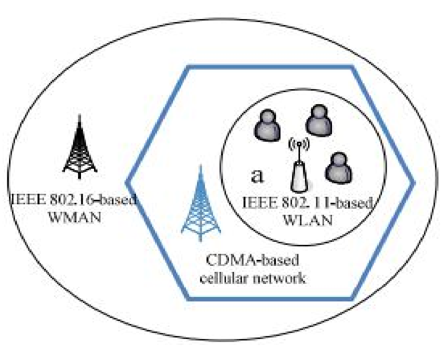

Fig 1. Heterogeneous network

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ZigBee link with single RF-chain transmitter and receiver, It can scale link capacity with Nt at a even faster rate than SSK, which translates into enormous energy saving. It achieves this goal by uncovering the hidden potential of antenna hopping in real communications systems like ZigBee. It employs an antenna index coding framework that enables a fine-grained antenna hopping. The key observation is that real wireless devices need to compound symbol-level modulation with wide-band channel spreading . Consequently, It can embed multiple bits of antenna-index information in each original data symbol, by using sub-symbol level antenna hopping. Further, to obviate the need for multiple RF chains at the receiver side, It judiciously plants redundancy in the antenna hopping patterns, such that decoding error can be minimized without incurring too much overhead. ZigBee Transceiver. We port an opensource C# implementation of ZigBee PHY layer to the driver. This implementation is validated by running it on and allowing direct communication with a ZigBee transceiver . On top of it, we develop the single-carrier AIC and its decoding mechanisms following, along with the for WiFi Transceiver. To verify for multi-carrier systems, we first implemented an 802.11n-compliant. Our implementation reuses the 802.11n preamble mechanism, that allows transmit antennas to send LTF preambles sequentially, from which the receive antenna can extract their channel pattern. As a benchmark comparison, we have also implemented the 802.11n scheme that exploits diversity gain between a multi-RF-chain transmitter and single RF-chain receiver.

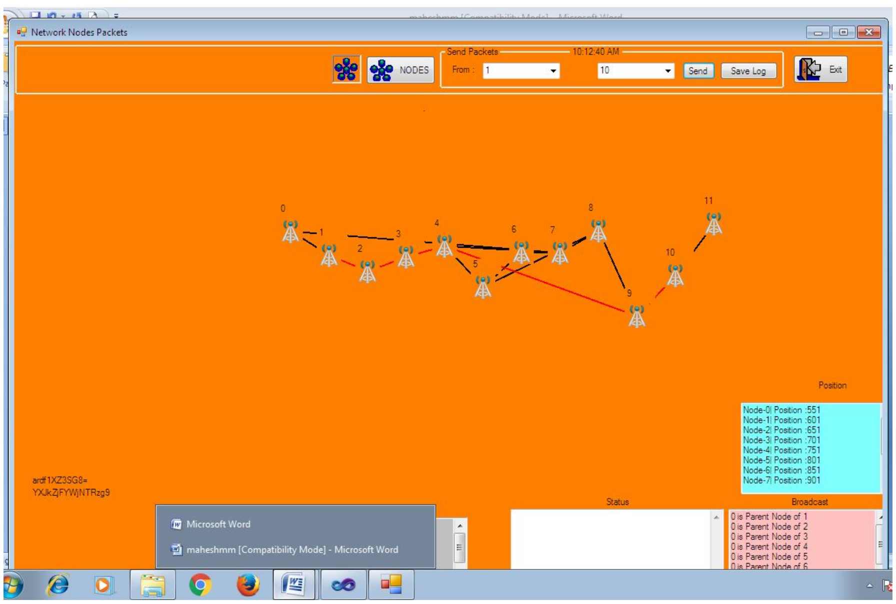

Fig 2. Path Routing system

Simulation scenario depicts the failure nodes and applies the recovery scheme for failure nodes. So the data transmit from another path to the destination, without dropping of the data transfer to the destination. To repair the failure nodes, so they are in active state. The combinational methodology detects the multiple failure Nodes at a time and apply the recovery scheme so that without failure of delivery of message packet data send to the destination and repair the failure nodes. The failure nodes have a time for regain the failure nodes. The data send from the previous routing path. So that the data deliver fastest which maximize the life time of network. The nodes are fail due to low battery of the nodes or the energy level of the node is low and apply the recovery scheme. The failure nodes are repair because it have time for regain the failure nodes.

V. CONCLUSIONS

The The dynamics of this network selection game has been analyzed using Bayesian best response dynamics and aggregate best response dynamics. The rest points of this aggregate dynamics determine the equilibrium distributions which correspond to the Bayesian Nash equilibria. Numerical results show the global convergence of aggregate best response dynamics and the analysis shows the impact of system on the equilibrium distributions. For the future work, we will study based on the equilibrium distribution, how the service providers can adjust the system capacity and price accordingly to maximize the profits.

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