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### Resource Allocation and Pricing in Virtual Wireless Networks

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Abstract  
The Internet architecture has proven its success by completely changing people's lives. However, making significant architecture improvements has become extremely difficult since it requires competing Internet Service Providers to jointly agree. Recently, network virtualization has attracted the attention of many researchers as a solution to this ossification problem. A network virtualization environment allows multiple network architectures to coexist on a shared physical resource. However, most previous research has focused on network virtualization in a wired network environment. It is well known that wireless networks have become one of the main access technologies. Due to the probabilistic nature of the wireless environment, virtualization becomes more challenging. This thesis consider virtualization in wireless networks with a focus on the challenges due to randomness. First, I apply mathematical tools from stochastic geometry on the random system model, with

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transport capacity as the network performance metric. Then I design an algorithm which can allow multiple virtual networks working in a distributed fashion to find a solution such that the aggregate satisfaction of the whole network is maximized. Finally, I proposed a new method of charging new users fairly when they ask to enter the system. I measure the cost of the system when a new user with a virtual network request wants to share the resource and demonstrate a simple method for estimating this "price".

Advisor(s) or Committee Chair  
Goeckel, Dennis L

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