Domestic and mobile networks: Measurements, analyses, and patterns

Mots clés :
- Directeur de thèse: Marcelo Dias de Amorim
- Co-encadrant(s):
- Unité de recherche: Laboratoire d'informatique de Paris 6
- Ecole doctorale: École Doctorale Informatique, Télécommunications, Électronique de Paris
- Domaine scientifique principal: Divers

Résumé du projet de recherche (Langue 1)

This thesis is structured around both home and mobile networks. In the context of home networks, we deal with both home traffic characterization and application performance degradation. In the case of mobile networks, we are interested in understanding the relationship between wireless technology and contact opportunities among nodes on the move. We summarize the main contributions of this thesis in the following. Part I (Application performance optimization in home networks). The increasing penetration ratio of residential Internet access leads to more people with home networks. Home network connects many devices to the Internet allowing different members of a household to share internet access and local network resources. Then, applications running in parallel can interfere with one another. For instance, children playing online games slows down their parents browsing over the web. The first focus of this thesis is to control the utilization of home network resources to optimize the performance of competing networked applications. The home gateway is responsible of connecting the home network to the rest of the Internet. Because it has an overall view of all the traffic going to the home network, it is the ideal point for application optimization. In this thesis, we make the first step toward a system that runs on the home gateway to detect performance degradation and optimize resource allocation to obtain the best applications performance. Typical home gateways do not include any mechanism to guarantee optimal applications performance. Another contribution of this thesis is to propose an application performance optimization approach for home networks. In particular, we study the feasibility of application performance tracking on home gateways. We show that although the home gateway has limited resources, it still has the capacity to do more than just forwarding packets. It can collect and export all the information needed to perform our application performance optimization method. Part II (Mobility trace breeding). The best way to analyze or validate any protocol or design choice in DTN is through a real deployment. Nevertheless, because of implementation challenges and even financial costs, only a few experimentations have been reported in the literature. As a consequence, several works still rely on synthetic mobility models. While synthetic mobility models are useful to isolate specific parameters of a solution or help investigate the scalability of a system, they cannot always reflect real life conditions. On the other hand, contact traces are known to better represent real-life mobility but also to be hard to get. What if one real trace were sufficient to get multiple others, just as if we performed multiple experimentations? To this end, we rely on plausible mobility, an algorithm capable of inferring spatial movement from contact traces and we propose a mobility trace breeding system that, from a single real-life contact trace, derives multiple contact traces inspired from the original trace. We check the conformity of our proposal by comparing the results of our breeding system with the original contact trace of a mobile network generated synthetically and show that the outcome of our system does correspond to the original trace. In this thesis, we investigate underlying phenomena in both domestic and mobile networks. The combination of the work from the home to the mobile networks rises new research questions. Given the little knowledge about the application mix in mobile areas in general, it is interesting to use our application characterization method on mobile devices from home networks to characterize applications in the context of mobile networks.