Proposition de recherche doctorale

Trustable monitoring infrastructure for residential Internet access

Résumé du projet de recherche (Langue 1)
Residential access networks, such as Digital Subscriber Line (DSL), cable and fiber to the home are seeing steady deployment. Despite this increasing penetration, very little is known about the actual performance of broadband access networks and whether users are getting what they pay for. Government agencies now want to regulate broadband access. However, the technology to monitor these networks efficiently and at large scale is not yet available. The goal of this thesis is to design a monitoring system that can serve government agencies to regulate residential Internet access and users to verify whether Internet providers respect the performance promised in contracts. Developing a performance monitoring system for these purposes brings new challenges. First, opportunistic providers may try to influence measurements to make their performance look better. Second, users may trick the system to get compensation from their providers. Hence, we need to develop a monitoring system that is trustable, i.e., a system that can reliably monitor performance and assign responsibility for performance degradation.

Résumé du projet de recherche (Langue 2)
This thesis will proceed in three main steps that will combine different theoretical techniques (for instance, to design and analyze new measurement algorithms), experiments in real environments to validate algorithms and collect data, simulations (for validation purposes) and also data analysis: * Step 1: identify and define a set of representative metrics to characterize the performance of Internet providers' network. To define performance metrics that are relevant for home users, we will profile the network behavior of typical home users. We plan to use machine learning technique on home traffic data collected at users’ machines and gateways. * Step 2: create a platform to monitor these metrics over time. This platform has to accurately report the performance of Internet access for large number of users (for instance, there are already almost 20 million Internet broadband customers in France today). We plan to use optimization techniques to ensure accurate measurements with low overhead. We also plan to use inverse problems/tomography to infer network characteristics. * Step 3: develop a trustable architecture. The system should include guarantees that providers, users, and government bodies cannot lie about reported performance. We will investigate whether game theory principles and cryptographic algorithms apply to our problem. Keywords: performance evaluation, broadband residential access networks, Internet measurements, performance accountability