Proposition de recherche doctorale

Multipath transmission control and mobility management for multihoming transport

Mots clés :

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- **Ecole doctorale** : École Doctorale Informatique, Télécommunications, Électronique de Paris
- **Domaine scientifique principal**: Divers

Résumé du projet de recherche (Langue 1)

With the decreasing price of network peripherals, most of mobile devices today are equipped with multiple network interfaces that could be connected to different network providers and obtain multiple IP addresses. For example, cell phones or laptops are equipped with WiFi, UMTS and WiMAX interfaces. It is widely agreed that full utilization of multihoming by simultaneous data transmission over multiple available paths can greatly benefit from connection reliability, fault tolerance, load sharing, load balancing, etc. Moreover, using several interfaces at the same time can also increase the available bandwidth. The full utilization of multihoming can also provide an efficient mobility management. For reliable transport protocols such as TCP and standard SCTP, packets are sent one by one at sender and put in order at destination. Out-of-order packets indicate possible data loss. However, when a terminal simultaneously transfers data over multiple interfaces in the context of multihoming, this principle is no longer valid. Because of the different characteristics of different paths, such as delay and loss, it is very likely that packets sent more previously arrive later. This causes the head-of-line blocking problem. Hence, simul- taneous data transfer can suffer poor performances if the conditions of different paths are not carefully considered especially when multiple paths go through heterogeneous wireless networks. In this dissertation, we investigate the multihoming problems at transport layer to improve the end-to-end performance in wireless networks. Moreover, the coordination between multihoming and mobility management is studied which permit us to propose a cooperative mobility management in the context of multihoming for an environment Post-IP. Firstly, we propose a cross-layer solution for performance optimization with the CMT extension of SCTP in wireless networks. Two parameters, FER at the link layer and RTT at the transport layer are used to evaluate the path conditions. The simulation results by using ns-2 show that our proposal improves the performance and reduces the out-of-order data reception. Secondly, we focus on the heterogeneous wireless links. Because of unreliable wireless links, we need a good description of link characteristics. We chose Kalman filter because it is an efficient recursive method which not only estimates and corrects the current system states but also predicts even the future states based on the latest state. The simulation results showed that our proposal with Kalman filter reduces the reordering degree and improves congestion window growth pattern. As a result, the total goodput increases. Finally, a cooperative mobility management architecture is proposed as a solution for Post-IP. Multihoming and end-to-end features are analyzed to present the proposal of MCMM. The cooperative mobility management optimizes the handover delay in the het- erogeneous access networks. When mobility occurs, update messages are sent over the interface with the smallest delay rather than over the interface which triggers the mobil- ity. The MCMM is implemented in C++ under Linux with a test-bed. The experimental results show that the handover delay can be reduced by sending update messages over the interface of the fastest path.