Service Problems within Highly Dynamic Distributed Systems

Résumé du projet de recherche (Langue 1)

The availability of wireless communications has drastically increased in recent years and established new applications. Humans, agents, devices, robots, and applications interact together through more and more heterogeneous infrastructures, such as mobile (ad hoc) networks (MANET), vehicular networks (VANET), (mobile) sensor and actuator networks (SAN), body area networks (BAN), as well as always evolving network infrastructures on the Internet. In such networks, items (users, links, equipments, etc.) may join, leave, or move inside the network at unforeseeable times. The dynamics of such networks, the heterogeneity of devices, usages, and participants, and often the unprecedented scale to consider, make the design of such infrastructures extremely challenging. For a vast majority of them, the dynamics are also unpredictable. Furthermore, designing applications on top of such networks requires to deal with the lack of infrastructure and numerous topological changes. Therefore, it becomes necessary to define and to develop new accurate models capturing the features of the considered objects: users' mobility, system stability, dynamics of applications, etc. Recently, numerous models (see e.g. [6-7] and [2] for a survey) for these harsh environments have been gathered in a general framework: the (Time-Varying Graphs) (TVGs) [4]. Based on this framework, REGAL team recently proposed a quite thoroughgoing study of fixed point problems (like maximal matching, minimal dominating set, etc.) in highly dynamic systems [1,3,5]. In particular, some necessary and sufficient topological conditions are exhibited for these problems. The main goal of this Ph.D. is to provide a similar study about service problems in highly dynamic systems. We propose to focus on one of the following fundamental problems: Mutual Exclusion, Token Circulation, Propagation of Information with Feedback, etc. All these problems received great attention in static systems but have barely been considered in the context of highly dynamic systems. The scientific agenda is mainly threefold: Studying service problems in the context of TVG with the goal to provide a specification that makes sense in highly dynamic systems; Producing necessary and sufficient conditions to enable existence of solutions to this specification in highly dynamic systems; The design of distributed algorithms that meet these necessary and sufficient conditions in order to obtain optimal solutions (with respect to impossibility results).

Résumé du projet de recherche (Langue 2)

Design, specification, and development of accurate dynamics environments enabling service tasks.