Proposition de recherche doctorale

Transport protocol design in information-centric networking: flow control and in-path caching

Mots clés :

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- **Domaine scientifique principal**: Divers

Résumé du projet de recherche (Langue 1)

The thesis focuses on transport protocol design in information-centric networking: flow control and in-path caching for future generation networks, and next generation content-distribution networks. In recent years we assisted to a shift in the communication paradigm used by the most popular Internet services from client-server towards publication, dissemination and retrieval of information. With the spread of information-centric services, the need for a content-aware infrastructure has been addressed to a certain extent through application-layer solutions like CDNs, P2P overlays and HTTP proxies, deployed on top of the current infrastructure. If the evolution of the Internet architecture has been a fruitful sequence of incremental extensions and enhancements, there is today a number of recognized functional limitations in terms of performance, cost and complexity, originating in the superposition of solutions inconsistent with the original host-centric design. The architecture itself appears inadequate to sustain the deployment of new applications and highly critical services such cloud computing, large live and on-demand video delivery, e-health services, pervasive context-aware applications and so on. The redesign of the architectural foundations of the Internet and its principles is envisaged to foster the transformation of the existing network architecture into an information exchange ecosystem that transparently interfaces users to content. Pioneering ideas have been proposed, as PARC's Content-Centric Networking by Van Jacobson (CCN), DONA at UC Berkeley, PSIRP (now PURSUIT), 4WARD (now SAIL) in the EU FP7 framework. As a shared principle of information-centric networking (ICN) proposals, content (the information object) is uniquely identified, addressed and retrieved by its name independently from its location, and storage capabilities are distributed across the network. To meet the challenges of ICN proposals, new protocols need to be designed support native content dissemination and retrieval, based on information identifiers instead of data end-point addresses, and exploit content-awareness for an efficient usage of bandwidth and storage resources.

Résumé du projet de recherche (Langue 2)

The CCN network is currently lacking of a flow control transport protocol for efficient multi-point to point communication for data retrieval from in-network caches. This communication paradigm has emerged as a novel technique that would allow significant performance gains in terms of reduced delivery time as well as agility and flexibility. Flow control is a non trivial problem that can be formalized as a theoretical control problem because the amount of outstanding data to be retrieved from a given point depends on the measured quality of the path to reach such point. In case we extend such system to a multipoint-to-point scenario the problem becomes difficult to solve and little studied in the literature. In addition in CCN the path to the searched data might be variable because data may change location. Location may vary because in CCN content is in-path stored upon user’s request. This means that data localization depends on content popularity as well as in-network storage data replacement policies. We believe that a three years doctorate would allow attacking this problem from a theoretical point of view as well as contributing to the protocol design within the CCNx network architecture.