Abstract

This thesis has been developed in the frame of the Content Distribution Mechanisms in IP Networks research line, whose activity ranges from several research projects to the subject "Content Distribution Mechanisms in IP Networks" from the PhD program "Telecommunications" taught by the Communication Department from UPV and, currently in the Master in Technologies, Systems and Communication networks.

The growth of the Internet is widely known, both in number of clients and generated traffic. This allows provisioning customers with multimedia interfaces, where data, voice, video, music, etc. converge. Though this represents a business opportunity from multiple dimensions, the scalability issue must be covered, which intends that the average performance of a system is not significantly affected as the number of clients increases or the volume of information requested and exchanged grows.

The study and analysis of video and web content distribution using CDNs is the main goal of this project. The focus will be from a general perspective, initially ignoring network-layer solutions such as IP multicast, as well as resource reservation mechanisms, as they are not natively available in the Internet infrastructure. This leads to the introduction of the application layer as a coordinating framework for the content distribution. Among these networks, also called overlay networks, a Content Delivery Network (CDN) has been used.

Such application level networks are highly scalable and allow full control over the resources and functionalities of all architecture elements. This allows evaluating the performance of a CDN distributing multimedia content in terms of: required bandwidth, response time obtained by users, perceived quality, delivery mechanisms, lifetime when using caching, etc.

CDNs were born in the late nineties and had as main objective the elimination or minimization of the so-called *flash-crowd* effect, which corresponds to a peak load - on the network or server side - caused by a massive implosion of customers. Currently these networks are shifting most of their efforts to the provisioning of streaming media over the Internet.

For a detailed analysis, this thesis proposes an initial simplified model of a CDN, both at theoretical and practical level. The theoretical aspect exposes a mathematical model which allows to analytically evaluating a CDN. This model introduces considerable complexity as new features are added, so the thesis arises and develops a simulation model that allows on the one hand, checking the validity of the previous mathematical model and, on the other hand, establishing a comparative framework for the practical implementation of the CDN. This task is performed in the final phase of the thesis. In this way, the results of the thesis cover the field of theory, simulation and implementation.