CCDN: Campus Content Delivery Network Learning Facility

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Abstract
In this paper we propose to adapt the scalable schema of Content Delivery Networks (CDN) to the campus environment, naming the novel architecture as Campus Content Delivery Network (CCDN). This overlay network will provide scalable and balanced access to the students and teachers to e-learning facilities. The CCDN will be composed by caches used as edge delivery nodes, content routing capabilities to route the client to the closest copy of the content, distributed content distribution and management and improving the access of users in terms of speed, reliability, scalability and prevention of flash-crowds. We present as a case study the work in progress of the deployment of a CCDN in the Technical University of Valencia together with an e-learning streaming application over the CCDN.

1. Introduction

CDNs are collections of servers that cache or deliver content on behalf of content providers. The intent of a CDN is to serve content to a client from a CDN server such that the response-time performance is improved over contacting the origin server directly.

CDNs improve performance and availability of web and some media content by pushing the content towards the network edges and providing replication and replica location services. The overall performance of a CDN is largely determined by its ability to direct client requests to the most appropriate server.

We propose the development of a CCDN to be used as a communication facility for e-learning within a university campus. CCDNs offer cost saving and performance improvement possibilities for those wishing to employ private content delivery channels. The main features of a CCDN are: content distribution from behind the firewall, content storage decentralization, WAN bandwidth reservation by delivering content locally and an internal content naming service implementation.

CCDN services can improve the access of clients to specialized content by assisting them in four basic areas: Speed, Reliability, Scalability and Special Events distribution.

2. Case Study: Technical Uni Valencia

Technical University of Valencia is one of the Spanish universities that invest more resources in e-learning and new technologies for improvement of the learning process. The university campus is distributed in three locations separated more than 50 Km, and with the LANs connected by dedicated leased lines of 34 Mbps. The main part of the network with more than 80% of the users is concentrated in Valencia. Until now the e-learning contents have been concentrated in one server, located in Valencia, so the links between Gandia and Alcoy with Valencia are highly loaded due to resilient network traffic.

While e-learning content has been html-based the load has been tolerable but when new streaming applications have been experimentally deployed the load in the whole network and particularly in the links increases and the perceived performance dramatically decreases. This is the main motivation for the development and deployment of the CCDN within the university campus.

The components of the CCDN deployed in Valencia have been: the origin e-learning server, the content manager and request routing server and five surrogate servers: three in Valencia and one in Alcoy and Gandia.

Together with the CCDN infrastructure a novel streaming application has been developed in order to distribute e-learning content using the overlay network support.

3. Conclusions

The main aim of the CCDN is to reduce the perceived user latency in the access to the information, and balancing the e-learning server within a university campus. Providing scalable and balanced access to the students and teachers to e-learning applications and information.

The utilization of CDN technology and services within a corporate campus network is a novelty and allows the distribution of user accesses, the minimization of effects of flash crowds when new learning material comes out and the reduction of the size of the servers. The preliminary results proof that the system has good performance although it is still not fully operational.