

Bumerang

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INTRODUCTION

The peer-to-peer (p2p) systems have promising characteristics to the sharing of digital resources—digital contents, processing power, bandwidth, and storage—in a free and equal way, among the members in a community of equals (peers) (Androutsellis-Theotokis & Spinellis, 2004; Barkai, 2001; Fattah, 2002; Milojicic et al., 2002; Oram, 2001; Schoder, Fischbach, & Schmitt, 2005). A member of a community could decide when and what he wants to share, knowing that to obtain something of his interest, he should offer something in return, and that the success of his community depends in some way on his own contribution and participation. This property is very interesting in academic environments and very reaching and diversified in collaboration forms, expression ways, and formal or informal relationships.

The p2p model is not new. Its popularity starts in the academic world with p2p being used for informally exchanging music files with Napster (Shirky, 2001) and with many others that followed. The phenomenon was supported by the very high capacity of the academic bandwidth infrastructures. This posed lots of problems and legal pressure to the academic institutions, with the generalized copyright violation and consequent legal processes. Another common problem was the uncontrolled usage of the computational resources and infrastructures, which were used in entertainment and nonproductive activities, affecting institutional bandwidth capacity, and posed security problems to the infrastructure. Hence, the majority of the academic institutions simply disabled and do not allow the use of such systems, or else restrict the amount of resources available for such applications. Recently, a new approach is emerging with the concept of music campus licenses, offering an alternative and legal way to have music in the academic environment (e.g., Napster on Campus and CDigix).

However, other types of projects based in the same technology appeared with a lot of success. These p2p systems were based on the aggregation of computational

resources (Loo, 2003) with SETI@home (<http://setiathome.ssl.berkeley.edu/>), the most notable example of a system based on the aggregation of computational resources with no costs, reeling in the persons willingness to contribute to a project nonprofitable project and helpful to the humanity.

In the academies, if in the beginning p2p applications were only seen in this entertainment component and therefore responsible for a huge waste of computational and bandwidth resources, presently, a strong interest and curiosity in academic environments is rising (Berman & Annexstein, 2003; Oram, 2001; Schoder & Fischbach, 2003) with lots of potential applications, for example, transmitting huge amounts of data, large processing power with ad-hoc grid computing, streaming, and others. Projects like Edutella (Nejdl, Nilsson, Wolf, Qu, Decker, & Sintek, 2002), Comtella (Vassileva, 2004), Swap (Broekstra, Ehrig, Haase, Harmelen, Kampman, Sabou, et al., 2003), and LionShare (2004) are example applications of p2p technology in the academy, especially in the area of content distribution, which is the main focus of Bumerang.

PROJECT MAIN IDEAS AND PURPOSES

At the Minho University, the project “p2p knowledge sharing” (Tavares, 2004) was the base of the Bumerang network. This project was based on three general principles of the Minho Wireless Campus Project—eUM (2003): “every one in the eUM has an official-process-private profile or space”; “every student, teacher and other staff at the eUM has a portable computer”; “everybody at eUM belongs to a peer-to-peer community sharing contents of knowledge” and a specific recommendation to “create and spread a culture of knowledge share between students, teachers and other staff, supported in applications of the peer-to-peer technology.”

In response to these principles, we tried to explore the full potential of p2p technology in the areas of

knowledge sharing and collaboration and used them with the purpose of instigating a feeling of social and community way of life, where responsibility, credibility, trust, equality, autoregulation, freedom of association, and freedom of expression were the main values. In our vision, a university is a community having thousands of individuals—students, teachers, and staff—related not only by formal processes of teaching/learning, investigation, and other services, but also through entertainment and cultural processes, more or less productive, which must be evaluated, explored, and supported.

One fundamental principle was that the place more appropriate to store the knowledge is near his creator and near his consumer, allowing each individual to contribute and benefit from the knowledge base of the community that he belongs—the knowledge exists to a personal level, allowing a more appropriated contextualization and utilization based on the human intervention. This scenario is enforced by the permanent growth of the notebooks technology in terms of communication, computation, and autonomy capabilities, which make us think of the p2p technology as a promising technology in a near future.

A central issue in this project was that we were in the presence of an institutional system, in other words, a service provided by the institution to its entire community, just like the e-mail service or other permanent service. In this scenario, the institution takes the responsibility for legal and ethical issues resulting from the system utilization and also assumes the responsibility by the member's function and quality of service. These issues raised the absolute necessity to protect the institution from the potential dangers of this technology, including copyright violation, uncontrolled usage of the computational resources and infrastructures, and defamation or personal image violations.

Thus, the system has to ensure data security, contents authenticity (trust), and force the user authentication, not allowing anonymity. At the same time, the concern of not violating the privacy of users is a central issue and compromise. These issues are regulated and defined by the institution in a totally transparent way, based on a legal defined framework (terms of use) and in mechanisms of control to prevent the system to become chaotic and uncontrolled. The main purpose is to ensure the credibility of the institution and the system, and create an environment where the institution could respond in a clear legal context.

To ensure the freedom of expression, the contents are not analyzed, but in the case of abused and legal violation, the system is capable to identify the authors and propagators of such contents. This process is not started by an automatic mechanism of control, instead it is based on human intervention—by the participation and denouncement of the elements of the communities and other individuals.

The concept of community defines the way in which the users participate in the system. A community is composed of a set of users that share a common interest, interacting and sharing knowledge about that interest inside the community (Vassileva, 2002). A user is a member of the Minho University and can simultaneously belong to several communities. Each community can define its own profile, forming its proper identity with its own resources. The profile of a community defines its interests and purposes, administration and regulations policies, admission conditions, rules of behavior, ethical values, security politics, metadata structures and tools, interoperability with other systems outside Bumerang, statistics and rankings, punishments and benefits, and all kinds of services that pretends to use. Examples are news services, persistence of contents, chats and forums, instant messaging, videoconference, grid computing, and so forth. One fundamental restriction is imposed to any community: it has to respect the general politic defined by the institution.

Our fundamental principle is not to impose anything on anyone, leaving to the communities the capability of gradually defining their profiles and encouraging their capability of autoregulation with the purpose of having a diversity of communities that translate the structure of the academic community in all dimensions—formal and informal. When communities ask for services that are not available, they are contributing to the enrichment of the system, which uses these new requirements to grow. They also can create new services on their own, having the possibility to give the new service to other communities or to the entire institution.

We ensure total freedom of association. The capability of creating communities is totally open to all members of the Minho University, independently of the member's profile in the institution or intentions. We do not make any distinctions between users according to their positions in academia—a student has the same rights of a teacher. This way, we want to emphasize the freedom of association in all academia, in its social and professional dimensions, responding to the diversity of interaction forms between its members.

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