LifeSocial.KOM: A P2P-based Platform for Secure Online Social Networks

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Abstract

Online social networks with millions of users are very popular nowadays. They provide a platform for the users to present themselves and to interact with each other. In this paper, we present a totally distributed platform for social online networks based on the p2p paradigm, called LifeSocial.KOM. It provides the same functionality as common online social networks, while distributing the operational load on all participating nodes. LifeSocial.KOM is plugin-based and extendible, provides secure communication, user-based data access control and integrates a monitoring component which allows the users and operators to observe the quality of the distributed system.

1 Introduction

Social networks and online communities are very popular nowadays and their growth is astonishing. Rarely somebody, who has not heard about MySpace, Facebook or LinkedIn. These websites are among the 20th most popular websites on the world according to Alexa Internet website access information. Online social networks allow users to create profiles, link to their friends, publish photos and status updates and various forms of user-to-user interaction.

Large scale networks for user interaction, however, also exist in p2p-based user communities. In p2p systems, maintenance and operational costs are shifted to the users by connecting them in a large-scale p2p network. We believe that the next large application area for the p2p paradigm lies in the area of online social networks, as well as that online social networks need to distribute the load on the user devices in order to become or remain profitable. Specifically, social networks provide a sufficient number and interest of users to be the next killer application in the field of p2p.

2 LifeSocial.KOM - A P2P-based Secure Online Social Network

LifeSocial.KOM[1] is an executable, totally distributed, extendible p2p-based platform for p2p applications providing the functionality of common online social networks with additional user collaboration tools. Common functionality in online social networks are user profiles, friend lists, photo albums, user groups, live chatting and status updates. The functionality of these social apps is implemented in form of plugins (as shown in Fig. 1) which provide clear interfaces both for the plugins themselves as well as for the GUI. Additional social functionality can be added through new plugins which may either be based on already existing plugins, e.g. a multicast plugin, or create a new functionality from the scratch. The architecture is based on OSGi with individual components that can be exchanged during runtime, allowing to add new plugins or update existing ones.

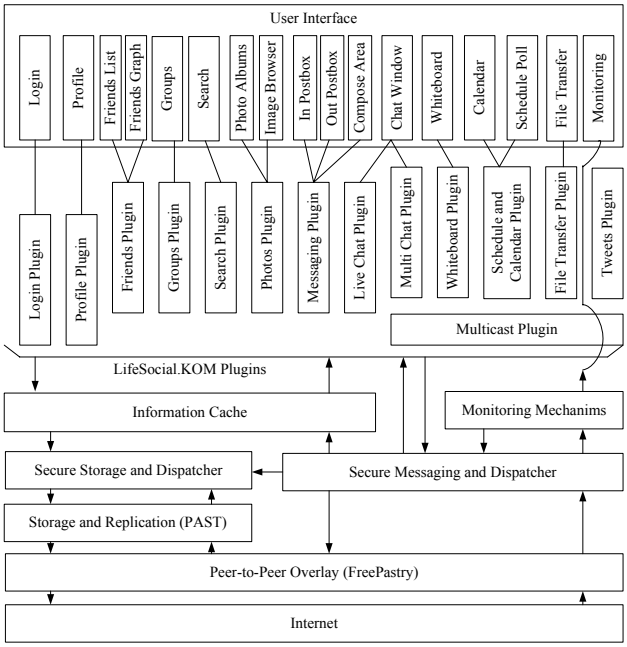
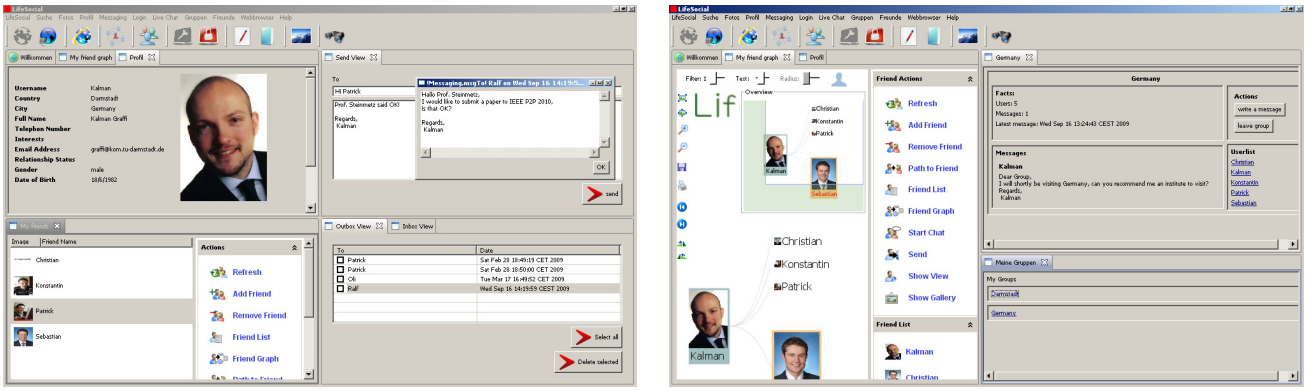


Figure 1. Architecture of LifeSocial.KOM

The plugins are hosted on our general platform for p2p applications. As p2p overlay we use FreePastry [1] for interconnecting the peers ad routing. We use PAST on FreePastry for reliable data storage, which we modified to support in-place data updates and deletion. We apply both atomic data elements (e.g. profiles, photo images, group messages) and distributed linked lists (e.g. friends list, photo albums,

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(a) Profile, Messaging and Friend List GUIs

(b) Friend Graph and Groups GUIs

Figure 2. Actual Screenshots of LifeSocial.KOM

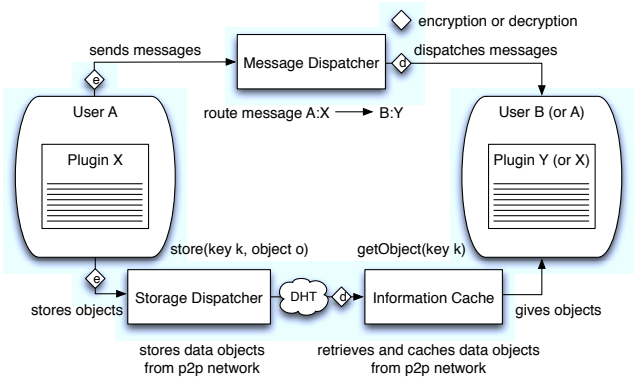


Figure 3. Plugin Communication Principles

group lists, multicast lists) for managing the occurring data types in the social network. An overview on the data types and distributed linked lists is presented in [3]. All data is securely stored in the DHT, the application load is distributed over all peers while taking care that the data is both replicated for data availability as well as secured with a user-based read/write access control.

For that we encapsulate the storage functionality with a storage dispatcher, that manages the local and remote data access and integrates the security concepts for p2p-based online social networks, as we presented in [2]. In order to provide an instant access on the data in the DHT, we apply an information cache which manages data requests and decouples asynchronous storage events in the DHT while providing instant replies for the plugins. The approaches for plugin-to-plugin communication are shown in Fig. 3.

For the support of live messaging and direct plugin-to-plugin interaction, we implemented a message dispatcher, allowing plugins to communicate with plugins on other peers and thus create individual plugins-specific protocols. This is for example used for chatting, multicasting or monitoring protocols. The monitoring component is an implementation of SkyEye.KOM [4], a monitoring and management solution for structured p2p systems. The resulting application as well as the p2p network are precisely monitored in terms of a wide set of performance and costs metrics, e.g. hop count, bandwidth consumption and LifeSocial.KOM specific storage load, allowing the operator and users to judge the quality of the p2p system and to debug and improve the platform. Both for the plugins and the monitoring, dedicated GUI modules have been created (see Fig. 2 and [5]), which can be conveniently arranged in a GUI framework, known from Eclipse. This allows to add views on demand to the screen and to customize the GUI.

3 Conclusion

LifeSocial.KOM is one of the first fully functional, executable, p2p-based online social network. Its plugin-based structure and the usage of dedicated functionality blocks in the core platform allow for an extendible and general app-based p2p application. We have implemented several social networking specific plugins, like the friends, groups, profile, photo plugin and show the rich functionality range of LifeSocial.KOM. As a result, LifeSocial.KOM provides the known functionality of traditional online social networks and adds new functionality for user collaboration. In addition, we focused in LifeSocial.KOM in specific on the quality of the resulting platform. With the monitoring component, implementing SkyEye.KOM, we are able to observe the performance and costs of the live p2p network in a lightweight and precise manner.

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