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Social Networks

and their Multimedia Application

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Preface

Social Networks are a fascinating phenomenon. Since the dawn of time, people have had the urge to communicate with like-minded others and group together. Between 300 and 600 A.D., early guilds formed, which were a collection of craftsmen of similar trade. According to Wikipedia.org: “They were organized in a manner something between a trade union, a cartel and a secret society. They often depended on grants of letters patent by an authority or monarch to enforce the flow of trade to their self-employed members, and to retain ownership of tools and the supply of materials. A lasting legacy of traditional guilds are the guildhalls constructed and used as meeting places.”
With the advent of the internet, people are now more than ever able to communicate and group with each other, and the creation of Online Social Networks was only a matter of time.
I myself was always hesitant to participate in such things, as publishing personal information on the web always brings a risk. Everyone is able to peek at your profile, and not always the ones you want to. However, as I came to believe, social networks do have a lot of possibilities, as the U.S. elections have proven. Not only is it a way to express and advertise yourself, it is also a powerful tool to reach a broad audience. I discussed this fascination with my supervisor at the end of 2008, who suggested writing my bachelor thesis about it.
Originally, it was due on 30 January of 2009. Sadly, due to personal reasons, I wasn’t able to put enough effort in it, and decided to postpone it until June. Acknowledgements go out to my supervisor, Prof. Dr. Anton Eliens, for allowing me a second shot at this subject and all the help and feedback he gave me. Further acknowledgements go out to Dr. Ronald Siebes, for being the second reader on both occasions.

Abstract

Over the past few years, social networks have become immensely popular and online social network sites have grown explosively. The uses of those networks have become numerous, such as dating, networking, job applications and review, content sharing and, as was seen in the 2008 U.S. Election, as a campaigning platform. Most studies in social networks are either an analysis of the networks themselves, and study the structure and growth, or study how features of a social network can be used in specific applications, such as search engines.
There is very little literature about the flexibility of social networks and how they can be applied to a wide range of very different applications. Because they are so popular and flexible, it is worthwhile to take a broad, general approach to studying social networks, and find a way to implement them in existing and future applications, improving their quality, usability and longevity.
To achieve this, a closer look has been taken at two of the currently most popular online social networks, MySpace and Facebook. Both have a long feature list, but have the same basic set in common; a way to promote yourself via a profile page, a messaging system for private, public and instant messages, and ways to share different kinds of media like music, movies and other forms of entertainment. With this basic list, a means of identifying applications that may benefit from such an implementation is established, as target applications must have a social aspect in the form of a community with distinct identities, a heavy reliance on communication and should have content that can be shared, like videos, pictures, music or other types of files. To test this, four different types of applications are discussed; The Sims 3, an offline game with a community centered around the sharing of stories and user-created content, World of Warcraft, a Massively Multiplayer Online Role Playing Game where users have distinct characters and where a lot of information is shared,

Marktplaats, a site for selling and buying of products and services, and the ACM portal, which has a search engine for scientific documents. It turns out these four identified applications either have core social network features integrated, or could possibly benefit from it.
Lastly, two popular open source social networks have been analyzed, Elgg and PHPizabi, to see if they are possible candidates for integration with applications, of which Elgg is the best fit feature-wise and is the most flexible, and more importantly, is free and can run on all platforms which support PHP, MySQL and Apache.
Certain applications may benefit from a social network implementation, and it is easy and cheap to accomplish. However, care should be taken as social networks are a main target for phishing, and might prove a privacy or security risk.

Introduction

Online Social Networks like MySpace, Facebook and Flickr are becoming increasingly popular. At the time of writing, Facebook.com is the 4th most popular website according to Alexa.com's Top Sites, and Myspace.com, Blogger.com and Twitter.com are in the top 30 [1]. According to a press release from comScore, their social networking category experienced a growth of 12 percent to nearly 140 million U.S. visitors in April 2009, which represents three-quarters of the U.S. online population [2]. Because of their large user base, groups and individuals have begun using social networks to spread their message and reach a broader audience than ever before possible. A recent example of this is the 2008 U.S. presidential election, where both the Democratic and Republican candidates used social networks to reach more and younger voters. Indian politicians followed suit, and tried to reach 70 million internet users during the 15th Lok Sabha elections, consisting of around 10% of the 714 million voters [3]. However, the use of social networks does not stop at politics.
Overstock Auctions uses social networks in their online auction system, enabling users to purchase goods from anyone on their social network. Users are able to add others to their friends list for future purchases. Although not every user makes use of this function, according to Swamynathan et al, the users who do experience higher consumer satisfaction [4]. Some crude social network functions are also built into eBay, enabling users to rate buyers and sellers, giving an indication of the to be expected service and trustworthiness. Satisfied and trusting customers are customers that return, so in the long run the companies that make use of these functions benefit greatly.
If social networks can be used to reach a broader audience, and helps sell a product better, perhaps social networks can be used in a wide range of existing applications. Current literature about social networks either analyze the technical aspects of social networks like growth and structure, or attempt to use the advantages of social networks for specific applications like search engines [15]. However, there is hardly any research or literature on the usage of social networks on a broader, more general, scale. This paper aims to analyze various radically different applications, some existing popular commercial and open source social networks, and attempts to suggest a framework for a flexible social network which can be adapted to the needs of the product it will be integrated with, if such a social network does not exist.
To achieve this, a closer look needs to be taken at what a social network exactly offers. Examining the popular commercial services like MySpace, Facebook, Hyves, LinkedIn and Flickr gives insights on why users use such applications. Not only does it establish your identity on the internet, it is also a way to promote yourself to the outside world, stay in touch with friends, gives a sense of belonging and eases the process of finding new social contacts. Most of these services also provide ways to share

either user created content, or existing content that have the user's interest. This gives us a general idea which types of applications benefit from social networks, and what features those networks should boast.
To test the requirements, various existing applications will be identified. If such applications make use of social network features, it confirms the method of identification. If such features do not exist, perhaps an integration of a social network can be created.
Lastly, a few open source social network solutions will be analyzed, and compared to the minimum feature requirements list to see if they are a possible candidate to integrate in existing and future applications.

Feature rundown of commercial social networks

To find applications that benefit from a social network implementation, it is important to know what exactly social networks have to offer the users that make them so appealing. It is therefore imperative to have a look at some of the more popular commercial social network services available. According to the numbers comScore published at the end of 2008, Blogger (also known as Blogspot), Facebook and MySpace are among the more popular social networks. Of the three, MySpace and Facebook are the most interesting, as they are more general social networks, with the emphasis on keeping track of, and finding friends, whereas Blogger is purely a blogging network. We will have an in-depth look at each of these networks. For a brief overview of the features of MySpace and Facebook, consult Appendix section 2 and 3.

MySpace Features

Besides adding and managing friends, MySpace sports the following features: a Bulletin system, the creating and management of groups, a chat function, MySpace TV, the creation and sharing of user created applications via the MySpace API, an interface for various mobile devices, a news service, MySpace classifieds, MySpace Karaoke, the creation of polls, forums, the ability to upload photos and videos, MySpace Music and the ability to customize one's profile page. We will have a look at the less obvious and straight-forward features.
MySpace's Bulletin system is basically a message system, allowing users to send a single message to their entire friends list. This is commonly used by bands on MySpace to announce tour dates, new songs, and such.
MySpace allows users to create and manage groups, which is basically a page which reflects a user his or her interest in something specific like a favorite band. Other users can join this page with the creator's consent. This is particularly useful if you want to find other people with the same interest. MySpace also features a calendar and a blogging feature, which users can share with their friends. The chat, or Instant Messaging function, allows users to check who's currently logged into MySpace, and allows instant messages to be sent. In most other social networks, messages are posted on other users their profile page, which will be read whenever the receiving person logs in.
MySpace TV boils down to a Youtube-like service, allowing users to upload and/or view other people's videos.
The most important aspect of MySpace is MySpace Music. This part of MySpace differs from the usual profile pages in the way that it is meant of music bands. Interested bands can create a profile on which they can upload whole albums, songs or previews, and that way promote their music and tours. Users can add these bands to their friends list to be kept updated, and add their current

favorite song to their own profile page, if present on MySpace music. It is also widely used by starting musicians to get their music out and listened to, with some success. Lily Allen claims in several interviews that her success is greatly due to MySpace, although such stories are few, and would warrant further research.

Type	Features
Social	Groups Forums Polls Mood Calendar
Communication	Profile Comments Bulletins Chat / Instant Messaging Private Messages
Media	Upload / Sharing of Videos Upload / Sharing of Photos Sharing Applications API Blog
Misc.	Karaoke Sharing RSS feeds Posting Classifieds MySpace Music Customizable profile page

Table 1: MySpace Features

MySpace Security and privacy

MySpace clearly is a jack-of-all-trades, incorporating successful internet formulas in its services like Youtube, Last.fm, Gallery, etc, and allowing the users ample control over the layout and color scheme of their profile. However, the latter does have one mayor flaw when it comes to security. Editing the way the profile looks is done by entering HTML en CSS in a customization box. However, in the past certain HTML tags were allowed to be used which enabled malicious users to create a profile which redirected to a fake login page in an attempt to steal users their username and password for spamming purposes. To make things worse, once the malicious users compromised someone's account, they were able to easily send spam and more phishing attempts via the MySpace bulletin system. Also, allowing scripting languages to be entered by users make the site vulnerable to Cross Site Scripting (XSS) attacks. Most of these attacks do not adhere to correct syntaxes, which is why most security filters do not filter them out. However, browsers do run those scripts anyway. An example of this is the Samy worm which propagated through MySpace in 2005, which infected profiles at an alarming rate (Fig. 2).

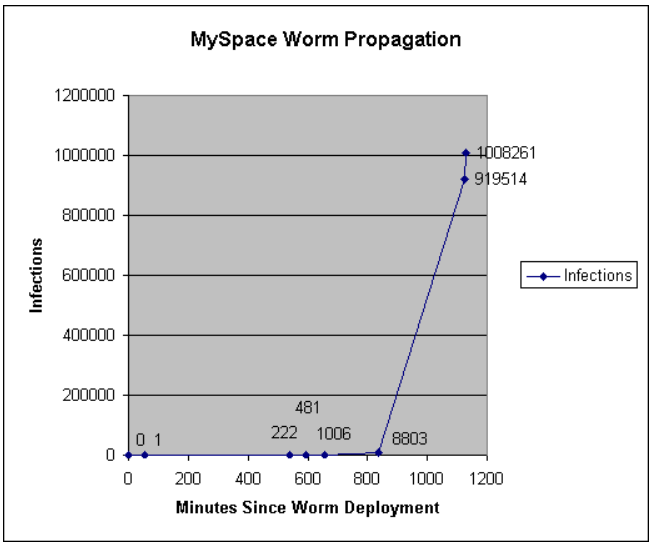

Figure 1: MySpace Worm Propagation

Since then, MySpace has significantly improved their spam detection and prevention. However, the standard settings for spam upon account creation are rather lax. The average casual user would need to dig into the account settings to make their profile more secure, and even then, it comes at the cost of user-friendliness. This goes for the user privacy as well. Upon creation, everyone can see a user's profile. Malicious users could easily extract personal information for spamming purposes. Employers often pre-screen applicants via the internet [9]. Due to the personal nature of the information on profile pages, this is not something users would always want. The account settings on the users MySpace page does let one adjust the settings so only added friends can view the information contained on a profile, but setting it strict by default and giving the option to users to adjust it to their needs upon account creation would be a better, more private strategy.

Facebook Features

Facebook is often compared to MySpace, but feature-wise there are quite some differences. One of the main differences lies in groups. Besides the almost identical group feature, Facebook allows users to join networks, which are only based around a workplace, region, high school, or college. Joining a network is a sure way to find other users on the same school or region and allows a user to view the participants' profiles, without risking joining a group which is user created and has little to do with the reason why the user joined it.

Another major difference is the customizability of the user's profile page. Where Myspace allows virtually whatever the user feels like and can script via HTML and CSS, Facebook allows practically no customization. The result is that every user profile is practically identical in layout.

Other features include the submitting of links, blogs, comments, photos, videos and applications to either your own or your friends' profile page. These submissions appear on an area called "The Wall", a collection of posts sorted by date. Next to this is a news feed, which keeps the user up to date on friends' profile changes, upcoming events and birthdays. Users can add events via the Event menu. Besides "The Wall", users are able to change their status which is comparable to MySpace's "mood"-window, poke someone, send other users virtual personalized "gifts" for a small fee and upload and manage a photo album. Compared to other photo album sites such as Photobucket and Flickr, Facebook allows users to upload unlimited photos for free.

Like MySpace, Facebook offers an API with which users can develop and share applications. Although

Facebook has less “out-of-the-box” features, applications can add a lot of features that Facebook users might feel they are missing, like polls.

Type	Features
Social	Networks Groups Mood News Feed Events
Communication	Profile Comments E-mail Private Messages Chat / Instant Messaging
Media	Upload / Sharing of Photos Upload / Sharing of Videos Sharing Applications API Blogs
Misc.	Virtual Gifts

Table 2: Facebook Features

Facebook Security and privacy

In 2005, two MIT students were able to mine data from over 70,000 Facebook profiles from schools using an automated shell script [7]. In May 2008, a BBC program called ‘Click’ crafted a malicious application with which they were able to steal profile information of even private profiles, based on the fact that most applications can request certain user details to function properly. However, users can currently decide which, if any, information may be retrieved by applications via the privacy settings. The default settings allow most of the information to be retrieved.

Before February 2008, it was not possible to delete profiles, but instead merely deactivate them which meant they were still visible. After a wave of criticism, Facebook changed their policy and allowed users to permanently delete their profile if they so desired.

Like MySpace, phishing attacks also occur on Facebook, but because the lack of customizability via scripting languages, these are easily detectable. Most phishing attacks happen via the private message system. In a test, we have sent ourselves a message which contained a link to a random site. Upon clicking, no dialog box appeared to warn the user he or she is leaving the main site with a warning the site may contain malicious content or may be a phishing attempt.

In contrast to MySpace, Facebook’s initial privacy settings are stricter, allowing only friends to see the user’s profile and contact information. The privacy settings are highly customizable, and users are able to decide specifically which information they entered on their profile they want to share or not.

Comparison

According to Wikipedia.org, a social network is “a social structure made of nodes (which are generally individuals or organizations) that are tied by one or more specific types of interdependency, such as values, visions, ideas, financial exchange, friendship, sexual relationships, kinship, dislike, conflict or trade”. In both discussed online social networks, user profiles and group profiles function as the nodes, and users create ties by adding friends or joining groups. Besides this basic functionality, both Facebook and MySpace offer some other important core features for expressing one’s self, communicating with and sharing with others. Those features are grouped in the respective categories “Social”, “Messaging” and “Media” in Table 1 and 2. The final category, “Misc.”, shows what extra features either online social networks have. The latter will not be regarded in this paper, as we are looking for a basic, general social network solution to integrate with existing applications. Furthermore, the existence of an API to write applications for any purpose largely

compensates for the lack of features, as any missing one can be written by any of the service's users. By comparing the feature list of both networks, a feature list can be made my adding features both online social networks have in common. This feature list is represented in Table 3.

Type	Features
Social	Groups Mood Event Notification
Communication	Profile Comments Private Messages Instant Messaging
Media	Upload of photos Upload of videos Sharing of Applications API for developing applications Sharing and creating blogs

Table 3: Minimum Feature Set Social Network

The above table has two functions. First of all, it tells us what kind of application can benefit from a social network integration. Because of the social nature of those networks, applications that could benefit from an implementation should have a strong community, and should benefit from the node-tie structure of a social network. Furthermore, users of the application must be dividable in groups, either by special interest or category, whilst retaining their own separate identities. Furthermore, applications should benefit from communication between users. Both discussed social networks boast a lot of features for communicating, like chat-functions, private messages and event notifications. Finally, applications should benefit from users sharing various types of media with each other. With benefitting we mean either making the application more attractive for users to use, or increasing the applications productive and effective value.
The other function of the table is a list of minimum features our social network framework consists of. When comparing open source social network solutions to see if they are suitable.

Identifying Benefitting Applications

We now have an idea what kind of applications could theoretically benefit from a social network implementation. To recap, a target application should have a great social aspect or community, it should benefit from user-to-user or user-to-group communications, and should benefit from the sharing of various types of media between users or groups. We will try to identify applications in various different categories: Online Multiplayer Games, Offline Single Player Games, E-Commerce sites and a search engine for scientific papers.

Multiplayer Online Games

Quake Live is an example of a multiplayer online game integrating a social network to enhance its features. Not only does it enable players to find adversaries of comparable skill level, it also boasts one's online character via the display of achievements and statistics. But there is a host of other online games that might benefit of a social network implementation in various genres. One of the most popular games currently available is the Massively Multiplayer Role-playing Game, or MMORPG, called World of Warcraft.

Online Games - World of Warcraft

According to an official press release in December 2008, the game has over 11.5 million subscribers worldwide [11], which fits the community requirement for a social network implementation. Players

can form so-called “guilds”, which is a group of players working together under the same flag to achieve a specific goal, in this case the completion of the game’s high-level content. This satisfies the social requirement, allowing the users to be tied to each other via group nodes. Lastly, players can promote their character and what they’ve achieved via a profile page.
Currently, Blizzard-Activision has some crude community tools available, of which a collection of profiles of players known as “The Armory” [12]. Anyone is able to look up specific characters and retrieve the most relevant information about that character, such as the items currently equipped, the abilities of the character, what the character achieved, what guild the character is currently in, etc. Guild pages also exist, enabling guild member to view the guild roster, what items are in the bank of the guild, and what events are planned. However, it lacks a few features upon which can be improved.
First of all, profiles are based on characters rather than subscribers themselves. There is no way of telling which character is controlled by which player. A different type of profile could be added which reflects the player, on which all the player his or her characters are located, plus whatever the player wishes to share to other players. Currently the player has no control of what gets displayed on the character profiles, so it might lack or have too much information for the player’s comfort.
This brings us to the second point. There is no way to interact in the way of manipulation with the content displayed on the pages via the armory itself. Events for example, can only be added, edited and removed via the in-game option. If a guild leader wants to add a raid event, but isn’t able to load his client remotely because he is, for instance, at work, there is no way to make the change. Also, the content on the page is restricted to what the game adds to the database. While this has its advantages, like preventing abuse and copyright infringement, it does have its limits. For instance, guilds cannot use the page to discuss tactics or show videos about how a specific boss is done, and no other forms of communication like raid signups and news bulletins are possible. Although there are enough free solutions available online who do offer such services, offering it as part of the game adds to the value of the product by making the game more immersive, even when not logged into the actual game.

Offline Games – The Sims 3

The Sims 3 by Maxis is an example of an offline single player game benefitting from a social network [13]. Having had a record sale of 1.4 million copies in the first week of release, there definitely is a huge community for the game [14]. In the game itself, players are able to create custom content for the game, like pink furry toilets instead of the plain porcelain white ones offered by the game, and share it with the other players via The Exchange, a market-like page maintained by the publisher. This covers the sharing requirement of the social network implementation. Furthermore, because the game is a simulation of people and their lives, players might want to share the stories of their Sims’ everyday lives, keeping other interested players updated on how their virtual characters fare.
And indeed, The Sims 3 also currently boasts a lot of features associated with social networks. Users can create a profile upon game registration, on which they can publish user-created content they are willing to share, and some basic information about themselves. Besides that, it also offers features to add friends and favorites. It even has the function to upload stories about their Sims to popular social networking sites like Facebook and Myspace.
This highlights another advantage of social network implementation. Not only does in increase how immersive the game is and adds to the game’s quality, it also rewards users who buy the game via official channels instead of pirating it. Without a legal serial with which to register, users do not have

access to The Exchange and The Sims 3 online store, missing out on some key features of the game which prolong the replayability. So in a way it is more effective than the conventional copy protection methods, which are mostly cracked during the first few days of release, and are considered a nuisance by all types of users.

E-Commerce – Marktplaats.nl

Marktplaats is a Dutch website dedicated to the users placing advertisements, either offering services and items, or requesting them. The users can be seen as a community, interacting with each other via sales and purchases. Users can be grouped together by interests, like wanting to sell or buy something general or specific like items in an existing category such as Cars. Communication is very important, and Marktplaats does not handle the eventual transaction, monetary or otherwise. To promote their product, users are able to upload photos of the item in question, and add more information regarding the product in the form of text. In short, according to the requirements listed in Table 3, Marktplaats could benefit from a social network implementation, as it complies with the Social, Communication and Sharing categories.

By allowing users to create a profile page and distributing information about themselves, potential buyers can check on the seller's information and judge if the seller is trustworthy, a major aspect in online transactions. Comments by other users strengthen this, as they may contain feedback of past sales and experiences. Furthermore, buyers can easily see other items which the seller may have to offer, and buy them if interested. This has the potential to raise the amount of successful transactions considerably. As mentioned earlier, transactions between friends also significantly raise user satisfaction.

Currently, the only way to contact potential buyers or sellers is via e-mail or phone if entered by the user. It is not unimaginable that conflicts arise due to transactions. The problem with the current system is that sensitive information is given to complete the transaction in the form of phone or e-mail addresses. Implementing a private messaging service in the application itself as used in our two example commercial social network services solves this issue, as messages from specific users can easily be blocked or reported. In a worst-case scenario, a whole profile can be deleted and a new one be made under a new alias.

Search Engine – Association for Computing Machinery

One of the main functions of the ACM.org website is a search engine with which one can find scientific documentation in its Digital Library. The community can be seen as users who submit their scientific papers to the Digital Library, and subscribers who search the library. The documents discuss a wide range of topics within the computing professional sector, including security and social networks. These topics can be seen as special interest groups. Communication between authors might improve scientific documents and improves discussion. Finally, ACM.org is about sharing knowledge with the subscribers, satisfying all three requirements for social network implementation. A social network implementation might be as follows.

Users who write documents on for example social networks automatically join the social network group. In short, there are two types of profiles, user profiles and group profiles.

User profiles contain information about the user him- or herself, including all articles written by the user and groups the user belongs to. Via this page, the documents can be accessed and read. Comments allow users to ask questions about specific documents and provide feedback, or a private message system might be used. De discussion of scientific documents could benefit the overall quality of the research done and provide more insights.

If a user has read a specific document, the user can easily read more of the author's research by simply visiting his or her profile instead of doing a broad search which might not lead to a wanted result. If the user cannot find any other relevant research by the author, simply visiting the group profile page gives all research in a specific field, and a search can be conducted within the group. According to Mislove et al, internet searches enhanced with social network technology display a 9% improvement in meaningful search results compared to traditional means [15].

So far, requirements have been given applications must conform to if they are to benefit from a social network implementation. Also, a list of features has been given of the most popular online social networking services. With this information, we've identified four different example applications which might benefit from such implementation, and discovered that some of them already have comparable tools implemented, enforcing the requirements given, and given an idea of how a social network might be implemented. The next step will be to have a closer look at some open source social networking tools, compare them to each other and see if any is a possible candidate to implement with a wide range of applications.

Open Source Social Networks

The open source social network offering is huge. Because of this, a selection has to be made, done via a list of requirements. First of all, we aim to implement a social network on as many different platforms as possible. Therefore, the first requirement is that the social network runs on Apache, MySQL and PHP, which are all cross platform. Another advantage of this setup is that all three software platform dependencies are free. Secondly, we aim for the more widely used and popular open source networking solutions [16, 17]. The last requirement is that the social network tool has at least similar features to the ones listed in Table 3, and can be considered general enough to be implemented with a wide variety of applications. These result in a selection of the following two open source network solutions: Elgg [18] and PHPizabi [19].
The setup used to install the applications is: Windows 7 RC, MySQL Essentials 5.0.83, Apache 2.2.11 and PHP 5.2.9-2. For a full hardware and software list, see Appendix section 1. For a brief feature overview of Elgg and PHPizabi, consult section 4 and 5 of the Appendix.

Elgg

Elgg is an open source social networking service most similar to MySpace, according to InfoWorld, which gave it an award for Best Open Source Software in 2008 [20]. Features include; an activity window, showing general activity site-wide and the activity of your friends, a profile page which can be customized or extended by the site administrator, a notification system that keeps track of selected activities of your friends, the creation of groups, a blogging function, the ability to upload whatever files a user deems necessary and the ability to embed them in their post and a twitter-like micro blogging feature called "The Wire". Another noteworthy feature is OpenID support.
When considering implementing social networks in applications, it is not unthinkable that, if it proves successful, we will be seeing a lot of social networking sites, which may require different login names if a user's favorite handle is already taken. OpenID is an initiative that replaces login information with an OpenID URL, which can be used across all sites that support OpenID, resulting in fewer to remember passwords. However, there are some security concerns, especially regarding phishing [21].
After setting up the test environment, installing Elgg did not give any difficulties. However, Elgg does

require some extra modules to be installed or enabled; PHP5 as an Apache module, the mod_rewrite module for Apache, the GD, JSON and Multibyte String Support libraries for PHP5. Elgg further recommends the SOAP and DOM libraries for PHP. Lastly, PHP must be configured to send emails for email functionality and user verification. The latter helps fight spammers utilizing bots to create fake profiles. The technical requirements of Elgg do hint of CAPTCHA support, reducing the creation of profiles by bots even more, but we've been unable to get it working on the test system.

Upon login, users are able to configure how their profile page, or dashboard, as it is called, looks like. It makes use of widgets which the administrator can allow, and are easily placed on either the right, left or middle of the screen by dragging and dropping, which does not involve any scripting and the result can be seen right away. Privacy settings can be set per module by clicking on the edit option. The default values regarding privacy are semi-restricted, allowing only logged in users to view any information on the profile. This can be changed to private, friends only and public, allowing no one but yourself, your friends, or everyone who stumbles upon your profile to read it.

Groups can be created by anyone, but joined depending on the privacy setting the creator selected. Groups are either open or closed, meaning either everyone can join, or they need to request membership and be invited. Depending on the settings upon creation, the group page has three functionalities; Group Discussion, Group Pages and Group Files. The first is similar to a very basic forum. The second is a text editor-like functionality that lets users create a page, or document, and defines who is allowed to view and edit it. This is especially handy to collaboratively create documents, or to set up a wiki-like environment. The latter functionality offers a place for a group to upload files to.

Although out of the box functionality is rather minimalist, Elgg provides an API with which users can create their own plug-ins, themes and language packs to extend functionality. Ready-made plug-ins can be found on the Elgg website, with over 600 available. Only the administrator can add extra features developed with the API, minimizing security risks like the ones in MySpace, where any user can just add developed applications to their profile, malicious or not. The downside is that apart from the layout, users cannot control any other visual aspect like color schemes. Only the administrator can change this site-wide wide the template function.

During testing, a few issues arose. While using the file upload system, excessively large files did not upload correctly. Allocating more memory available to PHP in the php.ini file solved this problem. Further investigation in the feature revealed that there is no way to upload the maximum amount of data a user can upload in total. Restrictions on the file size can be made, but this can only be done by editing the .htaccess file in the root directory of Elgg. This, however, does not stop users from just uploading multiple files. If this feature is enabled by the administrator, the system better has a lot of disk space.

The final issue with the file system is that it does not discriminate between file types. Besides videos, photos, images and music files, users can also upload any executables they may want to share. The applications do not run on profile loading, but still naïve visitors might be able to download malicious applications and compromise their sensitive data. This is, however, a common problem not unique to social networks, but applicable to most of the internet. In the end, nothing beats a good security package installed on the client machine. An improvement would be a daemon running on the server, actively scanning any uploaded files, reporting and deleting any identified malicious content.

PHPizabi

According to the website of PHPizabi, it currently powers thousands of websites with its social networking software. Oddly though, the showcase portion of the website is empty, apart from a demo site hosted by the company's website itself. Besides that, the feature list sounds promising. The user desktop page, similar to the Elgg dashboard, displays the user's personal information, his or her added contacts or friends, a horoscope, a calendar and event tracker, a profile ranking feature, a photo gallery, site-wide news, recent profile views, a comment section, a blog section, and links to the site's forums and chat room. The profile page, which other users can view, shows the user's comments, personal information, rating, blogs, and profile views.

Besides these standard features, PHPizabi also offers users to enter questionnaires, adding information to the user's profile page according to what has been filled out. However, standard questionnaires include ones of mature nature, which might not be suitable for anything but the more obscure dating applications. After browsing through the huge settings list in the administration control panel, no way was found to remove the default questionnaires, only an option to add new ones. Removing the standard questionnaires would require a user to dig deep into the source code. Upon closer examination of the database, no values regarding the questionnaires could easily be found.

Compared to the Elgg file system, the photo gallery from PHPizabi does have easy restrictions on file type, file size and maximum amount of files added. This can be changed by the administrator, but the site gives no feedback on what the limit is, and how much of the quota a user has used up. The gallery application checks file extensions to see if it really is a picture the user is uploading, which limits the security risks of malicious content.

Installation of the bundle did give a few problems. Upon creating the administration account, the following error was displayed: "Field act history doesn't have a default value". After looking up the field in the database, it was easily solved by setting the value to NULL. This resulted in the same error for a different field. The eventual solution was to set all the LONGTEXT fields to NULL. According to the support site, this is a known bug of the latest MySQL build, yet modifying the install script to cope with the bug would be easier and more user-friendly.

Compared to Elgg, which looked polished, PHPizabi sports a lot of typos and missing graphics, and gives the whole product an unfinished feel. Furthermore, although PHPizabi is supposedly free, it does require a fee to remove the PHPizabi branding. Group support as in Elgg is lacking, but can be added via a commercial module, which sadly costs over 50 dollars. This highlights the major problem of PHPizabi. Although it is open source, and there is a wide offering of modules, most of them cost money, even if they are not developed by the company themselves. PHPizabi does offer a review service for modules, which reduces the risk of security threats, although the administrator is the only one able to add them.

Comparison

Now that both social networks have been analyzed function-wise, it is possible to match both functionalities to the minimal requirements defined in table 3. This results in the following table:

Type	Features	Elgg	PHPizabi
Social	Groups	X	-
	Moods	-	X
	Event Notification	X	X
Communication	Profile Comments	X	X
	Private Messages	X	X
	Instant Messaging	-	(1)
Media	Upload of photos	(2)	X
	Upload of videos	(2)	-
	Sharing of Applications	(2)	-
	API for developing applications	X	X
	Sharing and creating blogs	X	X
Technical Requirements	PHP 5	X	X
	MySQL 5	X	X
	Apache 2.2.11	X	X
	Additional mods and/or libraries	X	-

1) Chat function, doesn't support 1-on-1 messaging
2) No gallery function, allows uploads of any file types.

Table 4: Elgg and PHPizabi feature-wise comparison

Note that they are out-of-the-box features. In both cases, functionality can be extended by either downloading and installing modules, or programming them with use of the respective API.

Conclusion

Social network technologies are used more and more to increase the value of a broad range of different applications. It has the possibility to enhance collaboration, trust, sales and knowledge exchange, it also allows users to show their identity and win trust with potential customers.
Given the set of requirements, community, communication and media sharing, potential applications that benefit from a social network implementation can easily be identified. Analyzing existing applications and discovering crude social network tools reinforces this. With the set of basic requirements and features, existing social network technologies can be tested for their suitability.
From the two discussed in this paper, Elgg is the most ideal candidate. Not only does it have most of the basic features required, it also has the ability to easily add more features via modules. The only real downside it has is the extra module requirements for it to function fully. That is compensated by the fact that the technologies and modules required are all free, easy to implement and not difficult configure. Most hosting solutions on the market are able to provide the required services, and setting up a server oneself is easy and cost-effective.
Also, PHPizabi has some undesirable features like the mature questionnaires which cannot easily be removed by the administrator. As we are looking for a social network solution for any application, even games for small children, it is not suitable.
The only function lacking in both solutions is the ability for the user to radically alter the look of their own profile page. This does have its upside, as it limits the security risk by not allowing users to inject scripting languages to customize. However, other solutions are possible, like giving users the ability to choose a template or color scheme.

Discussion

To fully understand which features are important in a social network, numbers should be studied on how often all functions are used. Sadly, such numbers were not available at the time of writing. Besides Elgg and PHPizabi, there are a lot more social network services available. To find the ideal solution, it might be required to do an analysis of all the possibilities currently available. Another approach would be to write a totally new application, with the specific features listed in table 3. Because not all open source network solutions are studied, there is a risk of re-inventing the wheel. Lastly, there is little known about the security risks of the discussed open source networks, as they are not as extensively used as the popular commercial alternatives. A closer look at the code might reveal vulnerabilities, but was out of the scope of this paper due to time constraints. A test with known internet vulnerabilities and attacks might also provide more insight into the security of the discussed social networks.

Appendix

1 - Test Setup:

Hardware:

- Asus P5B Deluxe Motherboard
- 2 GB DDR2 RAM
- Intel Core 2 Duo E4300 @ 1.8Ghz
- eVGA GeForce 8800 512 MB
- Western Digital 120GB HDD 7200RPM 8MB Cache

Software:

- Windows 7 Beta RC Build 7100
- MySQL Essentials 5.0.83
- Apache 2.2.11
- PHP 5.2.9-2

2 – MySpace Feature List

- Bulletins
- Groups
- MySpaceIM
- MySpaceTV
- Applications
- MySpace Mobile
- MySpace News
- MySpace Classifieds
- MySpace Karaoke
- MySpace Polls
- MySpace forums

Source: http://www.myspace.com

3 – Facebook Feature List

- Insider language
- News Feed and Mini-Feed
- Networks
- Profile
- Friends
- Pictures and Videos
- Events
- Groups
- Applications and Platform
- Status
- Facebook Chat
- Messaging
- Wall
- Poking
- Tagging
- Privacy
- News Feed
- Status Updates
- Upcoming Events
- Birthdays
- People You May Know
- Invite Your Friends
- General Interface
- Search
- Applications
- Facebook Chat
- Notifications
- Advertisements on Facebook
- Messaging
- Share link

Source: http://www.facebook.com – http://www.thefacebookproject.com/wiki/

4 – Elgg Feature List

- Activity
- Profile
- Notifications
- Groups
- Blog
- Embed media
- Files
- The wire
- Pages
- External Pages
- Dashboard
- Social Bookmarking
- Categories
- Access Control
- RSS
- Open Social
- OpenID (client and server)
- FOAF
- RESTful API

Source: http://elgg.org/about.php

5 – PHPizabi Feature List

- Random members gender selection
- Saved searches
- Smileys support
- Multilanguage support
- Registration captcha
- Mass mail support
- Pictures cropping / proportions
- Tell a friend
- Invite a friend
- Search and advanced search
- Search by geographic distance
- Contact us system
- Bookmark link
- Privacy and terms of use
- Match search based on profile
- Online / Offline status
- Activity notification
- Customizable genders
- Customizable profile data
- Customizable questionnaires
- Email address confirmation
- Automatic / Manual approval
- Unique address check
- Online status
- Personal Gallery
- Personal Blog
- User settings panel
- Ignore / Block users
- New contacts notification
- New mails notification
- Favorite blogs
- Recent profile views
- Contacts list
- Contacts categorization
- Contacts management
- Newsletter
- Horoscope
- Last login
- Profile / pictures rating
- Profile views
- Private photo gallery
- Nudges (kisses, slaps, ...)
- Users comments
- Events calendar
- Personal events
- Saved searches
- Blogs
- Internal messages system
- Pages (notifications)
- Forums (inkspot)
- Chatrooms
- Files sharing

Source: http://www.phpizabi.net/index.php?L=about.features

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