TALLINN UNIVERSITY
Interactive Media and Knowledge Environments

Social Media Integration to a Web Service. The Case of Vifi.ee

Master Thesis

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Tallinn 2011

AUTHOR'S DECLARATION

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Abstract

During the last years, the growth of the Internet has carried along, new ways of communication and technological developments within the society have created a form of new reality in which businesses have to change their ways and meanings for communicating with their consumers. Social networking websites, which allow individuals to create social bonds between one another, are becoming increasingly common on the Internet. One such social networking site is Facebook, which is currently one of the most popular social networks in the World. In 2008 Facebook opened up an application programming interface (API) that allows web-services to run in conjunction with Facebook ("Definition of: API". PC Magazine. 1996). In doing so, they exposed the data behind Facebook, which gives an excellent opportunity for developers and webmasters to create socially integrated web services. Using Facebook and its public API and analysing their properties, this thesis creates assessments of the use of new engineering techniques in the field of web services development. I attempt to analyze and design social connectivity for the development of web-based services from a perspective of social media users, as well as encourage these best practices in future web related software development. As the outcome of the thesis show that Facebook has gained many positive and pro-active techniques in implementing and deploying its API, I learn how to create socially connected web service and try to implement them to project Vifi.ee. The study and social networking describe new perspectives how software design can be applied to the web to create reliable and securely social connectivity; and how these web technologies can be used to create better awareness for the web service and maintain its reliability and security.

Keywords: social networking, facebook, data portability, social plugins, social media web service integration

Introduction

Social networking sites as a type of virtual communities have been growning tremendously in over the past few years (Kazeniac, Andy, 2009). An ever increasing number of people produces and consumes social media. These services have changed the ways we communicate and share of our life with friends, families, colleagues or even strangers. Social networking services offer different ways for sharing media, such as photos and videos, expressing our thoughts, e.g. blogging and micro-blogging and extending our social networks. Extending these social networking services with web services allows to consider them more like a platform rather than simple static website. This all leads to an extremely convenient and servicable environment to attract wider audiences.

The impact of these social networking services on our society is huge from the economical and sociological perspective. They reflect good and bad in our society. Often, media tends to emphasize the negative effects of social networking instead of the stories of how socially created media has positively changed something. There are endless possibilities to implement social networking and create positive value.

One of the most interesting elements of social networking and media is the massive user generated content. This kind of contents have been made available online and can be utilized in a multitude of different ways (Arrington, 2007). The content also gains more value as new methods and ideas to apply it for new services. Until recently, this data has been closed inside the social networks and no Application programming interface (API) has been provided to access it. However, the trends have turned towards openness and allowing to share this kind of data between entities with using open protocols and standards to provide access to the content. Openness like this offers many interesting possibilities for researchers and application developers alike. This thesis takes a direction in using this content for creating better webservice and trying to implement it to an existing video on demand (VOD) web service Vifi.ee to get more attention from the social network users by designing models to connect social content to a web service.

This thesis also analyzes Facebook's API and social plugins in regards of its connectivity, security and privacy to help develop a set of designs for building socially secure web service. This thesis attempts to address the following questions:

- What kind of different social connectivities Facebook platform offers?
- What are the possible outcomes and problems of Facebook connected website?
- How are the security and privacy maintained within connected web-service?

Original motivation for this thesis is connecting online VOD service Vifi.ee with Facebook API and social plugins.

1. Web 2.0

The concept of Web 2.0 was first introduced in 2004 by Tim O'Reilly and MediaLive International. There is no single definition for Web 2.0, but the definition seems to change slightly with every author. The Web 2.0 concept was developed to express the new evolving trends of web (O'Reilly, 2005). It can be considered that Web 2.0 is a joint name for a collection of new technologies, such as applications, concepts, ideas, business strategies, and social trends in the web. Web 2.0 has also been called wisdom web, people-centred web, participative web and read/write web (O'Reilly, 2005).

Figure 1. presents the main characteristics of Web 2.0 concept. Technology point of view consists of rich user experience, the usage of web as a platform, syndication, pear-to-pear, and folksonomy. Social web is the broadest Web 2.0 characteristic, and it includes user participation and social networking. Web 2.0 can also be seen as a basis for new web-based earning models which may be based on user collaboration, new advertising methods, exploitation of the long tail, or new types of products, such as digital products (e.g. music) or virtual goods (O'Reilly, 2005).

Social media			
Social networks	**User generated content**	**Content sharing**	**Social bookmarking**
User profiles	User reviews and ratings	Photos	Tagging
Communication tools	Wikis	Videos	Bookmarking
	Blogs	*Texts*	
	Forums	Podcasts	
Technologies			
Rich user experience	**Web as platform**	**Folksonomy**	**Syndication**
Interactive GUI elements	*Internet applications*	Tag	RSS feeds
Dynamic data	*Web API's*	Tag cloud	XML
Ajax	Beta	Unhierarhical data	Json
Adobe Flex	*Mashups*		
	Open source code		

Figure 1. Web 2.0 features. Features in italics are discussed within this thesis.

1.1 What are online social networks?

Professor J. A. Barnes has introduced the term "Social Network" in 1967 to describe the associations of people drawn together by family, work, hobby etc.; for emotional,

instrumental, appraisal and information support (J. A. Barnes, 1967). These networks may operate in many levels from family level to a level of nations and can play important roles in communications among people, organizations and even nations; as well as the way how problems are solved and how organizations may run in better way. In its simplest form, a social network is a map of the relevant ties between the individuals, organizations, nations etc. being studied. With the evolution of digital age, Internet provides a greater scope of implementing social networks online. Online social networks have broader and easier coverage of members worldwide to share information and resources.

The first online social networks were called UseNet Newsgroups (www.usenet.com) designed and built by Duke University graduate students Tom Truscott and Jim Ellis in 1979. Since then the online social networks have a continuous growth in size and numbers. In February 2010; online social network giant Facebook cross the massive 370 million registered monthly active users (D. Teten, and S. Allen, 2005).

The concept of online social network which emerges from Web 2.0 means individuals tied one another with one or more social connections and therefore individuals constructing societal connections and even partnerships and roles (Hill, R. and Dunbar, R. 2002). When people join social networking sites, they begin by creating a profile, then make connections to existing friends as well as those they meet through the site. A profile is a list of identifying information. It can include your real name, or a pseudonym. It also can include photographs, birthday, hometown, religion, ethnicity, and personal interest. Members connect to others by sending a “friend” a message, which must be accepted by the other party in order to establish the connection. Friending becomes from other members who give them access to your profile, add them to your social network, and vice versa. Members use these social networks for a number of purposes. The root motivation is communication and maintaining relationships. Popular activities include updating others on activities and whereabouts, sharing photos and events, getting updates on activities by friends, sending messages privately, and posting public testimonials.

1.2 Facebook

The name of the Facebook stems from the paper form given to students at the start of the academic year by university administrators in the United States to help students get to know each other better. This social network is free to its users and its profit comes from banner advertisements and sponsor groups. In Facebook users can share their photos, interests, hidden or open messages and friend groups in their profiles. Profiles privacy can be set to restricted to only friends or visible to everyone. According to Compete.com, Facbook.com ranked as the most used social networking service by worldwide monthly active users, followed by MySpace (Kazeniac, Andy, 2009). Table 1 shows the top 10 most popular online social networks in terms of user's visit. As on February 2010, Facebook also secured the first position in terms of number of registered users (Table 1.2). Based on number of registered user and monthly visit; Facebook is the largest and most popular online social network at this moment (www.insidefacebook.com, 2009). It had 350 million Monthly Active Users (MAU) at the beginning of January 2010. But it has been growing too fast around the world since then. Now, at the beginning of February 2010, the number increases to 373 million MAU across the world. As on 10 February 2010, roughly 23 million more people are using Facebook compared to 30 days ago, many in countries with big populations around the world. This is an interesting shift from much of Facebook's international growth to date. Once Facebook began offering the service in multiple languages (it's available in more than 70 of them as of today), it started blowing up in many countries like Canada, Iceland, Norway, South Africa, Chile, etc. The United States is at the top with more than five million new users; it also continues to be the single largest country on Facebook, with 108 million MAU. That's 35% of the total US population. Table 1.1 shows a growth comparison MAU of top ten countries between January and February 2010. Going down the list, we first see some regulars: Indonesia, Turkey, the U.K. and France. These all have been growing for months. Mexico is on its way to become the largest Spanish-speaking country on Facebook; with a gain of slightly less than a million new users; it is close to the largest, Spain, Argentina and Colombia(www.insidefacebook.com, 2009).

TABLE 1.0 - Top ten mostly visited social networks in (Jan, 2009) – based on MAU

Rank	**Site**	**Monthly visit**
1	facebook.com	1 191 373 339
2	myspace.com	810 153 536
3	twitter.com	54 218 731
4	flixter.com	53 389 974
5	linkedin.com	42 744 438
6	tagged.com	39 630 927
7	classmates.com	35 219 210
8	myyearbook.com	33 121 821
9	livejournal.com	25 221 354
10	imeem.com	22 993 608

TABLE 1.1 - Countrywise monthly growth of Facebook users- as on Feb 2010

Country	**1.1.2010**	**1.2.2010**	**Change**	**Change (%)**
USA	102 681 240	108 062 900	5 381 660	5
Indonesia	15 301 280	17 301 760	2 000 480	13
Turkey	16 961 140	18 556 840	1 595 700	9
U.K.	23 076 700	24 342 820	1 266 120	5
France	14 301 020	15 498 220	1 197 200	8
Mexico	6 671 560	7 624 120	952 560	14
Germany	5 796 940	6 674 740	877 800	15
India	5 658 080	6 342 800	684 720	12
Philippines	8 806 300	9 317 180	510 880	6
Brazil	2 373 520	2 869 920	496 400	21

Table 1.2 - Top ten largest social networks in Feb'10 – based on registered users

No.	**Network name**	**Web link**	**Reg. users**
1	Facebook	www.facebook.com	350 000 000
2	QZone (Chinese)	qzone.qq.com	200 000 000

3	MySpace	www.myspace.com	130 000 000
4	Windows Live Spaces	home.spaces.live.com	120 000 000
5	Habbo	www.habbo.com.au	117 000 000
6	Orkut	www.orkut.com	100 000 000
7	Friendster	www.friendster.com	90 000 000
8	Hi5	www.hi5.com	80 000 000
9	Flixter	www.flixter.com	63 000 000
10	Netlog	www.netlog.com	59 000 000

According to Facebook user statistics, users aged 30 years or older are the fastest growing age group. Facebook is the most in terms of traffic, has more than 500 million active users and 50% of them log on to Facebook in any given day. Average user is connected to 80 community pages or groups and events, average user creates 90 pieces of content each month, more than 4 million users become a fan of various pages everyday, every month more than 850 million photos and more than 7 million videos uploaded, more than 30 billion content shares (web links, latest news, blog articles, notes, photos and applications) is made. Entrepreneurs and developers from more than 190 countries build with Facebook Platform, since the social plugins launched in April 2010, an average of 10,000 new websites integrate with Facebook every day; and more than 2.5 million websites have integrated with Facebook (Facebook, 2011).

It is clear that Facebook increases its user number, however, even its users do not are not fully aware of what kind of phenomenon they faced with. Facebook provides to its users a personalized profile area consisting of communication and personal information as friend list, albums and social interest groups like other social network applications. In Facebook, you can chat with friends, share photos, comment on photos, write messages to your friend's walls, participate in social groups, create your own groups, share ideas with these groups, add various applications and play games. Thanks to these socio-technological features, Facebook has reached millions of users in a short time and come a part of peoples life and become in the focused attention of web developers with integration to the web-services (Ellison, Steinfield & Lampe, 2007).

From the standpoint of the social web, Facebook truly is an all-in-one wonder. Given that its more than 500 million users can update their public statuses to let their friends know what they're doing/thinking/etc., exchange lengthier messages in a fashion similar to emailing back and forth, engage in real-time chat, organize and share their photos, "check in" to physical locales, and do about a dozen other things via the site, it's not all that surprising that Facebook edged out Google as the most visited website as 2010 came to a close (Alexia Tsotsis, 2010).

2. Data portability in social networks

The Data Portability initiative was created to promote the idea that individuals maintain control over their data by determining how it can be used and accessed. The main idea is that users should be able to control what data can be used by whom and in what manner. The group seeks to achieve these goals by promoting existing standards that enable data portability, not by developing new standards, rather by encouraging development of these standards and by identifying new standards that are required to fulfil the data portability vision.

The vision is that data can be shared and remixed across the borders of web sites. The owner of the data should be enabled to control who has access to it, access that should not only be limited to the place where it has initially been uploaded. Application Programming Interfaces (API) have been developed and are being used by the user community, e.g. by creating mashups of aggregated data (Brian Suda, 2007). This is already a big step in the right direction; however it is not the end of the story and the solution to all the problems.

2.1 Some standards

I give a very brief introduction to some of the most important data portability and social networking technologies and standards, along with their implications.

2.1.1 OpenID

OpenID is becoming a number one global identification with over 1 billion OpenID enabled websites (Introduction to OpenID, 2011). OpenID is a set of protocols for digital identities, providing a single sign on solution. The protocols allow creating online identities that can be used on any of the OpenID-enabled web sites, called Relying Party (RP). OpenID Providers issue a unique URL, which can be used for signing in to many websites. OpenID is an open and decentralized user centric solution, users have the choice, which OpenID provider they want to entrust their online identity. The openness of the protocol also means that anybody can create their own OpenID provider; since no central authority is required to register OpenID enabled providers or relying parties (OpenID.net).

In essence, OpenID does two things for the user. Firstly, you can log in to multiple services with just one single OpenID and password, so you don’t have to remember all your usernames and passwords. Secondly it is a means of authenticating your identity – only you

have access to this particular OpenID, which means that if your OpenID is displayed on your user profile, visitors can verify your identity with your other accounts.

There are some serious privacy problems with OpenID. The obvious one is that your online accounts can be associated with each other if the Relying party displays your OpenID. Relying parties are therefore encouraged to allow the user to control if his OpenID URL is disclosed. Another fundamental privacy issue is that your OpenID provider can track all the websites you log into; even worse, they can log into them and view your private data (Stefan Brands, 2007).

The third major issue is availability. When your OpenID Provider is down, you will not be able to log into your regular services, to which you probably already have forgotten your usernames and passwords, because you never use them. The more interconnecting services are involved, the smaller the probability that all of them work at the same time.

2.1.2 OAuth

OAuth (OAuth.net) is an open and standardized protocol for secure API authentication and API access delegation. API access delegation means that a user, who has full access to a resource via his login credentials, would like to delegate access to a consumer service. Valet keys are a great analogy for this concept. You, the owner of a car (resource), would like to grant the valet (consumer) the ability to drive the car no further than 1 kilometre (restricted access), by giving him a valet key (access token). A real scenario where OAuth is being used would be Google contact information and address books. Your Google credentials do not have to be disclosed to third parties anymore, if you would like to search for your friends on the new social network you just joined. The OAuth protocol lets you give the consumer service restricted access to your account, only letting it read your contact information for a short period of time.

The authentication process is nothing radically new; it's simply an open standard of well known concepts, such as RSA public-key cryptography for authentic communication. OAuth authentication is done in three basic steps, beginning with the consumer requesting and receiving an unauthorized request token, which has to be authorized by the user. Usually this is done in a browser; the user enters his credentials on the service provider's web page. This protocol requires the user to authenticate himself directly with the service provider,

making sure the consumer service does not see the credentials and therewith cannot receive full access. This part is important to understand, the official website does not make this clear enough.

OAuth is primarily designed for use on the web; other means of direct authentication other than using a browser could be sent via alternate channels, such as SMS or e-mail, making the authentication process very frustrating and tedious. In the third and final step of the authentication protocol the consumer sends the request access token to the service provider, who in turn returns the access token and access token secret.

One concern about the protocol is the lack of user control. If the service provider simply implements the protocol, the user has no idea whatsoever what access rights he is granting the service consumer, and for how long. I outline some best practices that service providers are recommended to follow.

Service providers should:

• Let the user know or specify exactly what access rights are being granted to the consumer
• Let the user specify a time-frame for this access token
• Give an overview of what access tokens have been given to which consumers
• The user should be able to revoke these tokens at any time

Service providers may:

• Inform the user when access tokens are being used and what for

2.2 Usages of Data Portability

There are several ways to use data portability possibilities. In this chapter I describe some of the usages needed to research for creating better web services.

2.2.1 Mashups – Hybrid Web Applications

In Web development, a Mashup is a Website or web application that uses and remixes data, presentation or functionality from two or more sources to create new services. The term implies easy, fast integration, frequently using open APIs and data sources to produce enriched results that were not necessarily the original reason for producing the raw source data. The main characteristics of the Mashup are combination, visualization, and aggregation.

It is important to make existing data more useful, moreover for personal and professional use. To be able to permanently access the data of other services, mashups are generally client applications or hosted online. Since 2010, two major mashup vendors have added support for hosted deployment based on Cloud computing solutions; that are Internet-based computing, whereby shared resources, software, and information are provided to computers and other devices on demand, like the electricity grid. In the past years, more and more Web applications have published APIs that enable software developers to easily integrate data and functions instead of building them by themselves. Mashups can be considered to have an active role in the evolution of social software and Web 2.0. Mashup composition tools are usually simple enough to be used by end-users. They generally do not require programming skills and rather support visual wiring of GUI widgets, services and components together. Therefore, these tools contribute to a new vision of the Web, where users are able to contribute.

2.2.2 Web Widgets

A widget is a stand-alone application that can be embedded into third party sites by any user on a page where they have rights of authorship (e.g. a webpage, blog, or profile on a social media site). Widgets allow users to turn personal content into dynamic web apps that can be shared on websites where the code can be installed. Embeddable chunks of code have existed since the early development of the World Wide Web. Web developers have long sought and used third party code chunks in their pages. Early web widgets provided functions such as link counters and advertising banners. End users primarily use widgets to enhance their personal web experiences, or the web experiences of visitors to their personal sites. For example, a "Weather Report Widget" could report today's weather by accessing data from the Weather website. So users can put that widget on their own Facebook profile or on their blog, and only they need to do is copying and pasting the embed code into their Facebook profile.

The use of widgets has proven increasingly popular, where users of social media are able to add stand-alone applications to blogs, profiles and community pages. The developers of these widgets are often offering them as a form of sponsored content, which can pay for the cost of the development when the widget's utility maps to the user's needs in a way where both parties gain.

3. Facebook as a service platform

In this chapter, we'll take advantage of Facebook's incredibly powerful APIs for mining this data to discover your most connected friends, cluster your friends based on common interests, and get a quick indicator of what the people in your social network are talking about. I'll start with a brief overview of common Facebook APIs, and then analyze social plugins.

3.1 Facebook platform

Facebook's external architecture interface consists of three primary components: a REST-based application programming interface (API), a custom markup language (Facebook markup Language), and a custom database query language (Facebook Query Language).
Facebook allows for two types of applications: Website and Desktop. A Website application is one that ties directly into Facebook's web interface. Generally this is content written in a web scripting language like PHP, Python, or Java ServerPages (JSP), and hosted on the application developer's own servers. The application generates web pages that are grafted into Facebook's user web pages. The application's web pages can either be generated on the developer's server and presented to the Facebook user via an HTML frame, or can be marked up using FBML, a restricted subset of HTML. Under this second method, the FBML markup is retrieved by Facebook's servers, parsed, and rendered along with surrounding markup code (Felt, 2007). Web-based applications may also place a small "widget" on a user's profile page, which acts as an interface for interacting with the application or displaying data provided or processed by the application. Widgets must be written in FBML (Felt, 2007). A Desktop application is an application written in a programming language such as C++ or Java, and executed directly on a user's own machine. The application then communicates with Facebook's servers using Representational State Transfer, or REST. The particular type the application will have is a decision that is based upon the goals of the application's developers. A Website application generally adds content to the user's profile, or enhances his experience while using Facebook. Some Website applications allow Facebook users to rate music or movies, send each other electronic "gifts", or play games like Farmville or Mafia Wars. A Desktop application usually serves a more utilitarian role. For example, some desktop applications run on a user's computer in the background as daemons, and alert the user when they've received a new message or "poke" via Facebook. This allows a user to stay in touch with friends without continually checking Facebook via the web interface. Facebook seems to prefer integration via web applications. Its developers' documentation database contains much

more thorough information for the creation of web applications; even though desktop applications debuted before web applications, most examples are written for web applications. The integration of web applications with Facebook is more seamless. For example, desktop applications must first redirect the user to a login page, then have the user switch back to the desktop app. Web applications login “automatically” and thus do not have this break between start and login.

Facebook’s API is so powerful that the Facebook own engineers now implement most of Facebook’s new features as applications that can be selectively enabled and disabled by the end user. Thus the framework provides an interface for internal and external developers alike, as well as giving users fine-grained control over their own application experience. Furthermore, not only can users decide which applications to use and which ones to remove, but also whether those applications can append information to their public profiles, publish “stories” in their news feed, or show up in the user’s internal navigation bar. With this design, Facebook has raised the bar for web applications by maximizing customization.

3.1.2 OpenGraph API

The recently introduced Open Graph API and associated social plug-ins encourage third-parties to generate more traffic from and to Facebook. Since 2006, developers have been able to use Facebook‘s API to let users connect their account to third-party applications. Its recent changes, however, enable anyone to implement Facebook features on their website. Several examples of ’social plugins‘ have already been mentioned in the former chapter: the ubiquitous ’like’ button, the embeddable activity streams plug-in and a recommendation plug-in. In addition, some websites support ’instant personalization‘. In this process, partner services utilize Facebook user data to give them a personalized experience. For instance, the music service Pandora.com starts immediately playing the music you ’like‘ when you enter their website. Nowadays the ’like‘ button is nearly everywhere. By clicking on the ’like‘ button, users share their activity with a link to the site on the News Feed. In addition, it is possible that it leads to the creation of a ’connection‘, a page that is forever connected to your profile, even after you have deleted it (Constine, 2011). Whether this occurs, depends on the use of the Open Graph API by another person; the user might be unaware of this. Furthermore, blogger Didier Durand has shown that when people are logged into Facebook and simultaneously browse the Web, Facebook‘s cookies track every website that has implemented a ’like‘ button or another social plug-in, even when one does not click on them

(Durand, 2010). Moreover, if a user is logged out of Facebook and visits websites with social plug-ins you will be tracked anonymously (Durand, 2010). Then, when the users logs into Facebook again these previous marks will be reconnected back to the user-id. Thus, it can be argued that the new 'social' plug-ins have great implications on the users' privacy. Which have been addressed by privacy advocates in an open letter to Zuckerberg (Kincaid, 2010).

In this case, it is not the assemblage of protocols -visible to the user on the Facebook website which imposes a new operating logic onto the user interface, but rather a protocological assemblage which is distributed throughout the Web. When users are logged in and browse the Web, there is a chance that they run into API implementations that communicate with their accounts. Now that Facebook has flipped the switch, the user interface transcends the Facebook home page. It is at these instances of re-channeling that the distributed management style of protocol becomes very apparent.

3.1.3 Facebook Social Plugins – Social Widgets

Facebook and Open Graph have effectively begun the process of integrating the social network into the rest of the web. The question is what does this mean for the future of media outlets, third-party websites and developers, and other, competing social networking environments?

Facebook offers webmasters and bloggers a lot of options for integrating their platform onto websites. Consider the number of users that are logging into Facebook on a daily basis and staying logged in throughout the day while perusing the Internet. It makes sense that website owners would want to take advantage of the power of Facebook on their own sites, especially since Facebook is the most used identity when it comes to people signing into sites.

3.1.3.1 Like Button

The Like button lets a user share your content with friends on Facebook. When the user clicks the Like button on your site, a story appears in the user's friends' News Feed with a link back to your website.

When users Web page represents a real-world entity, things like movies, sports teams, celebrities, and restaurants, use the Open Graph protocol to specify information about the entity. If a user includes Open Graph tags on its Web page, the page becomes equivalent to a

Facebook page. This means when clicking a Like button on users page, a connection is made between webpage and the user. The page will appear in the "Likes and Interests" section of the user's profile, and clickers have the ability to publish updates to the user. The page will show up in same places that Facebook pages show up around the site (e.g. search), and can ads cab be targeted to people who 'like' the content.

Figure 2. 'Like' button

3.1.3.2 Send button

Facebook has just released 'send button' (Facebook.com, 2011). The Send Button allows users easily send content to their friends. People have the option to send URL in an inbox message to their Facebook friends, to the group wall of any Facebook group they are a member of, and as an email to any email address. While the Like Button allows users to share content with all of their friends, the Send Button allows them to send a private message to just a few friends.

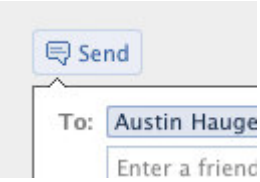

Figure 3. 'Send' button

3.1.3.3 Comments

Comments Box is a social plugin that enables users commenting on websites. Features include moderation tools and distribution.

Social Relevance: Comments Box uses social signals to surface the highest quality comments for each user. Comments are ordered to show users the most relevant comments from friends, friends of friends, and the most liked or active discussion threads, while comments marked as spam are hidden from view.

Distribution: Comments are easily shared with friends or with people who 'like' Facebook Page. If a user leaves the "Post to Facebook" box checked and posts a comment, a story

appears on its friends' News Feed indicating that comment has been made on website, which will also link back from Facebook to users website.

Friends and people who 'like' the Page can then respond to the discussion by liking or replying to the comment directly in the News Feed on Facebook or in the Comments Box on website. Threads stay synced across Facebook and on the Comments Box on website regardless of where the comment was made.

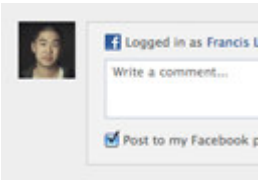

Figure 4. 'Comments'

3.1.3.4 Activity Feed

The Activity Feed plugin displays the most interesting recent activity taking place on website. Since the content is hosted by Facebook, the plugin can display personalized content whether or not the user has logged into the website. The activity feed displays stories when users 'like' content on the website, when users share content from website in Facebook or if they comment on a page on website in the comments box. If a user is logged into Facebook, the plugin will be personalized to highlight content from their friends. If the user is logged out, the activity feed will show recommendations from across the website, and give the user the option to log in to Facebook.

Figure 5. 'Activity Feed'

3.1.3.5 Reccomendations

The Recommendations plugin shows personalized recommendations to users. Since the content is hosted by Facebook, the plugin can display personalized recommendations whether or not the user has logged into the website. To generate the recommendations, the plugin considers all the social interactions with URLs from the website. For a logged in Facebook user, the plugin will give preference to and highlight objects her friends have interacted with.

Figure 6. ‘Reccomendations’

3.1.3.6 Like Box

The Like Box is a social plugin that enables Facebook Page owners to attract and gain Likes from their own website. The Like Box enables users to:

- See how many users already like this Page, and which of their friends like it too
- Read recent posts from the Page
- Like the Page with one click, without needing to visit the Page

Figure 7. ‘Like Box’

3.1.3.7 Login button

The Login Button shows profile pictures of the user's friends who have already signed up for the website in addition to a login button.

Facebook API offers possibility to specify the maximum number of rows of faces to display. The plugin dynamically sizes its height; for example, if user specifies a maximum of four rows of faces, and there are only enough friends to fill two rows, the height of the plugin will be only what is needed for two rows of faces.

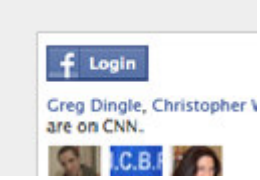

Figure 8. ‘Login button’

3.1.3.8 Registration

The Registration plugin allows users to easily sign up for the website with their Facebook account. The plugin is a simple IFRAME that you can drop into your page. When logged into

Facebook, user sees a form that is pre-filled with their Facebook information where appropriate.

The registration plugin gives a user the flexibility to ask for additional information which is not available through the Facebook API (e.g. favourite movie). The plugin also allows users who do not have a Facebook account, or do not wish to sign up for the website using Facebook to use the same form as those who are connecting with Facebook. This eliminates the need to provide two separate login experiences.

Figure 9. ‘Registration’

3.1.3.9 Facepile

The Facepile plugin displays the Facebook profile pictures of users who have liked the website or have signed up.

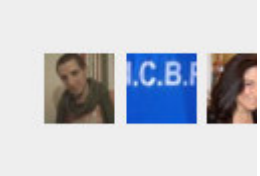

Figure 10. ‘Facepile’

3.1.3.10 Live stream

The Live Stream plugin lets users visiting your site or application share activity and comments in real time. Live Stream works best when website is running a real-time event, like live streaming video for concerts, speeches, or webcasts, live Web chats, webinars and multiplayer games.

Figure 11. ’Live stream’

4. Facebook API privacy and Security problems

Due to the popularity of the Facebook Platform and the ongoing development of new APIs, it is important to address the privacy risks inherent in exposing user data to third-party applications. By enabling all these new services, many users unwittingly trade access for privacy. They join service after service making their private information publicly available for everybody to see. The internet is a one-way host of information, there is no guarantee that you will ever be able to remove information, once it has been made available.

4.1 Likejacking

Over 100,000 websites have implemented Facebook's social plug-ins expecting to benefit from these new ways of generating traffic (Osofsky, 2010). Despite the latest privacy backlash, Facebook‘s count of unique visitors continues to grow rapidly (Schonfeld, 2010). From a Facebook API perspective it is interesting to acknowledge that social media have become sites of malicious protocol practices. Ironically, while the 'like' button is spread across the Web, users are increasingly struck by so-called 'clickjacking' worms which make them like things. This has been named to 'likejacking' by software security researchers (Cluley, 2010). Users read their News Feed and click on what their friends have liked. They reach a blank page which says: 'Click here to continue'. Scammers have placed an invisible button beneath the mouse cursor so that if they click anywhere on the website, their status is updated without permission. Subsequently, their contacts read that they have liked something and it starts all over again. According to Graham Cluley from the anti-virus research company Sophos, the goal of the scammers behind this 'likejacking' worm is to generate revenue, as the link leads to a website which is part of an advertising network. Cluley argues that the clickjacking attacks on Facebook exemplify the exploitable weakness of the platform (Cluley, 2010). This could lead to more malware or phishing attacks in the future, putting the users at risk. Indeed, the emergent like-culture on the Web is not exploit-proof.

'Likejacking' is a clear instance of a abusing a Facebook API protocol (Galloway and Thacker, 2007), which uses the 'like' button code to achieve hypertrophy. This has many implications for the users, Facebook and anyone who likes the 'like' button. Users will have to be more careful when they browse through their News Feed. Facebook needs to create a more secure environment, while scammers will continue to reinvent ways to exploit security

flaws. ‘Likejacking’ can be conceived as critical Facebook API protocol intervention to those who does not create desired benefits for the users and abide by the ongoing reconfiguration of technical assemblages.

4.2 Phishing

Phishing is an attack in which users are sent legitimate-looking email messages that contain URLs to legitimate-looking but fraudulent Web pages controlled by the attackers (Emigh, 2005). The fraudulent Web pages are designed to entice users into revealing personal or financial account information. Information entered by users in a fraudulent Web page is collected and sent to data drop sites under the attacker's control. Compromised computers provide attackers a convenient way to conduct phishing attacks. Compromised computers can be used to send phishing messages to users, host phishing Web pages, become data drop sites, or act as redirectors.

5.3 Profile cloning

Profile cloning is a well-known attack strategy where the victim’s profile from one network is cloned onto another network and her friends are invited to link to it (Maheswaran, Ali, Ozguven, Lord, 2010). For example, Alice has a public Facebook account, with pictures. Bob knows Alice and they are friends both online and offline. Bob also has an account on a other social network MySpace. Eve, in an attempt to exploit Bob’s friend-only information, creates a profile on MySpace using information taken from Alice’s public Facebook profile. Eve, impersonating as Alice sends a request to create a link between the fake Alice and Bob on MySpace. If Bob accepts the request, Eve can have access to Bob’s friend-only information.

There are several simple ways to reduce the incidence of this type of fraud. If Alice has made it clear, through any channel, that she is not creating any further profiles, Bob would have reason to doubt the incoming MySpace request. Also, Alice could make her Facebook profile private, stopping Eve from getting the necessary information to create the fraudulent account. Lastly, Bob could verify the fraudulent MySpace request with Alice through a secondary channel which they both trust as in person, on the phone, or even on Facebook.

5. Facebook API usages in global websites

5.1 Time.com

TIME.com's main idea is to provide reliable, up-to-the-minute reporting on the people, places and issues that matter. TIME.com is using social plugins to allow users to see what their friends liking, sharing, and commenting on across the site. On the homepage, users can see the stories which their friends recommend. As they read articles on TIME.com, users also can have a more engaging social experience by seeing which of their friends also liked the article.

Figure 12. Time.com front-page

5.1.1 Front-page

In Time.com front-page users can create instantly personalized news, by placing the Activity Feed or Recommendations plugins prominently on the homepage, users can see what their friends are liking, sharing, and commenting on across the site. Instead of only navigating to the catchiest headlines, users are compelled to check out what their friends are interacting with, too. As the Activity Feed and Recommendations continue to update in real-time, users stay engaged with the website longer and the social context encourages them to interact more with the content.

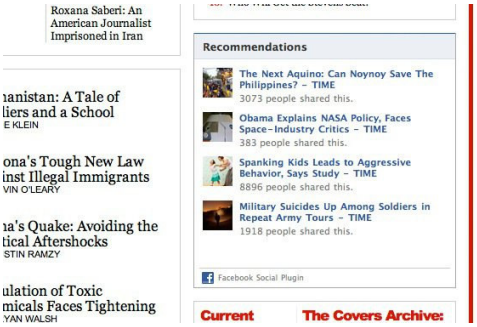

Figure 13. Time.com “Reccomendations”

5.1.2 Articles

Social network users have a possibility to easily share interesting content with friends. Time.com has added the Like button, which displays a user's friends who have liked or recommended the article, at the top of each article. It creates an easy to ’like’ possibilities for users to like the content by themselves after they've read the article. Every time a user likes an article, an opportunity is given to add a comment, and a story is published to their News Feed. Each Like creates distribution on Facebook, which brings more Facebook users back to the article on the website.

5.1.3 Topics

On the Topics section users have been given the ability to subscribe to their favorite columnists, blogs, sections, or specific topics. By adding ’Like’, users can publish updates directly into the feed of users who have liked the topic.

Figure 14. Time.com comments with ’Facepile’

For example, if a user likes the topic of "healthcare reform" or "local news," user friends can publish breaking news using the subject of the topic to their feed to share an article or generate discussion. Millions of users interact with their News Feed on Facebook

daily. Seeing meaningful content in their feeds will encourage continued and long-term engagement with the site.

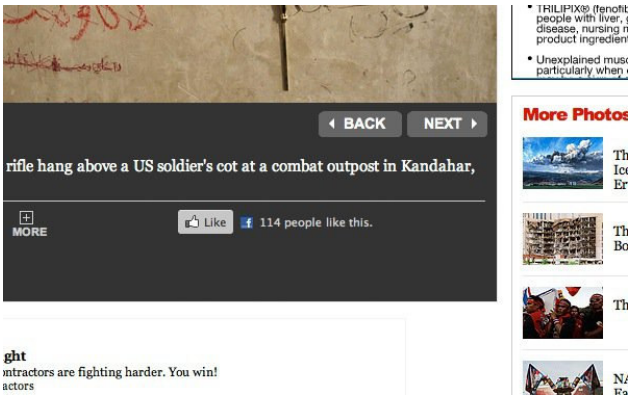

Figure 15. Time.com 'Like' with number of people liking the content

5.2 Pandora.com

Pandora, the popular Internet radio company, creates personalized radio stations. By simply entering a favorite artist or song, listeners can instantly enjoy a personalized station based on Pandora's Music Genome Project™. The more than 50 million listeners have registered for Pandora to date now have an additional tool with which to share their personalized radio stations and musical discoveries. Pandora, via linking to Facebook, is now making it easier than ever for listeners to build stations, connect with friends, share music discoveries, and make their Pandora experience more personal than ever before.

5.2.1 Front-page

On the front-page pandora.com developers have created functionality that helps users discover the music, movies, actors, or TV shows that their friends like. Pandora.com developers have added both the Activity Feed and Recommendations plugins, which gives users opportunity to see what their friends are liking, sharing, and commenting on across the site. Instead of only navigating to what's most popular, users are compelled to check out what their friends are interacting with, too. As the Activity Feed and Recommendations continue to update in real-time, users stay engaged with the site longer and the social context encourages them to interact with the content.

Figure 16. Pandora.com frontpage

5.2.2 Photos and Videos

Allowing users to be the first of their friends to share an awesome movie trailer or a photo of their favorite celebrity Pandora.com have added the Like button. This displays a user's friends who have liked or recommended the photo or video, directly next to or below it. Every time a user clicks the Like button, an opportunity is given to add a comment, and a story is published to their News Feed. With a comment, a full story is shown on Facebook, which includes a thumbnail image of the photo or video from the site. Posts on Facebook with images attracts more likes and comments, which get distributed out to more of the user's friends, and brings more Facebook users back to the site.

5.2.3 Movies, Actors, and TV Shows

Pandora.com gives users the ability to add their favorite movies, actors, or TV shows to their Facebook profile with one-click from their site. By adding the Like button next to movies, actors, or TV shows, users can easily add these links to their profiles by liking the object on the site.

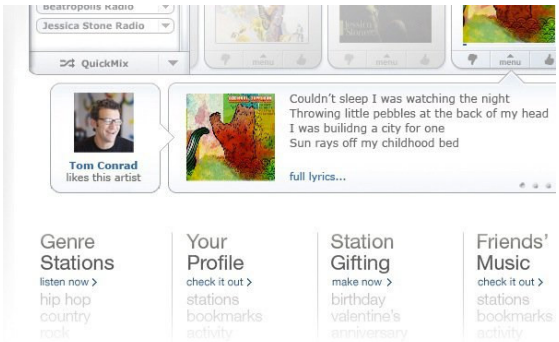

Figure 17. Pandora.com 'Likes'

When a user likes the object, other users have the ability to publish meaningful and interesting updates. For example, Pandora.com let's users know when a movie is coming to DVD with a quick status update or post a sneak peek video clip of a TV show's season finale.

5.3 ESPN.com

ESPN.com is the worldwide leader website in sports. In 2009, ESPN.com launched a cleaner, redesigned homepage with richer video experience and enhanced scoreboards; later in the year, they turned their focus to localization and it created a lift in usage and fantasy sports engagement. Now, they have also connected to Facebook to create a social experience with users' friends. For instance, they created a custom experience around the 2010 NFL Draft where users could like teams and players and view a running live stream of their friends' commentary as the rounds progressed.

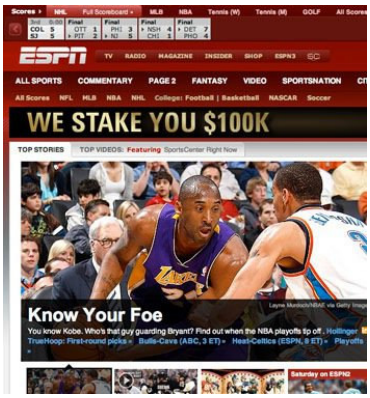

Figure 18. ESPN.com frontpage

5.3.1 Teams and Athletes

ESPN.com gives users the ability to like their favourite teams and athletes and add them to their Facebook profile. Users can send updates directly into the stream of other users who have liked certain athletes or teams. For example, if a user likes the Seattle Mariners, other users can publish to their stream every time a stat is updated or a score is posted. This creates a long term relationship between the site and users, and keeps them to be engaged with the content they find interesting.

5.3.2 Articles, Photos, and Videos

ESPN.com have added a Like button to content and allowing its users easily express their identity and interests with one click.

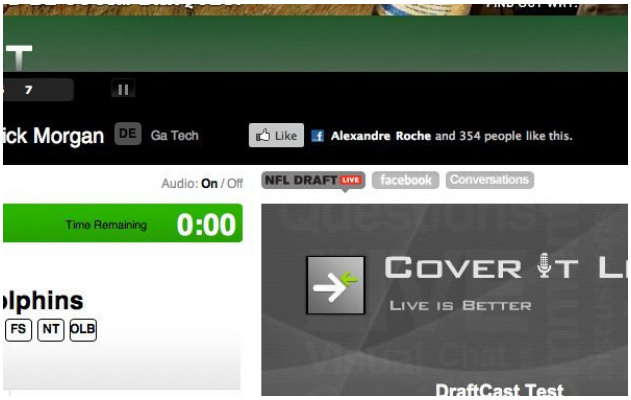

Figure 18. ESPN.com “Like” usage with a friend name and number of people are liking

ESPN.com is displaying a user's friends who have liked the content at the top of the article, it encourages readership, and gives users the opportunity to like it themselves at the bottom of the content. Every time an ESPN.com user likes an article, a story is published to their News Feed, user profile, and in search results.

6. Vifi.ee

Vifi.ee is a commercial video-on-demand service distributing movies and television programs online. This is a very unique service in Baltic States, which allows users to stream movies and TV-series over Internet.

Figure 19. Vifi.ee main page

Vifi.ee's concept is similar to those of Amazon Video on Demand, Vudu, Headweb, Spotify, and Grooveshark, its user interface is primarily designed for desktop computer interface. In figures 19-22 is shown current functionality of Vifi.ee website. The service is provided to use via web-browser and is supported with popular browsers and operation systems. There are many different categories of Movies and TV-series presented in Vifi.ee website. The quality what is offered varies from DVD to High Definiton (HD). As a media server Vifi.ee website uses Wowza mediaserver and for playing movies Flowplayer is used.

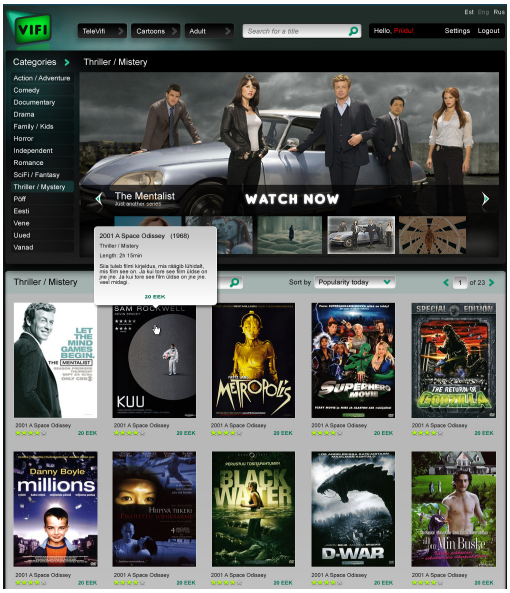

Figure 20. Vifi.ee movies in category

There is only one player in VOD services field in Baltic States. Elion AS offers VOD service through out their DigiTv device. Vifi.ee advantage over this is to offer content via Internet and without a need to buy and install any software and devices. All internet users in Baltic States are possible Vifi.ee users, it is limited only by Internet speed, which has to be more than 1mb/s and from commercial perspective users need to have online payment possibilities as banklink or credit card offered by local banks.

Throughout administrative backend all kind of digital content is provided to Vifi.ee frontend and is played over the streaming protocol RTMPE. This protocol is widely used in these kinds of websites and is difficult to record and snoop.

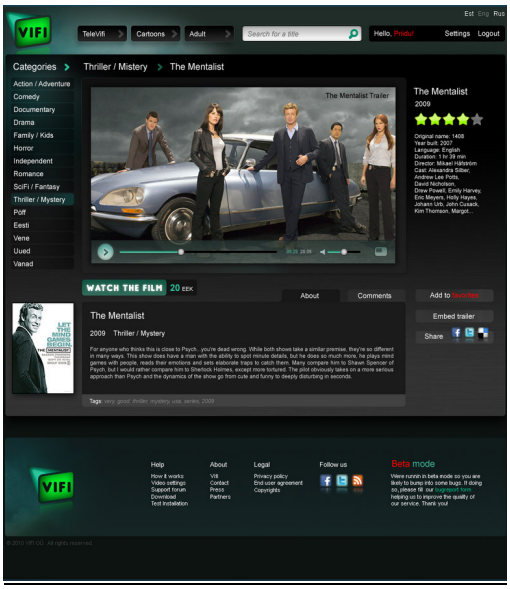

Figure 21. Vifi.ee movie page

The content quality is being offered according to user's broadband speed which allows showing the content without picture flicking and delay. The content is provided according to user device in suitable resolution, also there is possibility to fast forward without buffering pauses. The service is provided immediately after the payment is submitted and is valid for 24 hours.

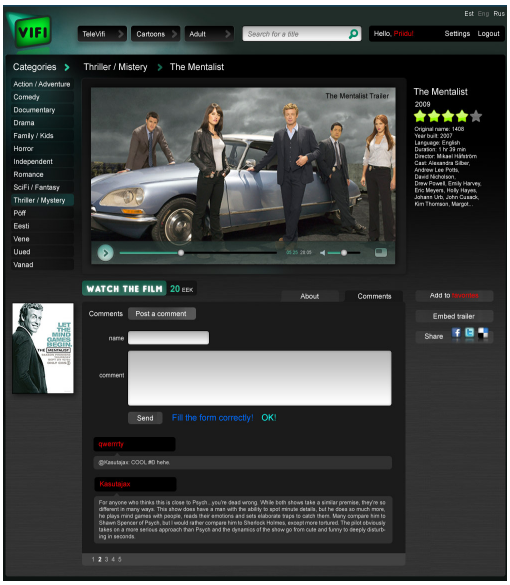

Figure 22. Vifi.ee movie page comments

As a general subject of this master thesis we are offering new social connectivity features to connect them with Vifi.ee online web-service. We are trying to implement most of the Facebook social plugins within the Vifi.ee web-service.

7. Vifi.ee service Facebook integration

7.1 Social plugins implementation to a web-service

Vifi.ee as entertainment web-service has a lots of opportunities connecting it with the Facebook. As described earlier in thesis I am using Facebook API and social plugins and try to integrate them within Vifi.ee functionality. Vifi.ee basic functionalities are login system, product (movies) categories and movies and movie player. These functionalities are playing the most attractive parts of website to use social plugins and possibilities.

7.1.1 Registration

The main issue of registration functionality is to keep it as simple as possible and avoid long forms. The simplified registration form (picture 2) shows how the registration reduced to minimum. As Facebook API offers a list of attributes (table 3.) to customize "registration plugin", I am proposing to use it with some custom developments to get to know more about the user and add checkbox "Do you like Vifi.ee?" to provide automatic like to Vifi.ee Facebook page and as well ask for security captcha to avoid registration spam and DDoS attacks.

Table 2. – registration plugin custom attributes:

Name	**Description**
name	The `name` on the HTML `<input>` element. This will be the name of the attribute when you decode the `signed_request`.
description	The label to show the user.
type	The field type. Supported values are `text`, `date`, `select`, `checkbox` and `typeahead`.
view	When to show this field. There are two views: `prefilled` and `not_prefilled`. `prefilled` means the user is registering using her Facebook account, `not_prefilled` means the user is not registering with her Facebook account. This parameter is useful if, for example, you only require a password for users not registering using their Facebook account. **Default:** Display this field in both views.
options	For `type:select`. An object of "submit value" to "user description ".

categories	For `type:typeahead`. An array of Open Graph protocol types that are valid for this field.

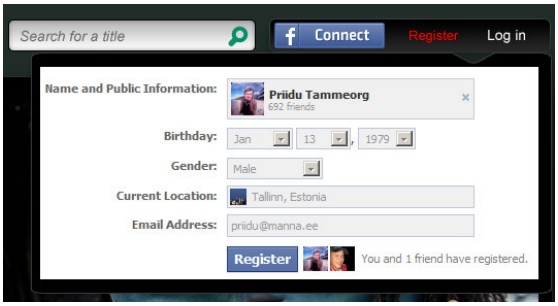

Figure 23. Simplified registration form

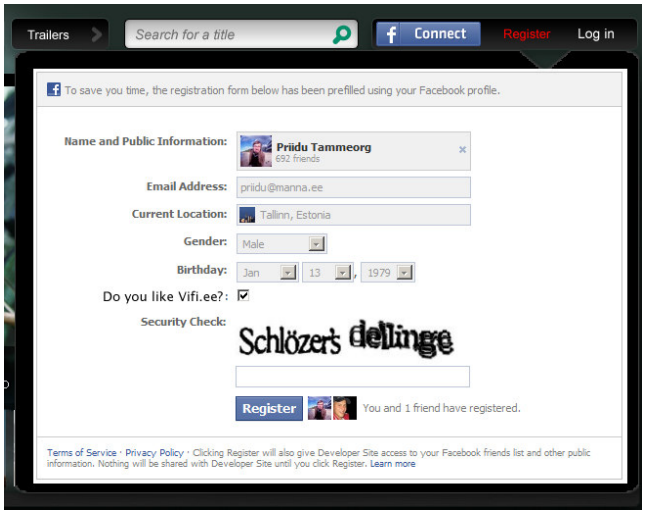

Figure 24. Customized registration form

7.1.2 Facebook Authentication and Login

Vifi.ee's login system allows user to login and maintain its orders and give an overview of history within website. With Facebook Authentication I am proposing a list of settings that are transferred from user's Facebook profile. These transferred settings can be used in web-service to show contents according to user interests and activities. As described earlier in this thesis, Facebook Platform uses the OAuth 2.0 protocol for authentication and authorization. I am also using Facebook's social plugin "Login" to show already logged in users. Facebook authentication provides user possibility to log in with a single click.

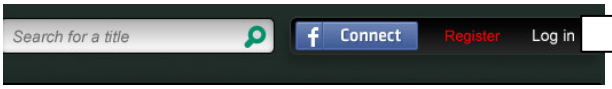

Figure 25. Facebook connect button for authentication.

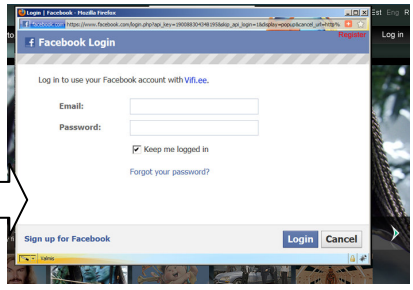

Figure 26. Facebook login popup for signed out users.

Once I have successfully authenticated the user, the OAuth Dialog will prompt the user to authorize the application. With this I ask user to provide access to its basic information, its email, to access its data any time, and to access its categories of profile information such as movies, games, books, groups etc (Figure 20).

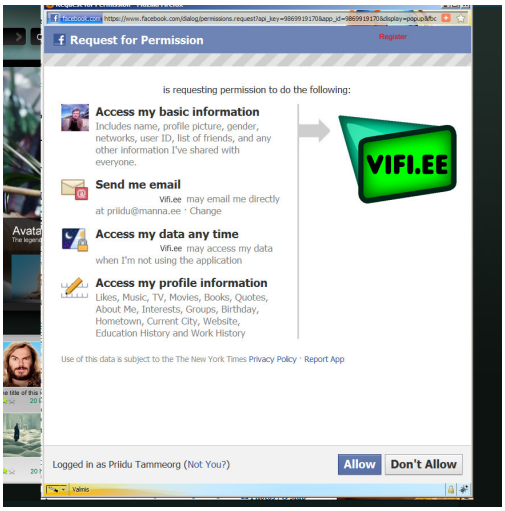

Figure 27. Profile information retrieval from Facebook.

By allowing this I get information from users profile and can present Vifi.ee contents by its interests.

7.1.3 Send

As a very new feature send offers private sending of content to other Facebook users. I am implementing this plugin into a movie page (Picture nr 21, 22). As an extra this feature also allows sending the content to groups and multiple users and is more private than “Like” which posts the information to users profile making the content visible to all user friends within Facebook.

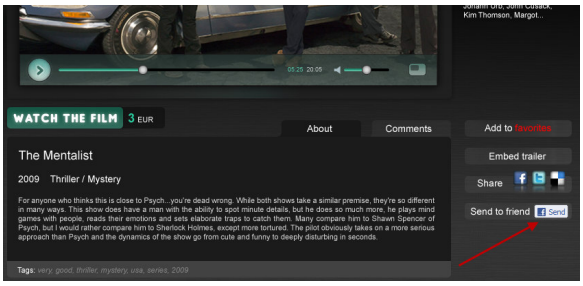

Figure 28. Send button in movie page.

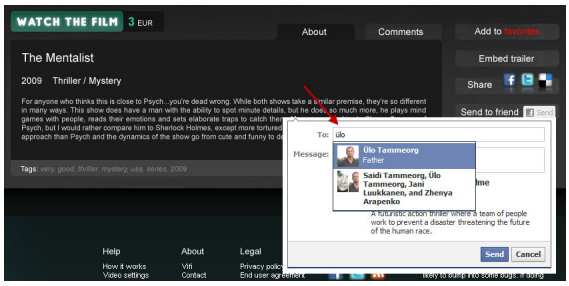

Figure 29. Send button clicked.

7.1.4 Comments

Comments Box is a social plugin that enables user commenting on Vifi.ee website (Picture 7). Instead of traditional web form commenting I will implement Facebook Comment Box and use this and allow friends and people respond to the discussion by commenting and replaying directly in the News Feed on Facebook. Comment threads stay synced across Facebook and on the Comments Box on Vifi.ee regardless of where the comment was made.

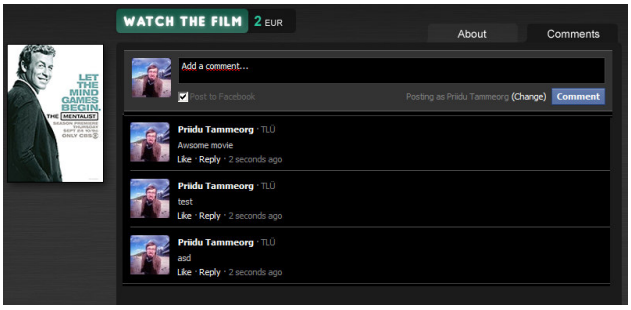

Figure 30. Comments box in Vifi.ee.

7.1.5 Like

The Like button lets a user share your content with friends on Facebook. When the user clicks the Like button on Vifi.ee, a story appears in the user's friends News Feed with a link back to Vifi.ee. Each like creates distribution on Facebook, which brings more Facebook users back to the move page and engage them more with Vifi.ee. Pictures nr 24, 25, 26 describe how it will be implemented.

Figure 31. Implementing “Like” button

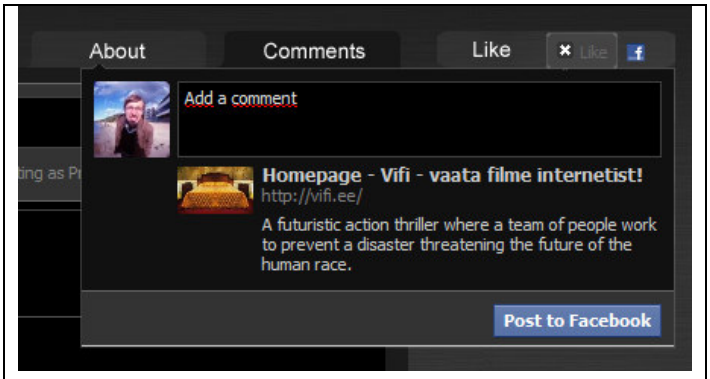

Figure 32. 'Like' is clicked.

Figure 33. Outcome in Facebook user profile

8. Issues and problems found

8.1 Problems with Facebook API

There are some problems with Facebook API. During the year 2010 Facebook has announced to stop developing Facebook Connect and opened up Facebook OpenGraph. Lot of developers over the world had to reprogram their websites to be stay connected with the Facebook. It has been turned into a mainstream as almost every two months the API changes and every code programmers write may not function anymore. This has been one of the constant grudges with the Facebook API and has still not been resolved effectively. There is also lack of support with questions regarding the API; the obvious place to put them would be the FB developer forums, but the answers come very slowly.

8.2 Security problems found

While trying to implement Facebook Chat onto movie-page, I had to reconsider by finding this may expose to much privacy from users friends. The bug popped up in the Facebook instant message service that accidentally allowed users to view the live chats of their Facebook friends. They could also see friends' pending friend requests, and which friends you have in common with the pending friends. It is not known how many users were exposed, but Facebook took the entire Chat service was offline for an hour or so as they fixed the problem.

8.3 Privacy problems found

The first significant change is Facebook's "Open Graph". It basically allows partner websites and Facebook applications to share user's public information and the public information of user friends. The other big change which is a departure from Facebook Connect is that developers can hold your data indefinitely. Before releasing the Open Graph the requirement was only for 24 hours, but developers weren't really holding to that. What seems more concerning that with new Facebook API developers don't even need a Facebook account to search the Open Graph.

For example, *https://graph.facebook.com/search?q=facebook&type=post* is showing 25 recent status updates. These status updates are set public and it seems that Facebook has put a limit on data for retrieving with one query. Before new API there was a need to log in to Facebook to do a search or use some Google hack queries for this information. This kind of

openness gives huge opportunities for attackers, spammers and data miners. Facebook also have made publicly available information easier to search, this is a sign of trying to compete with Google on personalized searches.

Conclusion

The results of my study have led to a much better understanding of the nature of Facebook's framework and third-party API. This knowledge has allowed me to make a fair assessment of Facebook's engineering progress, as well as provide recommendations for future web developers endeavouring to build and deploy unique socially connected web services. Most importantly, my study has given me better insight on the security and privacy problems, as well as a better theoretical understanding of how to improve and maintain socially connected web services. The examination of the technical aspects of Facebook's third-party framework, as well as the methodologies used in its design, has allowed me to understand greatly the nature of web engineering and helped me socially connect existing web service Vifi.ee. With researching the literature and experimenting with Facebook API, I have found that Facebook platform has huge variety of different possibilities which give unlimited possibilities for web developers and designers to connect social services to a web service. While I am certainly impressed with Facebook's framework, the study of the API has made me realize that, as the World Wide Web continues to grow and some fundamental changes are necessary in the very nature of the web building tools we use to, and the manner in which we develop web-based applications.

Summary

The aim of this thesis is to analyze Facebook API and to investigate its different integration possibilities. In the design phase I have connected customized Facebook social plugins within Vifi.ee web service and described the outcome of these integrations. It is understandable that social networks contain an enormous amount of data that is largely used by third-party developers. As social aspects to the Internet continue to expand in both portability of this data will be achieve more importance to web developers.

While researching the open authorization standards it clearly explained me how the Facebook API and its social plugins are functioning. In the middle part of the thesis I've reviewed three global websites and their Facebook social plugins usages, to get better knowledge how others are doing it and trying to create new and unique usage of social plugins and integrate them in the Design phase.

While more research must be done to prove the social networking data in the field of security and web content analysis, this thesis makes it clear that data portability gives huge opportunities to connect social media with third-party websites. In addition, this thesis proves that there are possible security and privacy issues with using social networking data with the web service. This thesis has given me solutions how to maintain privacy and security while integrating social media into a Vifi.ee web service.

Kokkuvõte

Töö eesmärk oli uurida andmete portaablust ja Facebook platvormi võimalusi andmete liidestamiseks olemasoleva veebiteenusega. Töö disainifaasis muutsin Facebooki sotsiaalsete pluginate ülesehitust ning toimist ja liidestasin need Vifi.ee veebiteenusele. Sotsiaalvõrgud sisaldavad tohutul hulgal andmeid ja nende liidestamine teiste veebilehtedega leiab järjest rohkem rakendamist. Interneti sotsiaalsus on järjest suurenev trend ja andmete portaablus on üha rohkem veebiarendajate tähelepanu all. Facebook platvormi liidestamise võimalusi liidestamiseks veebiteenusega on mitmeid.

Avatud autoriseerimisprotokolle uurides jõudsin arusaamani, kuidas Facebooki API ja sotsiaalsed pluginad on üles ehitatud ja funktsioneerivad. Töö keskmises osas kirjeldan ja analüüsin, kuidas kasutatakse sotsiaalseid pluginaid maailmamastaabis suurtel veebilehtedel, et omandada parimaid teadmisi, kuidas teised teevad ja luua unikaalseid kasutusjuhte, et neid disainifaasis integreerida.

Oma töös kasutan Facebooki sotsiaalseid vidinaid ja muudan nende kooslust nii, et need oleks turvalised ning annaks Vifi.ee veebiteenusele lisandväärtust. Lisandväärtusena pean silmas kasutajatele parema sisu pakkumist ning sotsiaalse informatsiooni kasutamist Vifi.ee veebiteenusel, aga ka kasutajate kasvu teenuste liidestamisega. Andmete portaablus on seotud ka turvalisuse ja privaatsuse riskidega, mida uurides jõudsin lahendusteni, mis aitavad veebi arendajatel vältida neid riske. Selle magistritööga jõudsin lahendusteni, mis aitavad mul viia lõpuni Vifi.ee turvalise ja privaatse liidestamise sotsiaalvõrgustikuga Facebook.

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