Wide Review of Social Network and Decentralization

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Abstract. Social networking has slowly formed an important part of the social, political, educational, professional, personal and business life. Online Social Networking sites offer services that are valuable to people even though there are some limitations. In this paper, some social networking concepts and related challenges will be discussed. Decentralization framework is proposed as a solution to the limitations which currently online social networking sites are being faced. It will be shown how the combination of various semantic web technologies form the decentralized framework and improve the management of information. Finally, the issues that decentralization would have in term of security are pointed out and possible ways to overcome this issue will be reviewed.

Keywords: social network, decentralization, semantic web, foaf+ssl.

1. Introduction

In the last 10 years or so, the popularity of social networks has seen a tremendous rise in growth and popularity. There are millions of people participating in online social networking sites such as Facebook today. There are an estimated 900 million active users in Facebook at the moment. These social networking sites also play a role in providing space for social discussions, business promotions and even governmental programmes. These users, be it individuals or workgroups, share opinions, knowledge as well as interest with the other individuals and workgroups in the site. All these information can be gathered and collected to perform a social network analysis on organisations to get a better understanding of them [1][2]. With the increasing number of participants in social networking sites, the analysis and evaluate the information are also increasing in complexity. In addition, the current online social networks are isolated which has brought many types of challenges. Some of these challenges include having information silos and lack of privacy control to personal information [4]. In order to address these issues, the use of the traditionally centralised social network by most web community has now shifted towards a decentralised structure. This gives more authority to the users to control the privacy and the dissemination of their personal information without having to go through information silos.

To have a decentralized Social Network, web technology tools developed by Semantic are used. The retrieval of information regarding Social Networks using Semantic Web has been already studied along with the impact it has on organisation. A real world decentralised organisation was selected in 2009 and the social analysis was performed for both semantic and non-semantic types. The results has shown and proved that the combination of social network analysis and Semantic web technologies provides a seamless transition with some improvement in both functionality and performance. This is approved by increasing the manageability and controllability of the decentralisation structure [1]. After explaining all existing and possible limitations of Social Network, this paper will then review all proposed solutions and demonstrate how these solutions can overcome the limitations. Afterwards, the Semantic Web technologies are presented and reviewed based on the impact it has on Social Networks. The benefits of using Semantic Web Tools to improve the performance and process of decentralisation will be shown. Finally, any limitations in the authentication and

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authorisation found in the framework proposed will be highlighted and possible solutions for it will be reviewed.

2. Social Network Concepts

The Socialisation process is one of many ways to obtain new knowledge. This process involves the transfer of information from one individual to another and the information expansion of organisations. As such, the adoption and acceptance of emerging social networking sites such as YouTube and Facebook, has provided the opportunity for the management of information and knowledge [5].

Social Network comprises of a social structure between different nodes or actors which are individual users or organisations. It also includes ways each node communicates and interlinked with each other. This represents the relationships and the connections of every node from known acquaintances to close family connection. The importance of these connections is wider in the social networking context because as these new nodes are created and populated every day, more profiles and documents are also created. In social network, each cardinal node known as hub is defined by the level and strength of the relationship it has with the number of links that it is connected to [3][6].

These Social Network sites have many benefits to many online users. By using them, online users can communicate with each other as well as share knowledge and information for different purposes on different context. All these benefits provide an avenue for revenue generation, business opportunities, or promoting government programmes and political campaigns [3].

3. Social Network Challenges

Social Network sites have many benefits to many online users. By using them, online users can communicate with each other and share knowledge and information for different purposes on different context. All these benefits provide an avenue for revenue generation, business opportunities, or promoting government programmes and political campaigns [3].

Despite its increasing popularity and the many opportunities it provides to online users, both individuals and organisations, it raises a few questions regarding privacy threats and the use of personal information [4][5]. These issues are highlighted because of the centralized nature of the current Social Network architecture [3][4][7]. Listed below are the explanations for these issues:

3.1. The lack of integration between information silos

With the current structure, user information is scattered over different social networks. A single user might register in various different social networking sites for different purposes and have different relationships. His or her information is stored at the sites own data silos. In order to enjoy the benefits of different social networking sites, users have to register their information on each site. It is not uncommon to have a single user re-registering the same information on different sites due to the centralized struction which fixes their data to one location at a time [4]. The current framework is a very tedious and time-consuming process [4][7] and results in limiting both expansion of users' relationships and knowledge. In addition, it would be difficult to properly identify a user in different social networks sites [3].

3.2. Lack of control for the user their personal data

In the current centralised structure, users do not have the flexibility to share their personal information or how they are disseminate over the many different social networks. They cannot filter what information is being presented or which are being restricted [3]. The users only have the option to allow selected users to view their information. This also depends on the policies and services of the social networking sites they subscribed to. All users' information is completely controlled by the social networking sites. These data can be used for financial gains from advertisements provided by user data and habits given to advertisement agencies. For example, Facebook's Beacon is an advertisement features that distribute user data to other websites for the purpose of advertisement [4]. Moreover, there is no way for the users to be sure their data has been erased if they deactivated their account.

4. Decentralization Framework as Solution

To overcome the above mentioned limitations, one suggested approach is to migrate from centralised framework to a decentralised structure. This means that all the users' information will be hosted in a trusted location (server, local computer, etc). This option gives users full control over their personal information. In general, through decentralised structure, three different aspects of controlling information are considered [4]:

Privacy - Users are able to select what and to whom the data is shown with certain level of restrictions.

Ownership - The information now belongs to the user and is stored inside a trusted machine rather than being control by social network applications.

Dissemination - How information is disseminated is based on the user's own preference and relationship.

Decentralization also gives users benefits from social networking sites without being bounded by user registration. In this process, social network applications are also benefited. They will be able to access larger pool of users and their relationships [4][7]. Besides, this will result in the breaking of different social network boundaries and giving a more sound foundation for social resources [4].

Moreover, the benefits of decentralised social network are also being accepted by organisations as more and more large corporations are shifting towards decentralisation. Organisation that uses the decentralised social network structure tend to adapt changes and problems more efficiently, their decision making process are quicker, and the level of their collaboration are higher [2].

5. Social Web Technologies on Decentralization Social Network

Semantic Web technology was suggested for the migration from centralised to decentralised social network. In Semantic Web, the flow of information is enhanced via machine-processable metadata which data can be shared and reused on different applications, various enterprises and boundaries of community [12]. The semantic web technology uses the reasoning and ontology to aggregate isolated data [13]. The framework of Semantic Web Technologies provides a graph model called RDF and the SPAROL query language. It has the type and definition system (RDFS and WOL) that allows the representation and exchanging of data across the web. In this transmission, the Semantic Web tools such as OpenID and web ontology (RDF and FOAF) are used [3][13]. Currently, there are social network sites that represent their information in semantic web ontology such as FOAF format [13].

In this matter, a study was done to approve that distributed data across the different social sites can be merged to create a decentralized social network model by using the semantic ontology and applying semantic web reasoning techniques. As ontology represents data in standard format, semantic web reasoning techniques can be applied to link and discover the connection between data [13]. However, in online Social Network sites, this process would be deeper and more complex. Currently, social network sites are based on web protocols e.g. HTTP, HTML, CSS and JavaScript and their data which is exposed on the web is not in RDF foramt [4].

The useful of Semantic Web ontologies are further explained in order to fully understand how the Semantic Web works on social networks.

5.1. Friend-of-a-Friend (FOAF)
The FOAF is one of the web semantic technologies and was the first project used to properly define the decentralised social network for connecting social web sites, representational networks and information networks [8][9][10]. It is used to describe people, groups, companies and their relationship, information and activities across different social sites or even applications and software systems. In order to integrate this isolated data, FOAF provides data descriptions in the way that machines are able to process and read. FOAF provides some basic terms as vocabulary which are written in computer language RDF/OWL and in XML syntax (or any other RDF Synatx). This vocabulary contains classes and properties which are known as Core. The classes available in FOAF are *foaf:Agent, foaf:Group, foaf:Organization, foaf:Person, foaf:Document, foaf:Image, foaf:OnlineAccount, foaf:PersonalProfileDocument, foaf:project, foaf:LabelProperty, foaf:OnlineChatAccount, foaf:OnlineEcommerceAccount, foaf:OnlineGaminAccount* [8].

Currently, many of the data obtained in FOAF is extracted from large social networking sites [8]. Despite its many usefulness, not all functionalities of social networking are available in FOAF. The FOAF project itself also suggested the use of other ontology and technologies along with it for the decentralised social networking. However, using the FOAF approach is a good idea for social network processes because it can be easily extended and is able to use URIs and web-scale linking in a decentralisation manner [3].

5.2. Semantically interlinked online communities (SIOC)

Another prominent Semantic Web framework is SIOC. It is used to present rich data in the Social Networks on the Semantic Web by providing required concepts and properties in RDF format. It is widely utilized in various commercial and open-source software applications. SIOC is aimed to provide the richer metadata description and to prevent redundancies by reusing the existing vocabularies which leads to better data interoperability [8][11][15]. In social network, in order to describe personal profile and social information, SIOC is commonly combined with FOAF. For example *sioc:User* is a subclass of the foaf: *OnlineAccount* so through the *foaf:OnlineAccount, sico:User* can be link to a *foaf:Person* or in the reverse direction *sioc:AcountOf* can be used. This link means that properties of real person behind this user can be referred further.

6. Security in a Semantic Decentralized Structure

In decentralized Social Network, FOAF profile is stored in a public location and any application would be able to access to data for any purposes. On one hand, users to access their data in a decentralised social network, they need to be authenticated throughout different servers and login to different social network services by using the same digital identification [4]. In FOAF framework, each user is provided with a unique identity and URI to access their profile. However, this method of authentication is not really secure [8]. All these issues have led experts to find a more secure technique of authentication. In a centralised social network, username and passwords is used as a method of authentication. These information is encrypted and stored in a data repository belong to the social networking sites. A different method is used in a decentralised social network where FOAF combined with OpenID (decentralised authentication standard) along with available protocols such as URLs, SSL and HTTPS are required for authentication [4].

Secure authentication can be obtained via a number of different protocols such as OpenID, WebID, AOuth, Infocard, XAuth, etc [8]. The best solution so far is the WebID which is thought to be utilised for use in the decentralised social network. It allows access to different types of data for different groups of users [16] [17]. WebID is a user identifier which uses the URI method of uniquely identifying a user. It is also linkable and can relate people to each other [18]. One of the technical protocols in WebID is the FOAF+SSL protocol which enables WebID by linking an SSL client to a WebID profile for the purpose of third party authentication and authorization. foaf+SSL which is part of Semantic Web tools, can be used to provide decentralised digital identity to the users. It requires the use of ontology to define who have access and what data can be accessd [17][18].

foaf+ssl uses x.509 certificate to tie the user identified via URI to the User Agent (browser). Trust management is also available in foaf+ssl where a locally trusted key is used in conjunction with the signing of the FOAF files. It also bridged the traditional PKIs. Existing SSL certificate exchange mechanism which is used results in smoother integration of foaf+ssl in all web browsers currently available (including mobile devices) and permits interactive as well as automated sessions. Programming language such as Java and Python has been used to test the foaf+ssl on different browsers e.g. Firefox, Safari, etc [16].

At the moment, the FOAF information is accessible through Linked Data over HTTP or via RDF and an identity provider before access is used for authentication [8].

7. Summaries

This paper has explained the concept of social network and highlighted the benefits as well as the challenges it faces. The challenge of information silos and lack of access control can be solved by migrating from centralised social network to a decentralised structure. In order to ease the transition, Semantic Web technologies can be used. It also improves the management of decentralised social networks by presenting

information in a structured, machine process-able format. The ideal framework would be using FOAF as the web semantic technology with other technologies along with other Semantic Web technologies. Unfortunately, a strong authentication method is still lacking in the proposed platform because user needs to log into several servers while data is stored in public locations. The best method conceived would be using the foaf+ssl protocol. In order to provide a secure authentication, the user is given a WebID by linking SSL client to WebID profile at third parties.

8. Acknowledgements

9. References

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