



Comprehensive Survey on Social Cloud Computing

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Abstract—There has been a rapid magnification in cloud computing and social networking technologies in recent times. In Cloud computing technology, the resources are shifted to a third party, eliminating the necessity to purchase, configure and preserve them. Due to the low operational cost inducement in software, hardware and human effort, many companies are being attracted by the consumption of cloud services. There are uncountable numbers of Internet users heavily participating across various social networking websites, social networks have visually observable huge growth. Even corporations have started utilizing friendly networks which are useful to marketplace and reach their consumers. A Social Cloud is a metaphor of synergetic resource sharing structure on the online Social network. The consumption of computational resources on the substratum of 'give-and-take' policy for respective benefit is the main theme of Social Cloud. The online relationships in social networking are predicated on real world relationships. A trust is developed by these online relationships. The social relationships are utilized to compose a dynamic Social Cloud and also to enable users to allocate heterogeneous resources within the context of a social network. As users may have desired structures regarding with whom they do or do not wish to allocate their resources, The study on how resources can be well allocated within a social community, which offers resources on a best effort substratum is done. In this paper, we place a survey on Social cloud computing, its Basic concepts, different existing approaches as well as challenges.

Keywords— Social cloud computing, social networks, Cloud computing, online social networks, Resource allocation, Storage, Security, Performance

I. INTRODUCTION

A set of actors and a set of ties in a social network stand for relationship among the actors. Actors may be people, organization or other social entities; they are associated with a set of relationships, such as friendship, financial exchanges, information exchange [17]. LinkedIn, Facebook, Google+ are some examples of Social networking site. The social cloud computing allows the users to create their personal profile and coherent a list of other users with whom they want to share. Users can share their photos, ideas, videos, with their friends through their personal computers or laptops. Social Cloud also aims to provide a mechanism for resource sharing. Friends can use the unused storage space offered by the Social Cloud members. Consider an example, a needful member of Social Cloud offers a storage-as-a-service as like commercial data centre by a member of Social Cloud [1].

In social cloud, group members decide the membership policies for new group members. It is also possible that multiple Social clouds can exist in a social network. And one member can also be a group member of another cloud. But there are certain policies where the group members should follow, and this is true for all the group members those who have a membership of two or more social clouds.

It is believed that there is lots of resource sharing mechanisms provided by combining trust relationships with suitable mechanisms. It is necessary that the structure of a Social Network be a dynamic virtual organization with trust relationships linking friends. This trust is the base for resource sharing in a Social Cloud. The capacity of restricted storage devices like phones and desktops are enhanced by the storage clouds, and they provide transparent access to data from any place [10].

Online social networks (OSN) such as LinkedIn, Google+, Twitter, Facebook and have enjoyed much development in these recent years. Consider an example of twitter, it acts as a social medium and information can spread quickly all over the world [13]. The OSN not only offers the relationship among the human, it also provides the well-organized platform of sharing the information between one another in a small period of time. By utilizing the mobile devices, OSN is capable of collecting more private data, for example, medical data from on-body medical sensors. As we utilize the social networking, the more we need them to be secure [9].

Being part of a social network not only allows interacting and connecting with similar kind of people, but it also comes with the security hazards especially with online users. Virtually anyone can forge an untruthful identity on a social network and pose as someone else. One could be a friend without absolute authorization of someone's identity or a complete unknown. In addition, to retrieve the password and gain access to unauthorized information to sell online, hackers generate programs. There is a chance of someone plagiarising the private information or photos without the proper privacy controls and settings to make it public. There are many large number of past cases in which an intruder has gained access to profile information and made the content public through mass emails. The risk of malicious viruses and spam also exist on social networking sites and can pose a threat to the computer.

Security is of great consequentiality in cloud computing and social networking, when compared to most other technologies; Cloud computing security refers to the technology that is utilized to protect the data and applications of the cloud from threats such as disruption of accommodations, modification, and unauthorized access. In cloud security, the common goals or objectives of information security are: integrity, availability and confidentiality. Along With social networks, attention should be given to the sharing of data between genuine users [4].

A. Social cloud computing applications

The applications of the social cloud computing is as follows:

- Facebook: Facebook is a social networking website which provides user to create his personal profile page where they can post messages, photos. These resources can be shared with other users with whom they are already friends with [18].
- Twitter: Twitter is a social networking service which helps the users to create their personal page where they can post messages that are no longer than 140 characters called “tweets”. The twitter helps the users are able to communicate with each other through adding a username prefixed with the “@” symbol.
- LinkedIn: LinkedIn is a social network geared towards professional networking. Users are provided with a profile where they can maintain a list of connections with other users on the service [19].
- YouTube: YouTube is a video sharing website where users can upload, see the video, share and place a comment on videos. Users are provided with a profile page that lists their videos and messages.
- Flickr: Flickr is an image and video hosting website that allows users to share and comment on photos.
- EHarmony: eHarmony is an online dating website that is aimed at matching couples thorough their common interests. EHarmony has a participation of over 30 million members.

II. EXISTING APPROACHES OF ONLINE SOCIAL NETWORKS

In this section, we take a look on the recent status of the social cloud computing. In the recent literature survey, a number of approaches have been offered which includes design, implementation of a social cloud computing. In this paper we survey the work with orientation to the several views of a social cloud, applications which are used in the different domains, resource sharing mechanisms,

A. SOAP (Simple Object Access Protocol)

This protocol specifies the way for a program running in one kind of operating system to interact with the program running on another kind of the operating system; SOAP uses World Wide Web’s Hypertext Transfer Protocol (HTTP) and its Extensible Markup Language (XML) where both HTTP AND XML are used for exchanging the information. It involves in encoding an HTTP Header and XML file, where the program which is already running on the one computer can call the program which is running in another computer, where both of these protocols involve an information exchange. The disadvantages include:

- SOAP can be considerably slower than tricky middleware technologies such as Internet communication engine (ICE) or common object request broker Architecture (CORBA) because of the XML format. When minute messages are sent this is not an issue.
- When relying on HTTP as a transport protocol and not using Web Services-Addressing or an Enterprise device bus (ESB), the roles of the communicating parties are set. Only one party (client) can use the services of the other client. System Developers must use polling instead of notification in such familiar cases.

B. PERSONAL CLOUD

Mobile devices with their well set of sensors provide rich user experience, which are controlled by the limited battery lives, restricted from the factors, and by the scope of the data accessible locally. The personal cloud distributed software addresses these issues by enhancing the capabilities of mobile devices via both nearby and remote cloud resources. By leveraging and interacting with such potentially cooperative resources, mobile device capabilities can be improved and device users can gain enhanced interactions with their current environments.

Personal cloud presents an abstraction which, along with the runtime and its implementation with Xen hypervisor, where it helps in coupling their mobile device with the network attached resources. Personal cloud can service end users even when remote cloud resources are not present or difficult to access due to the insufficient network connectivity or due to expensive 3G/4G connections. This is because a personal cloud can also run on available and free of charge user owned machines in the home or other operating machines.

Personal Clouds can also augment device capabilities through the use of nearby devices. The outcome is not only improved storage and computational capacities, but also the creation of entirely new functionalities not available from remote services, such as the ability to present on large displays, the potential to share content not resident in remote clouds, and others. Personal clouds can ease their limitations, including lack of performance, but more concentration on service sharing is required.

C. Online Social Networks (OSN)

The online social network mainly concentrated on the user privacy and the data availability. Suppose the user wants to get in contact with a friend who is in a different OSN, he has to register in each network separately. Although the terms

of service agreement between the user and the OSN provider set a legal limitations for their usage of personal data, from the user point of view privacy need to be enforced by some technical measures. As the number of users increased the number of OSN providers also increased. In this OSN approach the user information is Encrypted and Decrypted by using special Security algorithms, aliasing approach, and certain replication themes.

Users may become their own data storage provider or choose the commercial one to rent the storage capacity. Storage servers can exchange the data via network protocol. All the data objects exchanged between the users are secured by the Cryptographic Operations. Here the servers are not interrupted instead the servers just forward that content. User generated content cannot be read or forged by service provider at all, which meets a privacy requirement.

Some features used in OSN are

- Circle: Consider the example of Google+, each circle has a group of Friends. If a data object is encrypted, a member in the circle only he can decrypt the data.
- Chats: Besides sharing the content in the circle, there is also possibility to exchange the message only with the Friend. This is implemented in chats.

In case of server downtimes, many replication schemes are used to increase the availability of the data object. The OSN uses cache. This means that there can be Several Copies of Data Objects [7].

Some drawbacks of OSN are:

- The complexity and openness of federated systems in general make some problems harder to address. For instance, access control policies have to be supported across different systems.
- Spam is another serious threat to federated systems; as such systems would have to trust each other to filter outgoing spam. Blocking incoming spam would also be far less efficient.
- Access control lists in social networks are those that can be used in two different ways: 1) to limit the audience of user's post (selective broadcast) and 2) to protect user's privacy (control reading access on the Wall). Note that, in the latter case, the effect is quite limited because shared data are hard to control in practice.

D. Social Content Delivery Network (SCDN)

Data volumes are increased so significantly that we should need to carefully consider how we interact with, allocate, and analyse the data in order to avoid the bottlenecks, which results in the many challenges in ensuring that the data is in the right place at right time, also accessible by right consumer. These requirements create the challenges for the allotment, analysis, storage, replication of potentially large data sets.

Socially driven approach to address some of these challenges by defining the social data cloud and content delivery network, the data must be distributed to support high performance, reliable, and trustworthy access. In this SCDN, the members of the scientific community contribute storage resources to act as nodes, within a content delivery network for caching temporary as well as persistent storage. Each user is allocated a portion of the hard disk or storage of the server that are used both as an interface to the content delivery system itself.

The typical usage of a content delivery network (CDN) is to replicate data across many geographically distributed web servers. The main purpose of this SCDN is to help websites meet the demand of the peak usage by improving scalability, performance and availability. When the end users request content from a central server, the server redirects access to the specific CDN nodes that serve web content to end users.

In the SCDN model, we use a CDN as a means of replicating scientific data at appropriate edge nodes. So that data storage is scalable and highly available and geographically distributed. This provides improved access to research data, making it faster to download, process, and share. SCDN provides the trust overlay that ensures that data stays within the bounds of a particular project and nodes accessible by a particular member. There are many commercial CDNs available such as Akamai, Limelight, and Amazon cloud front. Profitable CDN providers have thousands of dedicated resources geographically distributed to provide high performance global access to data [8].

The main disadvantages of using a content delivery network are: content delivery networks cost extra money. It adds complexity to the website and deployment procedures. Clients may have network filters that obstruct some content delivery networks and avoid the content from being loaded.

E. P2P Approach

In order to reduce the challenges such as load and server maintenance cost, practical approach called P2P approach was introduced. Social networking sites are web based platforms which help the user to create their personal profile, helps to post the pictures, posts, videos, search for friends and helps to communicate with friends through messages. In this peer to peer approach we split the functionality into individual modules like photo management, friends management.etc.

After describing the socialized Network platforms, we now concentrate on the Security Requirements such as:

F. Registration and login-

Each user creates his username and password. The public key is used as a UserId and NodeId in a Network. The communication is encrypted with the public key of a Receiver. The encrypted data and the encrypted keys are stored as a package in peer to peer network. Any node can accept and replicate the data, but only privileged user can decrypt it. The Network focused more upon User registration and login process, where communication is confidential, legal and integrated.

G. Access control-

In the access control, all the documents stored in this Network Server should be able to mark a privileged user, which are authorized to read the Documents. To manage a group with thousands of users, a group based access control is needed and the storable data are called Shared Items. A user can read a Shared Item, Create or alter an existing one in each case the user should have access rights to do so. To the shared item, data structure is added which holds the copies of encryption key of a shared item and encrypted with the public keys of the user who are allowed to access Item. These encrypted items can be replicated or can be cached. In case of groups, access to the document can be granted for all the group members, this allows just one symmetric key for all accessible data created by group founder at the time he establishes the group. At starting the founder creates the key list of his group where he can store the symmetric key encrypted with the public key of that group member. For every new member who joins the group, the administrator adds the copy of the symmetric key, encrypted with the public key [11]. A few examples of P2P approaches are Safebook [14], Life social [15], cachet [16], My3 [20].

III. TABULAR COMPARISON

By considering all these above approaches, we can make a comparison among different existing systems as follows:

Table I.Approaches of social cloud networking

<i>APPROACH</i>	<i>FLEXIBILITY</i>	<i>OPERATOR PROTECTION</i>	<i>USER ANONYMITY</i>	<i>INDEPENDENT FROM PROVIDER EXISTENCE</i>
<i>SOAP</i>	<i>No</i>	<i>No</i>	<i>N/A</i>	<i>No</i>
<i>Personal Cloud</i>	<i>Some</i>	<i>No</i>	<i>No</i>	<i>No</i>
<i>Federated online social network</i>	<i>Some</i>	<i>Yes</i>	<i>Some</i>	<i>Yes</i>
<i>SCDN</i>	<i>Yes</i>	<i>No</i>	<i>No</i>	<i>No</i>
<i>P2P OSN</i>	<i>Yes</i>	<i>Yes</i>	<i>N/A</i>	<i>No</i>

IV. THE RESEARCH CHALLENGES

Although several views and approaches to the social cloud are known, but there are few major issues yet to be addressed such as group formation, service availability, and design market model.

A. Group Formation:

Present Literature in social cloud emphasis on trust of Group formation. In particular some members come together on the basis of trust to form a social cloud, but this is not a single factor where the group members can be formed and the members can share the resources. Rather, what kind of resources that different group members can contribute within a group plays a very important role. In addition to this group sustainability defines the utility of each member in a social cloud.

B. Service Availability:

There are various services offered by the cloud service providers [12]. Cloud computing offers X-as a service (XaaS) where X is a platform or software to consumers and an on demand access to these services regardless of time and location. Many numbers of services are increasing day by day. In a social cloud market, availability of any service depends on the size of a group.

If a group contains low membership or a population, the rate of sharing the services or resource is limited. A social cloud consumer has a very limited search space for required services, by which many service requests from the consumer cannot be fulfilled effectively. How to make the user’s specific service available for 24×7 hours is a critical issue in social cloud.

C. Design Market Model:

In social cloud users share their resources with each others in the group, in belief that they are allowed to utilize resource owned by the others in return. So that set of computational economic or non economic market models are needed to control the sharing and allocation of resources within the social cloud.

Although several views and approaches to the social cloud are known, but there are few major issues yet to be addressed such as group formation, service availability, and design market model.

V. CONCLUSIONS

In this paper social cloud has been defined with examples, applications and advantages. Related work regarding social cloud has been described briefly. We have also reviewed the various existing social cloud approaches. The rapid growth of these social networks has given rise to marketing and customer relationship opportunities for businesses, and analytics of large data sets. Security of the data and the allocation of their resources to access the data are also focused upon and the tabular comparison of existing approaches is made.

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