Survey of Social Compute Cloud & Social Networks

Priyanka Shivaji Gawali[1] Prof. Arti Mohanpurkar[2]
[1]P. G. Student [2]Assistant Professor
[1,2]D Y Patil School of Engineering & Technology, Pune

Abstract— Social networks are very popular for sharing photos, videos, or messages. In the future, they will not only be used for the exchange of data, but also of services. Social network platforms have rapidly changed the way that people communicate and interact. They have enabled the establishment of, and participation in, digital communities as well as the representation, documentation and exploration of social relationships. We believe that as 'apps' become more sophisticated, it will become easier for users to share their own services, resources and data via social networks. However, as users may have complex preference structures concerning with whom they do or do not wish to share their resources, we investigate, via simulation, how resources can be effectively allocated within a social community offering resources on a best effort basis. In the assessment of social resource allocation, we consider welfare, allocation fairness, and algorithmic runtime. The key findings of this work illustrate how social networks can be leveraged in the construction of cloud computing infrastructures and how resources can be allocated in the presence of user sharing preferences.

Key words: Social Cloud Computing, Social Networks, Cloud Computing, Resource

I. INTRODUCTION

CLOUD computing has garnered praise for many reasons, most notably due to its ability to reduce overheads and costs for consumers by leveraging economies of scale to provide infrastructure, platforms and software as services. Infrastructure providers such as Amazon Elastic Compute Cloud (EC2) rid users of the burdens associated with purchasing and maintaining computer equipment; instead compute resources can be out-sourced to specialists and consumers can obtain access to an "unlimited" supply of resources. Despite its benefits, many businesses and end users are put off by an array of (perceived) uncertainties, as identified in numerous studies (e.g. [1], [2]). Two key issues are the notions of trust and accountability between resource consumers and providers [3]. In this context, trust and accountability encapsulate several different aspects such as security, privacy, ethical practices, transparency, protection of rights, and issues concerning compensation. Addressing these concerns is a significant undertaking, and consequentially, many international research programs have emerged, covering issues such as provider certification and service level agreements.

A Social Cloud is "a resource and service sharing framework utilizing relationships established between members of a social network." [5]. It is a dynamic environment through which (new) Cloud-like provisioning scenarios can be established based upon the implicit levels of trust that transcend the inter-personal relationships digitally encoded within a social network. Leveraging social network platforms as mediators for the acquisition of a Cloud infrastructure can be motivated through their widespread adoption, their size, and the extent to which they are used in modern society. For example, Facebook surpassed 1 billion users in 2012,1 and has illustrated that Milgram's 6 degrees of freedom in social networks [6] may in fact be as low as 4 [7]. Users also spend inexorable amounts of time "on" social network platforms – a recent study indicated up to 1 in every 7 minutes of time spent online by all Internet users worldwide [8].

II. OVERVIEW OF SOCIAL COMPUTE CLOUD

A Social Compute Cloud is designed to enable access to elastic compute capabilities provided through a cloud fabric constructed over resources contributed by socially connected peers. A Social Cloud is a form of Community Cloud (as defined in NIST's definition of Cloud Computing [13]), as the resources are owned, provided and consumed by members of a social community. Through this cloud infrastructure consumers are able to execute programs on virtualized resources that expose (secure) access to contributed resources, i.e. CPU time, memory and disk/storage. In this model, providers host sandboxed lightweight virtual machines on which consumers can execute applications, potentially in parallel, on their computing resources. While the concept of a Social Compute Cloud can be applied to any type of virtualization environment in this paper we focus on lightweight programming (application level) virtualization as this considerably reduces overhead and the burden on providers; in [14] we explored the use of a more heavyweight virtualization environment based on Xen, however the time to create and contextualize VMs was shown to be considerable.

With the increasing pervasiveness of social network platforms, adoption of social network structures for different types of collaboration is becoming more common. Key examples are: community and scientific portals like PolarGRID and ASPEN ; social science gateways[1] ; social storage systems like Friendstore , and omemo.com; network and compute infrastructure sharing web sites such as fon.com; models to share insurance policies amongst social peers (friend-surance.de); and where social networks emerge due via collaboration. Ali et al.[2] present the application of Social Cloud model to enable users in developing countries to share access to virtual machines through platforms like Amazon EC2. In effect they subdivide existing allocations to amortize instance cost over a wider group of users. Using a cloud bartering model (similar to our previous virtual credit model), the system enables resource sharing using social networks without the exchange of money and relying on a notion of trust to avoid free riding. Like writer approach, they use a virtual container (LXC) to provide virtualization within the existing virtual machine instance; however writer approach using Seattle"s programming level

virtualization provides a much more lightweight model at the expense of flexibility.

III. RELARED WORK

Here, we argue an alternative approach to establish trust and accountability in Volunteer computing and Cloud platforms: a Online Social Cloud. It is a dynamic environment through which (new) Cloud-like provisioning scenarios can be established based upon the implicit levels of trust that transcend the inter-personal relationships digitally encoded within a social network. Vision of the OSC is motivated by the need of individuals or groups to access resources they are not in possession of, but that could be made available by connected peers which show users are willing to donate personal compute resources to "good" causes. Using this approach, users can download and install a middleware connect their personal social network, and provide resources to, or consume resources from, their friends through a Online Social Network (OSN). We anticipate that resources in a Social Cloud will be shared because they are underutilized, idle, or made available altruistically.

An Online Social Cloud is "a resource and service sharing model utilizing pre-established trust between members of a social network."[10]. The expanding depth of social networks has prompted a world in which numerous relationships and cooperation"s are also represented on the web. These social digital relationships have created new opportunities to define socially oriented computing paradigms such example is the 1) Social Cloud computing model. 2) A collaborative resource allocation model built upon a social network. An Online Social Compute Cloud is intended to empower access to flexible figure abilities gave through a cloud fabric built over resources provided by socially connected users. An OSC is provided virtualized resources that expose (secure) access to contributed resources, i.e. CPU time, memory and disk/storage of user through this they are able to execute programs. Vision of the Online Social Cloud is motivated by the need of individuals or groups to access resources they are not in possession of, but that could be made available by connected peers. OSC present a infrastructure resource allocation using social connection of user. Using this approach, users can download and install a middleware, leverage their personal social network via a Social application, and provide resources to, or consume resources from, their friends. We anticipate that resources in a OSC will be shared because they are underutilized, idle, or made available altruistically. However a key aspect of a Social Cloud is the notion of sharing, not selling, resources. Specifically, due to the social network basis of a Social Cloud, users will have explicit preferences with whom their resources are allocated to, and from whom they consume resources.

IV. SOCIAL CLOUD: SOCIAL NETWORK AND CLOUD COMPUTING

Social networks have become an excellent platform for sharing and communication that reflects real world relationships. Social networking plays a major part in the everyday lives of many people. Facebook is one social networking site that has more than 400 million active users. The possibility of social media and cloud integration is compelling. Social networks are being more than an online gathering of friends. It's becoming a destination for ideation, e-commerce and marketing. For instance, there are some organizations and integrated applications that make use of Facebook credentials for authentication rather than requiring their own credentials (for example the Calgary Airport authority in Canada uses Facebook Connect2 to grant access to their WiFi network). There is a certain report which aims to create a Social Storage Cloud that looks at probable mechanisms to be used in creating a dynamic cloud infrastructure in a Social network environment. It is believed that combining the pre-established trust with suitable incentive mechanisms can be a way to generate sustainable resource sharing mechanisms.

Social network is a dynamic virtual organization with inherent trust relationships between friends. This dynamic virtual organization can be created since these social networks reflect real world relationships. It allows users to interact, form connections and share information with one another. This trust can be used as a foundation for information, hardware and services sharing in a Social Cloud. Typically, cloud environments provide low level abstractions of computation and storage. Computation and Storage Clouds act as building blocks where high level service Clouds and mash-ups can be created. Storage Clouds are often used to prolong the capabilities of storage-limited devices and provide transparent access to data from anywhere. A large number of commercial Cloud providers like Microsoft Azure, Amazon EC2/S3, Google App Engine, and smaller scale open Clouds like Nimbus and Eucalyptus provide access to scalable virtualized resources. Through pre-dominantly posted price mechanisms, these computation, storage, applications resources can be accessed.

Thus, a Social Cloud is a scalable computing model wherein virtualized resources contributed by users are dynamically provisioned amongst a group of friends. Users may choose to share these resources freely and make use of a reciprocal credit-based model; This compensation free model is similar to the Volunteer computing approach, where guarantees are offered through customized SLAs. However, accountability through existing friend relationships exists in this model.

The Social Compute Cloud facilitates preference-based sharing of computational infrastructure using several different preference matching algorithms. Our prototype implementation leverages the Seattle virtualization middleware to enable execution of user applications on remote resources and our deployed clearing house enables users to define preferences and provides several matching algorithms to obtain a short term resource lease. Our results show the qualities of the algorithms and the trade offs that arise from factors like runtime, allocation mode, and allocation quality.

V. CONCLUSION

In this paper, we have presented a Social Compute Cloud: a platform that enables the sharing of infrastructure resources between friends via digitally encoded social relationships. In online social cloud users can discover and trade services contributed by their friends, taking advantage of preexisting trust and relationships between them. Using this approach,

users are able to execute programs on virtualized resources provided by their friends. This methodology used by users to communicate with each other and interact with the resources of their friends. Using our DESIGN, users are able to execute programs on virtualized resources provided by their friends.

As future work, we will include additional ways for users to provide their preferences, as well as methods to detect them automatically from their social network. Where examples of the latter include: clustering based on homophily (aspects of similarity), relationship lists and Granovetter-like [51] indicators for relationship strength. This would also enable further, and potentially more realistic settings for experimenting with the allocation algorithms. In terms of the Social Cloud platform we will further extend the sandbox to provide additional system calls and social access control so that users can give extended/restricted access rights to groups, for example enabling command line access for family members. These extensions would increase the number of possible applications that could be executed within the Social Cloud and also further extend the social integration of the system. Finally, we aim to investigate how users use and interact with the resources of their friends, and move our implementation towards a production ready system.

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