

Next Generation Virtual Communities

Caspar Ryan and Jim McGovern

RMIT University, School of CS & IT
PO Box 71, Bundoora VIC, Australia, 3083
{caspar,jim}@cs.rmit.edu.au

Abstract—This paper is concerned with the increasing opportunities for the formation and application of virtual communities in a Next Generation Internet environment. This paper reviews existing literature, and introduces a multidisciplinary research project that aims to provide support infrastructure and proof of concept for Next Generation Virtual Communities.

Index Terms—Next Generation Internet, Virtual Community

I. RATIONALE

The spread of the Internet, and the introduction of new networking technologies in the push for pervasive computing, is rapidly changing the way we understand the idea of community. Amidst the uncertainty accompanying such rapid technological change, comes the possibility of new ways of forming *virtual*¹ or online communities that spread beyond the geographical relationship that has often defined community boundaries in the past.

The potential usefulness of such virtual communities is vast. Applications range from supporting pre-existing communities such as educational environments; business related workgroups; family and friends; and formalised community-based organisations, through to the formation of ad-hoc recreational or special interest communities in a partyline style of social interaction. Given such diversity, users would be able to assume different roles and participate in many different communities, each satisfying a particular set of needs or goals.

Furthermore, the potential benefits to the wider community of mobile aware Next Generation Virtual Communities are extensive. Examples of future community-oriented applications include the co-ordination of workers and inter-worker communication in volunteer based emergency services such as the State Emergency Services (SES) [1] or County Fire Authority (CFA) [2]. Support groups such as SeniorLink [3] and Meals on Wheels [4] could use virtual communities as a means of extending their reach and facilitating community

interaction between clients in addition to the traditional carer based relationship. The commercial implications for businesses are also substantial since existing corporate environments currently often rely on disparate solutions such as groupware, videoconferencing and internal publications to meet their communication needs across geographical separation in an increasingly global market. In addition, communications carriers such as Telstra [5] and Vodafone [6] are looking for ‘killer applications’ to provide return on investment (ROI) on the costly 2.5 and 3G infrastructure they have deployed or are in the process of deploying, with Virtual Communities looking set to adopt this role.

Given this powerful rationale, the authors have identified three core issues related to the successful deployment of future virtual communities.

1. Hardware and device compatibility and interoperability in a heterogeneous next generation environment [7].
2. Software infrastructure and middleware [8].
3. Social issues related to safety and productivity within the community.

First, the challenge of hardware interoperability exists because the range of devices with which community users could interact is constantly growing, as the latest generation of mobile phones and personal digital assistants (PDAs) provide greater ability to send text, voice, images and video in real time. Additionally, virtual community members expect to rapidly switch from one device to another. Such a scenario could see a user interacting with the community via a personal computer (PC), and then removing their PDA from the PC cradle and continuing the session uninterrupted on the portable device, with no loss of session context.

Second, in order to provide standardisation and a level of abstraction between users and devices, vendors and software developers are moving towards middleware or software framework based solutions in which developers target a single software environment, which is then ported to many different devices [9]. This can potentially enable interoperability without the development costs associated with directly targeting multiple specific implementations. Therefore, an effective virtual community solution should leverage existing

¹ The term virtual communities was coined by Rheingold who described them as ‘social aggregations that emerge from the Net when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace.’

framework or middleware technologies as much as possible, and should expose its own domain specific infrastructure as reusable services that can be exploited by the application clients that sit above it.

The third, and perhaps the most difficult, obstacle to the successful deployment and widespread adoption of virtual communities is not only a technological challenge, but a social one. Although virtual communities offer the promise of more efficient workplace communication and more rewarding and diverse recreational activity, their potential anonymity and lack of formalised structure readily facilitates less desirable forms of social and community interaction [10]. This can range from simple pranking and nuisance attacks [11, 12], through to malicious behaviour such as harassment and other criminal activity [12].

Given the nature of the three aforementioned challenges, any successful virtual community research must be a multidisciplinary effort that addresses both the technological and social aspects that have been identified. Consequently, this paper identifies infrastructural requirements for next generation virtual communities and presents a multidisciplinary research project aiming to develop a middleware-based framework for such a purpose (section III). Such a framework would support the implementation of dynamically reconfigurable client/server based virtual community applications running in a heterogenous device and networking space.

II. LITERATURE REVIEW

A. Virtual Community Defined

The literature points to a change in our notion of community as geographical constraints become less relevant and communities emerge based on mutual interests and benefit [12-14]. At the extreme, Berghel [15] predicts that by 2100 cyber-publishing will have displaced all other conventional technologies, including the currently modern notion of digital ink. A more conservative estimation would be that at a minimum, virtual communities are likely to increasingly co-exist with conventional communities.

A contemporary and readily accessible definition of virtual communities sees them described as “groups of people with common interests and practices that communicate regularly and for some duration in an organised way over the internet through a common location or mechanism” [12]. Although there has been some conjecture about the use of the term ‘community’ to describe such a social aggregate [16], Kozinets [17] argues that if taken in its simplest term, namely as ‘a group of people who share social interaction, social ties, and a common “space” (albeit a computer-mediated or virtual ‘cyberspace’ in this case)’, the usage is appropriate.

Although this type of definition is prevalent in the literature

on virtual communities, Stevenson [18], in his political treatment of ‘communities of tomorrow’, argues that viewing community as structured along the dimensions of space and unity ignores the reality of the ‘diverse personal interests, linkages, value sets, intentions and even contentions’ (p.737) that often co-exist.

Blanchard and Markus [19], referring to how participants themselves identify with the community, differentiate *sense of community* (SOC) from *sense of virtual community* (SOVC). Despite finding much commonality, Blanchard and Markus identified a greater need to assert individual identity through other means, given the absence of physical identification in the virtual environment. Note that as the media supporting online collaboration improve (section F), this may become less relevant.

B. Virtual Community Lifecycles

A common view sees the emergence of virtual communities as an incremental one [17, 20, 21]. Kozinets [17], describes a specific scenario where a consumer begins using the Internet to gather information passively about a specific product. As expertise grows, the same user initiates contact with others to broaden her information base, and eventually goes on to participate actively on related discussion forums.

Johnson [20] makes the distinction between virtual communities, which are created by design and provide networking or other collaborative infrastructure, and more dynamic *communities of practice*. Communities of practice are emergent in nature and occur when participants actively collaborate, whilst maintaining individual decision making processes, in order to pursue a common interest or solve a common problem. As such, according to Johnson, a given virtual community can engender many communities of practice that come and go over time. A further distinguishing factor is that communities of practice require a legitimate task oriented reason to foster their emergence and development. Additionally, communities of practice are generally organised along the dimension of expertise, with experts forming the core of the community. Because of this, a master/apprentice relationship is adopted in order to avoid separation and encourage novice learning via participation and collaboration so that they can transition from the novice periphery to the expert core.

Although much has been written about the ability of virtual communities to ‘spontaneously’ evolve out of the Internet, Carver [21] describes a situation in which students were tasked with creating a virtual community as part of their coursework, yet despite much encouragement many of the communities did not flourish. Carver speculated that this could be due in part to the duration of 10-15 weeks, which did not provide enough time for the community to develop or evolve.

C. Motivation and Participation

Andrews [13] and Craig et al. [22] argue that one's perception of an appreciative audience, as well as overt peer recognition and reward, provide a strong motivating factor for community participation thus enabling communities to become self-sustaining. This phenomenon was demonstrated in a case study by Craig et al. [22], where the authors found that simply providing an online collaborative environment without the abovementioned motivators, was not enough to engender or sustain a strong sense of community. As such, users of the system, particularly professionals participating on a voluntary basis, were not highly motivated to contribute in an unstructured setting.

Lack of motivation is not the only factor affecting community participation. Andrews [13] identified a reluctance of community members to interact with people with whom they had not met face to face, as well as general distrust of and concerns about privacy within, the online setting. Furthermore, Andrews [13] refers to *crafted policies* that target explicit user groups, citing the example of a mid-life career change group who expected "free access with no subscription fees, strong privacy and security rules, avid and visible discussion group moderation, and member driven Net etiquette."

Stevenson [18], in his study of current and future communities in Australia, points to pressure from the global economy, which is eroding the social infrastructure to the point where government funded and volunteer based support agencies are struggling to survive. This provides a strong motivation for community participation and highlights the importance of developing the socially oriented virtual communities described in section I. Such domain specific virtual communities can enable support services such as SeniorLink and Meals on Wheels to become more self-reliant as they leverage the input of their stakeholders, beyond a traditional carer based role.

D. User Roles

As was evident in the discussion on communities of practice, users can take on different roles (in that case based on level of expertise) depending upon their needs and goals. In addition to domain specific roles, the literature sometimes refers to stereotypical groups of users, independent of a specific community or application. For example, in their study of MSN, Blanchard and Markus [19], identified three types of members: 1) Peer and self identified *leaders* who were considered to be influential within the community; 2) *Participants*, who took on an active but less influential role in community exchange, and 3) *Lurkers*, who passively viewed dialog exchanges but did not explicitly interact within the community.

Galston [14] point to low entry and exit barriers, particularly in Internet based virtual communities, which give

the perception of autonomy and control, and encourage relationships based on mutual adjustment rather than hierarchical authority and coercion.

E. Knowledge in the Virtual Community

Another area of interest is the derivation, representation and evolution of the community's collective knowledge. Bieber et al. [23], propose the Collaborative Knowledge Evolution Support System (CKESS), and examine hypothetical scenarios where it would serve as "an ever-evolving repository of the community's knowledge, which members would actively use in everyday tasks and regularly update" (p.2840). Such a system sees community participation as central to creating and maintaining the representative Conceptual Knowledge Structures (CKS), with participant voting and scaling being augmented by higher level 'knowledge organisers' in order to foster consensus. Such a notion relates well to the concept of communities of practice, where communities and their emergent knowledge arise out of an express need or goal.

Furthermore, by their very nature, communities have emergent properties of knowledge organisation since they often act like portals that filter and aggregate information of interest to their members [24]. Following on from this, Rothaermel and Sugiyama [24] propose that the success of a virtual community rests on its ability to engender collectively held knowledge.

F. Interaction Modes in the Virtual Community

Despite the rich media abilities that can potentially be delivered over the web, much of the existing study of virtual communities has focused on text based engines such as MOO [25] and online chat [19]. It is important to be aware when developing any new virtual community infrastructure based on rich media such as live video, that the medium can affect the way that participants interact within the community, since such media reduces the anonymity and astigmatism (lack of behaviours or markings identifying one's social status) [21] that characterise text based communities. Additionally, Chuah [26] predicts a trend towards reality instant messaging where a chat session is based upon some external media source such as a performance or sporting event. This form of interactivity could be taken even further, wherein a performer is able to respond to the instant messaging session thereby incorporating a feedback loop to provide an even greater level of interactivity.

G. Commercial Interest

There has been much commercial interest in generating profit from virtual communities, however following the collapse of the 'dot coms', a more rigorous investigation has begun into how this can best be done. Krieger and Müller [27] explore the issues of legitimization and reproduction of the community metaphor that can facilitate the emergence and

lifecycles described in previous sections. They identify four steps necessary for generating profit. These are:

1. Legitimizing community behaviour with an appropriate metaphor so that members are motivated by community rather than individual needs and goals.
2. Designing the community so that it reproduces itself. This is also done with metaphors to re-enforce community behaviour.
3. Creating value by fostering the community, in much the same way as communities of practice [20].
4. Translating value into profit by positioning the community in its competitive environment.

Krieger and Müller cite many companies that have been able to achieve the former three without actually turning the value proposition into profit. However, they distinguish eBay as a best practice case that has managed to foster a sense of community via peer based evaluations, member rating system, cyber cafe and messaging forums, and turn it into a competitive business venture.

Furthermore, with regard to explicit charging models Rothaermel and Sugiyama [24] argue that of the various business models of subscription fees, usage fees, member fees, advertising commission and transaction fees; the latter two represent the most sustainable business model since they have the least impact on the community metaphor. In the same paper, Rothaermel and Sugiyama [24] present a number of propositions related to the commercial viability of a community.

III. REQUIREMENTS FOR NEXT GENERATION VIRTUAL COMMUNITIES

As discussed in the previous sections, Virtual Communities can be used for a wide range of purposes, and thus their broad acceptance requires customisation for specific applications such as academic, groupware or recreational usage. Nevertheless, such diverse application domains share much in common at the technological and software infrastructure level. Therefore, research into the development of Virtual Communities should approach the problem from two perspectives.

1. The creation of a generalised reusable framework that can support the development and customisation of virtual community applications for specific domains.
2. The development of specific domain-based implementations for use within targeted environments such as academia, the workplace or recreation.

Therefore, based on the rationale of section I and the literature review of section II, the specific aims of our research into Next Generation Virtual Communities are to:

- Develop software infrastructure for multimode media

delivery that can handle voice, text and audio both synchronously and asynchronously. Such infrastructure will use mobile object technology to dynamically delegate responsibility from the server to the client, thereby facilitating device heterogeneity, reduced server load, and a more responsive user experience than is possible with existing technologies.

- Develop a more cohesive model for collaboration and communication than is currently available. This will involve leveraging the better aspects of existing online communication technologies such as BBS (bulletin board systems), NNTP news, MUDs (Multi User Dungeons), IRC (Internet Relay Chat) and Net Meeting style video-conferencing communication, whilst adding more sophisticated collaborative multimedia capability and reality aspects [26]. Additionally, asynchronous messaging and logging will be used in cases where an immediate or 'live' response is not possible. This area of our work will leverage existing expertise in the field of Human Computer Interaction (HCI), and the body of knowledge in Computer Supported Collaborative Work (CSCW) [28].
- Evaluate processes for facilitating social structure and cohesion in the community, and provide software support in the framework for enforcing such protocols as well as reporting or responding to violations in acceptable usage. Determining the most suitable community model; be it peer based, hierarchical, or delegated or nominated authority, will be done both analytically (based on existing work and literature) and via empirical usability testing conducted as part of the proposed research.
- Develop a prototypical client and server based virtual community application, which utilises the software infrastructure, communication model and moderation principles outlined above, to specifically target the academic community. The development and testing of this system will involve the formation of number of user profiles addressing both academic staff and student usage and will follow a user centred design process according to the latest work in the Smart Internet Technology Collaborative Research Centre project on user centred design [29]. Such a system would not only provide a test bed and proof of concept of the proposed infrastructure, but a useful tool in its own right. Such a system could be used for meetings or student consultation in situations where face-to-face teaching or communication is not possible, especially in online or offshore applications.

IV. SUMMARY AND CONCLUSION

This paper has addressed issues related to the formation and application of virtual communities in a Next Generation Internet environment. This paper has provided a rationale, and

reviewed existing literature on virtual communities, in order to introduce a multidisciplinary research project that aims to provide support infrastructure and proof of concept for Next Generation Virtual Communities.

REFERENCES

- [1] State of Victoria, "URL: <http://www.ses.vic.gov.au/>," 2003.
- [2] State of Victoria, "URL: <http://www.cfa.vic.gov.au/>," 2003.
- [3] SeniorLink, "URL: <http://www.seniorlink.com.au/>," 2003.
- [4] Australian Meals on Wheels Association Inc., "URL: <http://www.mealsonwheels.org.au/>," 2003.
- [5] Telstra, "Telstra Broadband Fund URL: <http://www.broadbandfund.telstra.com/>," 2003.
- [6] ATCRC, "URL: <http://www.telecommunications.crc.org.au/content/partners.html>," 2003.
- [7] S. Moyer and A. Umar, "The Impact of Network Convergence on Telecommunications Software," *IEEE Communications*, vol. January, pp. 78-84, 2001.
- [8] P. Bellavista, A. Corradi, R. Montanari, and C. Stefanelli, "Dynamic Binding in Mobile Applications: A Middleware Approach," *IEEE Internet Computing*, vol. March/April, 2003.
- [9] Sun Microsystems, "URL: <http://java.sun.com/j2me/>," 2003.
- [10] S. Turkle, "Virtuality and its Discontents: Searching for Community in Cyberspace," *The American Prospect*, vol. 24, 1996.
- [11] "Hackers, Crackers and Phreakers Oh My!," *Computer Fraud & Security*, vol. 1999, pp. 18-19, 1999.
- [12] C. Ridings, D. Gefen, and B. Arinze, "Some antecedents and effects of trust in virtual communities," *The Journal of Strategic Information Systems*, vol. 11, pp. 271-295, 2002.
- [13] D. C. Andrews, "Audience-Specific Online Community Design," *Communications of the ACM*, vol. 45, pp. 64-68, 2002.
- [14] W. A. Galston, "Does the Internet Strengthen Community?," in *Democracy.Com: Governance in a Networked World*, E. C. Kamarck and J. S. Nye, Eds.: Hollis Publishing Company, 1999.
- [15] H. Berghel, "Digital village: A Cyberpublishing Manifesto," *Communications of the ACM*, vol. 44, pp. 17-20, 2001.
- [16] T. Erickson, "Social Interaction on the Net: Virtual Community as Participatory Genre," presented at Proceedings of the Thirtieth Hawaii International Conference on System Sciences, Hawaii, 1997.
- [17] R. V. Kozinets, "E-Tribalized Marketing?: The Strategic Implications of Virtual Communities of Consumption," *European Management Journal*, vol. 17, pp. 252-264, 1999.
- [18] T. Stevenson, "Communities of tomorrow," *Futures*, vol. 34, pp. 735-744, 2002.
- [19] A. L. Blanchard and M. L. Markus, "Sense of Virtual Community - Maintaining the Experience of Belonging," presented at Proceedings of the 35th Hawaii International Conference on System Sciences, Hawaii, 2002.
- [20] C. M. Johnson, "A survey of current research on online communities of practice," *Internet and Higher Education*, vol. 4, pp. 45-60, 2001.
- [21] C. Carver, "Building a Virtual Community for a Tele-Learning Environment," *IEEE Communications Magazine*, vol. 37, pp. 114-118, 1999.
- [22] D. L. Craig and C. Zimring, "Supporting Collaborative Design Groups as Design Communities," *Design Studies*, vol. 20, pp. 187-204, 2000.
- [23] M. Bieber, D. Engelbart, R. Furuta, S. R. Hiltz, J. Noll, J. Preece, E. Stohr, M. Turoff, and B. V. D. Walle, "Virtual Community Knowledge Evolution," presented at Proceedings of the 34th Hawaii International Conference on System Sciences, Hawaii, 2001.
- [24] F. T. Rothaermel and S. Sugiyama, "Virtual internet communities and commercial success: individual and community-level theory grounded in the atypical case of TimeZone.com," *Journal of Management*, vol. 27, pp. 297-312, 2001.
- [25] Q. Jin, "Design of a virtual community based interactive learning environment," *Information Sciences*, vol. 140, pp. 171-191, 2002.
- [26] M. Chuah, "Reality Instant Messaging: Injecting a Dose of Reality into Online Chat," presented at Proceedings of CHI 2003, Ft. Lauderdale, Florida, 2003.
- [27] B. L. Krieger and P. S. Müller, "Making Internet Communities Work: Reflections on an Unusual Business Model," *ACM SIGMIS Database*, vol. 34, pp. 50-59, 2003.
- [28] K. Mills, "Introduction to the Electronic Symposium on Computer-Supported Cooperative Work," *ACM Computing surveys*, vol. 31, pp. 105-115, 1999.
- [29] SITCRC, "URL: <http://www.ucd.smartinternet.com.au/>," 2003.