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EDITOR'S NOTE

Networking the Metaverses



Ioanis Nikolaidis

Dear readers, welcome to the September 2007 issue of *IEEE Network*. Ample speculation surrounds the extent to which Metaverses will have (are having) an impact as the next big thing in networked applications. The origins of the word Metaverse is rooted in science fiction [1], but the term applies collectively to existing immersive virtual worlds ("Meta"-Universes). A less exotic definition is that Metaverses are essentially the extension of web-based interaction from "2-D web" to "3-D web." It is assumed that 3-D interaction is more engaging, and a generation of 3-D game players, and usually familiar with social networking as well, will be naturally adept to immersive environments. Certainly the accelerated pace of new users signing up with services like Second Life or There.com seems to support the view that Metaverses provide an interaction modality which is, at least, entertaining. However, attention is gradually moving to how Metaverses are not just entertaining but possibly useful for everyday work.

The "serious" ways of using Metaverses seem to be the ones where a Metaverse acts as a facilitator for collaborative interaction or as a place of commerce. The topic of networked immersive collaborative environments is certainly not new. One can go back at least a decade when concept systems, such as Dive [2] of the Swedish Institute of Computer Science(SICS), were preparing the ground for immersive application experiences. What has changed is a confluence of improvements in commodity-priced processors, graphics cards, and networking access speeds. The ongoing concern, though, is that Metaverses available today are not as open, in the sense of not being accessible using open protocols and standards, and that large parts of their architecture is proprietary. One can foresee that, at least when optimizing the networking aspect of Metaverses and linking it to existing network services, attention should shift toward exposing more of the logic and architecture of these systems to open interfaces and protocols.

Metaverses are meant to satisfy a clientele that is usually familiar with 3-D rich real-time multi-user game experience, where the visual and auditory experience is at a premium because it defines the degree of immersiveness. This is precisely the reason why, as Metaverses scale, in order to sustain satisfactory user experiences the total bandwidth demands could be quite severe. In addition, the control of avatars (the virtual "embodiment" of a user) is increasingly the subject of scripting languages, user—modifiable, and hence unpredictable in terms of communication side-effects. One can anticipate that we will be revisiting the variations and dilemmas on how to best perform multicast/broadcast with sufficient user dynamics and possibly large numbers of fused multimedia streams. Another complication is deciding how and where to perform the processing of audio and video data in order to capture the points of view of different users in virtual space. This leads to tension over where processing and communication should take place, spanning a wide spectrum of possibilities, including P2P and client-server.

Metaverses are extremely challenging when used as a place of commerce. First, it is as yet unknown whether the Metaverse could be more profitable to merchants than usual 2D Web interaction. A merchant's involvement in creating 3D content specifically for Metaverses has to be seen as a cost that is justified by increased profits. Using 3D environments to project preexisting 2D content might appear "lame" and could possibly even backfire by looking "cheap." True, there is some value added work meant entirely for virtual presences (like clothing and footwear for avatars — which, by the way, frequently fly rather than walk!), but the Metaverse

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We would like to thank all the authors who submitted their articles to this special issue. Highlighting the significance and amount of research activities in this area, we received nearly eight times the number of articles that could be published, a number that was beyond any of our expectations. We are grateful to all the reviewers for their time and input in carefully reviewing all the articles and providing valuable review comments. Many thanks go to *IEEE Network* for giving us the opportunity to serve our community by putting together this special issue. We would like to thank the Editor-in-Chief, Ioanis Nikolaidis, for giving support and guidance during the whole process of this special issue, and the liaison editor, Paolo Giacomazzi, for providing valuable comments in making the final decisions. We would also like to thank the previous Editor-in-Chief, Chatschik Bisdikian, for his support and encouragement during the early stages of this special issue. In addition, we are thankful to Sue Lange, the Digital Production Manager, and all other publication staff for their support and help during the publication process.

It is our hope that the articles included in this special issue present a good snapshot of the latest research advances in broadband access networks and become an important reference for researchers and practitioners in the area. Finally, we hope that the readers of *IEEE Network* will find this special issue timely, informative, and enjoyable.

Biographies

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and symposia. He is currently serving as Symposium Co-Chair for IEEE GLOBE-COM '08 Symposium on Next-Generation Networks, Protocols, and Services. He has also served on the technical program committees of a number of international conferences and symposia, including IEEE ICC, GLOBECOM, and WCNC. His current research interests include broadband access networks, optical networks, and wireless sensor networks. He has co-authored (first author) a book on optical WDM networks published by Wiley-IEEE Press, and has published about 60 papers and book chapters in archival journals and peer-reviewed conference proceedings.

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economy is facing a huge roadblock: control and regulation (down to possibly even taxation) in the monetary systems within Metaverses. The concern is that the economy within the Metaverse could “leak” into the real tangible world and without some strong form of identity management it could become, among other things, the perfect place for money laundering. At the same time, strong notions of identity are at odds with one of the original attractions to joining Metaverses: users could abandon their real identity and assume alternate ones (even many identities). It might turn out that one reason for Metaverses to open their architectures up to external protocols will be to allow identities to be established and managed.

Finally, as with most networked applications, the value increases the more users contribute content; thus, the underlying chicken-and-egg problem whereby services provided in the Metaverse would be successful if there is adequate attraction so that users contribute, but users do not contribute unless they are attracted to it in the first place. This is also one reason why Metaverses are already integrating and interoperating with other application experiences (VoIP telephony, Web browsing, etc.). The transition is not without its parallels, similar to what we expect of Web browsers where many other network applications are accessible directly or indirectly; hence the question becomes whether the 3D element of Metaverses will make them the “browsers” (albeit of collective nature when so desired) of the future.

A common denominator for enhanced user experience in Metaverses is that the higher the access bandwidth, the more engaging the resulting experience should be. Even when rendering is local on the client, the handling of multiple streams into (and, possibly, out of) a single user's device requires an appropriate level of access bandwidth. Hence, the topic of access technologies will continue to be with us, and possibly even more urgent, in the following years. This is the topic of the Special Issue in your hands: “Advances in Broadband Access Networks.” I would like to thank the authors, the Guest Editors, Jun Zheng, Yang Xiao, and Abbas Jamalipour, and the issue's Liaison Editor, Paolo Giacomazzi, for producing an interesting and balanced collection of contributions on wired (optical) and wireless broadband access networks.

As always, your feedback regarding the direction and substance of the magazine is invaluable and always appreciated. Please contact me, by e-mail, at yannis@cs.ualberta.ca, to let me know what you think about the editorial comments, what type of content might be more interesting to you, and in what ways the magazine's distinct character could be improved or further publicized.

References

- [1] N. Stephenson, “Snow Crash,” Bantam Spectra Book, Bantam Books, 1992, New York.
- [2] <http://www.sics.se/dive/>