Preface

Peer-to-peer (P2P) computing is attracting enormous media attention. Typical applications are file sharing, as in Gnutella, and exploiting distributed computing power, as in the SETI (Search for Extra Terrestrial Intelligence) project.

The most popular applications at present are limited in their scope, but they are highlighting some of the key challenges of P2P computing and exposing the limitations of traditional approaches to addressing such challenges. First, the peers are autonomous entities: they can cooperatively participate or not according to their own choice. Second, the peers are heterogeneous, meaning that in general we would not be justified in making strong assumptions about how they are designed or how their information structures are conceptually modeled. The applications of P2P computing go beyond file sharing or load balancing of computing resources. Understood more generally, P2P computing is a natural approach to the development of large systems from autonomous, heterogeneous components. The obvious idea would be for entities to function as peers that provide services or expose resources for sharing. Services or resources can then be composed dynamically to yield novel functionalities. Rigorous composition techniques are a major research direction.

First, let's consider heterogeneity. One aspect of the above-mentioned techniques for developing P2P systems is dealing with the information structures of the various peers. Another aspect is dealing with the underlying processes. How do we ensure that peers are able to share knowledge and able to act in unison? Addressing both aspects involves modeling the peers appropriately and reconciling their conceptual differences.

Next, let's consider autonomy. Since the participants are autonomous and not governed by any central agency, certain new challenges must be addressed. One, we need mechanisms for trust and reputation, and, related to these, for governance and regulation. Two, we need to develop economic environments or incentive mechanisms that foster knowledge sharing and collaboration, i.e., lead the peers to prefer cooperative over non-cooperative behaviors in sharing resources. Systems such as Gnutella already suffer from the problem of *free riding*, where some participants take advantage of the system but never contribute to it. What business models would properly support those who contribute or give an incentive to the peers to cooperate? What techniques would sustain such business models?

Interestingly and significantly, research on multiagent systems and on large-scale information systems has at least partially addressed many of the challenges of P2P systems. The work on information systems has studied the consequences of heterogeneity of knowledge and process. The work on multiagent systems has studied the consequences of autonomy. In particular, the basic doctrine of multiagent systems—that the member agents are autonomous—agrees with what P2P systems require. Research on topics such as task decomposition, protocols,

economic models involving game theory and decision theory, and coordination and teamwork all feed naturally into P2P systems.

For the above reasons, this workshop series aims at addressing the following nonexhaustive list of topics:

- Intelligent agent techniques for P2P computing
- P2P computing techniques for multi-agent systems
- The Semantic Web and semantic coordination mechanisms for P2P systems
- Scalability, coordination, robustness and adaptability in P2P systems
- Self-organization and emergent behavior in P2P systems
- E-commerce and P2P computing
- Participation and contract incentive mechanisms in P2P systems
- Computational models of trust and reputation
- Community of interest building and regulation, and behavioral norms
- Intellectual property rights in P2P systems
- P2P architectures
- Scalable data structures for P2P systems
- Services in P2P systems, including service definition, discovery, filtering, composition, and so on
- Knowledge discovery and P2P data mining
- P2P-oriented information systems
- Information ecosystems and P2P systems
- Security considerations in P2P networks
- Ad hoc networks and pervasive computing based on P2P architectures and wireless communication devices.

The workshop series emphasizes discussions about methodologies, models, algorithms and technologies, strengthening the connection between agents and P2P computing. These objectives are accomplished by bringing together researchers and contributions from these two disciplines but also from more traditional areas such as distributed systems, networks, and databases.

This volume is the postproceedings of AP2PC 2003, the 2nd International Workshop on Agents and P2P Computing,[1] which took place in Melbourne on July 14, 2003 in the context of the 2nd International Joint Conference on Autonomous Agents and Multi-agent Systems (AAMAS 2003).

This volume is organized according to the sessions held at the workshop. Besides the invited papers related to the invited talk and to the panel, these were framed into the following topics:

- Paradigm integration and challenges
- Trust
- Self-organization
- Incentives
- Search and systems
- Adaptive applications

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[1] http://p2p.ingce.unibo.it/

– Mobile agents

This proceedings brings together papers presented at the workshop, fully revised to incorporate reviewers' comments and discussions at the workshop, plus three invited papers related to the panel. After the call for papers we received 22 submissions. All submissions were reviewed for scope and quality; finally, 11 were accepted as full papers and 6 as short papers. AP2PC 2003 drew over 40 attendees. Given the dual threats of SARS and war this year and logistical challenges of getting to Melbourne, it is not surprising that this was one of the better attended workshops at AAMAS.

We express our deepest appreciation to the participants for their lively discussions. We would like to acknowledge the contributions of the invited speaker, the authors for their excellent submissions, and the program committee members for their diligence in reviewing submissions on a tight schedule. We would also like to thank the panel chair, Aris M. Ouksel, and the invited panelists, Sonia Bergamaschi (University of Modena and Reggio-Emilia), Rajkumar Buyya (University of Melbourne), and Onn Shehory (IBM Haifa). We would like to acknowledge the steering committee for its guidance and encouragement.

This workshop followed the successful first edition, which was held in conjunction with AAMAS in Bologna in 2002. In recognition of the interdisciplinary nature of P2P computing, a sister event called the International Workshop on Databases, Information Systems, and P2P Computing was held in Berlin in September 2003 in conjunction with the International Conference on Very Large Data Bases (VLDB).

Gianluca Moro
Claudio Sartori
Munindar P. Singh

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University of Bologna, Italy

Claudio Sartori
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Dept. of Computer Science,
North Carolina State University, USA

Panel Chair   Aris M. Ouksel
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University of Illinois at Chicago, USA

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