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Agents and Peer-to-Peer Computing

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Revised and Invited Papers

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Preface

Peer-to-peer (P2P) computing has attracted significant media attention, initially spurred by the popularity of file-sharing systems such as Napster, Gnutella, and Morpheus. More recently systems like BitTorrent and eDonkey have continued to sustain that attention. New techniques such as distributed hash-tables (DHTs), semantic routing, and Plaxton Meshes are being combined with traditional concepts such as Hypercubes, Trust Metrics, and caching techniques to pool together the untapped computing power at the "edges" of the Internet. These new techniques and possibilities have generated a lot of interest in many industrial organizations, and have resulted in the creation of a P2P working group on standardization in this area (http://www.irtf.org/charter?gtype=rg&group=p2prg).

In P2P computing, peers and services forego central coordination and dynamically organize themselves to support knowledge sharing and collaboration, in both cooperative and non-cooperative environments. The success of P2P systems strongly depends on a number of factors. First, the ability to ensure equitable distribution of content and services. Economic and business models which rely on incentive mechanisms to supply contributions to the system are being developed, along with methods for controlling the "free riding" issue. Second, the ability to enforce provision of trusted services. Reputation-based P2P trust management models are becoming a focus of the research community as a viable solution. The trust models must balance both constraints imposed by the environment (e.g., scalability) and the unique properties of trust as a social and psychological phenomenon. Recently, we are also witnessing a move of the P2P paradigm to embrace mobile computing in an attempt to achieve even higher ubiquitousness. The possibility of services related to physical location and the relation with agents in physical proximity could introduce new opportunities and also new technical challenges.

Although researchers working on distributed computing, multi-agent systems, databases, and networks have been using similar concepts for a long time, it is only fairly recently that papers motivated by the current P2P paradigm have started appearing in high-quality conferences and workshops. Research in agent systems in particular appears to be most relevant because, since their inception, multiagent systems have always been thought of as collections of peers.

The multiagent paradigm can thus be superimposed on the P2P architecture, where agents embody the description of the task environments, the decision-support capabilities, the collective behavior, and the interaction protocols of each peer. The emphasis in this context on decentralization, user autonomy, dynamic growth, and other advantages of P2P also leads to significant potential problems. Most prominent among these problems are coordination: the ability of an agent to make decisions on its own actions in the context of activities of other agents; and scalability: the value of the P2P systems lies in how well

they scale along several dimensions, including complexity, heterogeneity of peers, robustness, traffic redistribution, and so forth. It is important to scale up coordination strategies along multiple dimensions to enhance their tractability and viability, and thereby to widen potential application domains. These two problems are common to many large-scale applications. Without coordination, agents may be wasting their efforts, squandering resources, and failing to achieve their objectives in situations requiring collective effort.

This workshop series brings together researchers working on agent systems and P2P computing with the intention of strengthening this connection. Researchers from other related areas such as distributed systems, networks, and database systems are also welcome (and, in our opinion, have a lot to contribute). We seek high-quality and original contributions on the general theme of "Agents and P2P Computing." The following is a non-exhaustive list of topics of special interest:

- Intelligent agent techniques for P2P computing
- P2P computing techniques for multiagent 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 and legal issues in P2P systems
- P2P architectures
- Scalable data structures for P2P systems
- Services in P2P systems (service definition languages, service discovery, filtering and composition etc.)
- Knowledge discovery and P2P data-mining agents
- 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
- Grid computing solutions based on agents and P2P paradigms
- Legal issues in P2P networks

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 post-proceedings of AP2PC 2006, the 5th International Workshop on Agents and P2P Computing,[1] held in Hakodate, Japan on May 9,

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

2006 in the context of the Fifth International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS 2005).

This volume brings together papers presented at AP2PC 2006, fully revised to incorporate reviewers' comments and discussions at the workshop. The volume is organized according to the following sessions held at the workshop:

– Invited Paper
– P2P Infrastructure
– Agents in P2P
– P2P Search
– Applications

We would like to thank the invited speaker Raman Paranjape, Director of Special Initiatives from TRLabs in Saskatchewan Canada, for his talk entitled "Macroscopic Modeling of Information Flow in an Agent-Based Electronic Health Record System."

After the call for papers, we received 23 papers. All submissions were reviewed for scope and quality, ten were accepted as full papers, and six as short papers. We would like to thank the authors for their submissions and the members of the Program Committee for reviewing the papers under time pressure and for their support of the workshop. Finally, we would like to acknowledge the Steering Committee for its guidance and encouragement.

This workshop followed the successful fourth edition, which was held in conjunction with AAMAS in Utrecht in 2005. In recognition of the interdisciplinary nature of P2P computing, a sister event called the International Workshop on Databases, Information Systems, and P2P Computing[2] was held in Trondheim, Noray in August 2005 in conjunction with the International Conference on Very Large Data Bases (VLDB).

September 2006   Sam Joseph
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[2] http://dbisp2p.ingce.unibo.it/

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Preceding Editions of AP2PC

Here are the references to the preceding editions of AP2PC, including the volumes of revised and invited papers:

- AP2PC 2002 was held in Bologna, Italy, July 15, 2002. The website can be found at http://p2p.ingce.unibo.it/2002/ The proceedings were published by Springer as LNCS volume no. 2530 and are available online here: http://www.springerlink.com/content/978-3-540-40538-2/
- AP2PC 2003 was held in Melbourne, Australia, July 14, 2003. The website can be found at http://p2p.ingce.unibo.it/2003/ The proceedings were published by Springer as LNCS volume no. 2872 and are available online here: http://www.springerlink.com/content/978-3-540-24053-2/
- AP2PC 2004 was held in New York City, USA, July 19, 2004. The website can be found at http://p2p.ingce.unibo.it/2004/ The proceedings were published by Springer as LNCS volume no. 3601 and are available online here: http://www.springerlink.com/content/978-3-540-29755-0/
- AP2PC 2005 was held in Utrecht, Netherlands, May 9, 2005. The website can be found at http://p2p.ingce.unibo.it/2004/ The proceedings were published by Springer as LNAI volume no. 4118 and are available online here: http://www.springerlink.com/content/978-3-540-49025-8/

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