Foreword

We are witnessing an explosive growth in the number of mobile computing devices, including smart phones, personal assistant devices, and sensors, and in wireless communication technologies and capabilities. Despite such growth, systems in which the devices collaborate directly to process information, namely mobile P2P systems, are in their infancy.

This does not mean that research on the subject has not been done, but that the problem is very difficult. An example of an MP2P application that has been worked on for more than twenty years is routing, which is important in the digital battlefield, vehicular networks, and others. The problem is to route messages between a sender and a receiver that are out of each other's transmission range, using the mobile devices as intermediaries. Despite the extensive amount of work on this problem, it is not solved yet.

Furthermore, not all reasons for the slow start on mobile P2P systems are technological. For example, data broadcasting is a well understood mechanism that is technologically easy to implement and can facilitate mobile P2P systems development and deployment. Some of the chapters in this book discuss broadcasting. Yet it is not implemented by existing cellular service providers.

Nevertheless, technology is a major stumbling block. The technological challenges include resource constraints on the mobile device, security and privacy, variable and/or disconnected network topology, and heterogeneity of devices. More specifically, it is hard to build systems when energy, memory, CPU power, and bandwidth resources are constrained on each one of the devices participating in the P2P system. Furthermore, the wireless medium is easier to tap into, and the devices are harder to protect physically. Thus, serious security and privacy concerns arise. Additionally, many mobile P2P systems cannot rely on an infrastructure for wireless communication among the devices. For example, an infrastructure often does not exist in a battlefield. Thus, such systems depend on direct collaboration among the mobile devices via short-range wireless networks, which is difficult when mobility and failures continuously change the set of neighbors with which a node can directly communicate.

This book addresses the technological challenges. It describes the problems, some existing solutions, and proposes new ones. The first section deals with the problem of finding information in a network lacking an infrastructure. Observe that this is different than the routing problem. It is harder in the sense that even the identity of the receiver, that is the location of information, is unknown; but easier in the sense that the information may be replicated and therefore routing to a single receiver is often not strictly necessary. The proposed solutions combine query and information dissemination in an intelligent way. P2P methods have been quite successful in the fixed world, and the second section explores adaptation of the successful methods (e.g. overlays) to the mobile world. Section III continues this exploration, with a distinction between mobile P2P systems that use an infrastructure, the ones that do not do so, and the ones that use a hybrid strategy. Section IV proposes that cooperation is a useful approach to

deal with the resource constraints, and it discusses incentives and mechanisms for cooperation. Section V discusses the critical topic of security, and sections VI, VII, and VIII discuss strategies that facilitate the development of mobile P2P systems. These strategies include standards, software tools, platforms, programming paradigms, service provision and discovery, and protocols.

Overall, the book is an invaluable resource for both researchers and practitioners. It addresses the most important issues in mobile P2P systems, it is well organized, very readable, comprehensive, and presented at the right level of depth. It strikes a good balance between presentation of novel ideas, and survey of the state of the art.

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Ouri Wolfson's main research interests are in database systems, distributed systems, and mobile/pervasive computing. He received his PhD degree in Computer Science from Courant Institute of Mathematical Sciences, New York University. He is currently the Richard and Loan Hill professor of Computer Science at the University of Illinois at Chicago, where he directs the Mobile Information Systems Research Center. He is also an affiliate professor in the Department of Computer Science at the University of Illinois at Urbana Champaign. Ouri Wolfson is the founder of Mobitrac, a high-tech startup company that had about forty employees before being acquired. Most recently he founded Pirouette Software Inc., and currently serves as its President. Before joining the University of Illinois he has been on the Computer Science faculty at the Technion and Columbia University, and he has been a Member of Technical Staff at Bell Laboratories. Ouri Wolfson authored over 150 publications, and holds six patents. He is a fellow of the Association of Computing Machinery, and serves on the editorial boards of the IEEE Transactions on Mobile Computing and the Springer's Wireless Networks Journal. He received the best paper award for "Opportunistic Resource Exchange in Inter-vehicle Ad Hoc Networks," at the 2004 Mobile Data Management Conference.