Pervasive and Mobile Commerce Applications

Monday, May 20, 2002 - 14.15:18:00

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As technology continues its dramatic progress, making possible new and improved applications, we experience the creation of new paradigms and changes in the way technology impacts every day's life. Always-on connectivity, location-awareness, and environment-aware products are among those new paradigms. Smart devices, portable devices, wireless communications, and sophisticated sensors, appear to be the underlying principles of a new revolution in technology.

This tutorial will explore research issues in the intersection of pervasive and mobile computing and electronic commerce. Pervasive computing deals with a broad range of information access methods enabled by mobility, wireless, small embedded systems, and broadband technologies. At the same time, electronic commerce is redefining the way business is carried out creating new business models and novel interactions with end users. The topics to be discussed are as follows:

- Evolution of Pervasive Infrastructure
- Transactional interactions
- Software componentry for building mobile applications
- Security for mobile commerce applications
- Location-based services
- Emerging eCommerce Frameworks
- Case studies

Marisa Viveros is an Senior Technical Staff Member and a Senior Manager of the Pervasive Computing Solutions group at IBM Thomas J Watson Research. She is responsible for the creation of emerging applications in the areas of wireless technology, pervasive devices, and their seamless integration in business environments. Examples of such work include applications in mobile commerce, using sensing technologies to bridge the gap between the digital and physical world, and multi-modal applications for knowledge workers. A common theme is enabling end users with ease of use computing solutions. Throughout her career at IBM, Ms Viveros has received an Outstanding Innovation Award for her pioneer work in mobile commerce, and an Outstanding Technical Award for her work in parallel systems. She has coauthored papers, patents, and has participated in numerous conferences as a program committee member, keynote speaker, session chairman, and panelist. Ms. Viveros holds an MS degree in Computer Science and a BS degree in Electrical Engineering. She is a member of ACM.

Peer-to-Peer Systems: Architectures and Performance

Monday, May 20, 2002 - 9.00:12:45

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Peer to peer systems are quite an old idea (IP routing is a peer to peer system, and is over 20 years old). However, through the ubiquity and connectivity of the Internet, the end user has taken control of her fate, and this has made these systems a highly attractive way to build dis-intermediate content services.

This tutorial will provide a taxonomy of such systems , ranging from the basic file sharing of Napster and Gnutella and variants, through to the persistent storage of freenet and eternity, and via Content Addressable Networks, such as CAN, Chord, Pastry, and Mixnet, Publius Xenos, and Mojonation.

We'll look at the difference between P2P and pure overlay systems, and how they interact. We'll look at how P2P and overlay services may merge into the infrastructure. We'll look at degrees of transparency.

These systems have different levels of complexity and distributedness for their service discovery and topology organisation, and subsequent indexing, searching, routing, as well as providing a wide range of levels of anonymity, availability, integrity, and payment.

The second part of the tutorial will cover the claimed and actual performance of such systems, including robustness, delay, route complexity and so on. We will also take a look at how to measure P2P systems.

Jon Crowcroft is the Marconi Professor of Communications Systems in the Computer Laboratory as of October 2001. He been working in the area of Internet support for multimedia communications for nearly 20 years. Three main topics of interest have been scaleable multicast routing, practical approaches to traffic management, and the design of deployable end-to-end protocols. He leans towards a “build and learn” paradigm for research.

He graduated in Physics from Trinity College, University of Cambridge in 1979, gained an MSc in Computing in 1981, and PhD in 1993 both from UCL. He is a member of the ACM, a member of the British Computer Society, a fellow of the IEE and the Royal Academy of Engineering and a Senior Member of the IEEE. He is also on the editorial team for Computer Networks, IEEE Networks, Monet, and Cluster Computing. He is involved in two COST actions for the UK, 264 on Group Communication which sponsors the NGC 2001 Workshop, and 263 which sponsors the workshop on Quality of Future Internet Services. 2001 Workshop, as well as Cabernet. He is currently on the Internet Architecture Board.

He is on the PC for SIGCOMM 2002 and Infocom 2002, and co-program chair of SIGCOMM 2003. Recently, he joined the OST's E-Science Technical Advisory Group, and Grid Networking Team. He likes teaching, and has published a few books based on learning materials.

Personal web page: http://www.cl.cam.ac.uk/users/jac22

Ian Pratt is a University Lecturer and Fellow of King's College. As a member of the Computer Laboratory's Systems Research Group (SRG) for over six years, he has worked on number of influential projects, including the Fairisle ATM LAN, the Desk Area Network workstation, and the Nemesis operating system.

He lectures a number of Systems courses, including Comparative Architectures (about advanced microprocessor design), Digital Communication II, and Structured Hardware Design. He is also co-organiser of the first-year hardware practical laboratories.

His research interests cover a broad range of Systems topics, including computer architecture, networking, and operating system design.

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Mobile Computing Middleware

Sunday, May 19, 2002 - 14.30:18:15

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Mobile computing devices such as PDAs, laptops, cameras and mobile phones impose new requirements for middleware platforms. These devices face temporary loss of network connectivity when they roam; they need to discover other mobile devices in an ad hoc manner; they are likely to have scarce resources, such as battery lifetime, processing power and memory; they are required to react to frequent and unannounced changes in the environment, such as high variability of network bandwidth, new physical locations, and so on.

The recent popularity of these devices, however, opens the door for new distributed applications and service provision: in particular, ad hoc groups and intermitted connectivity become more and more used. For building these novel applications, engineers should be able to rely on a suitable middleware.

This tutorial will discuss the requirement of mobile computing, and the emerging call for context and environment awareness for applications. The tutorial will briefly discuss standard middleware principles to then provide a conceptual framework for the art mobile computing middleware. The tutorial will use this framework to describe some earlier examples of middleware for mobile computing, which targeted a specific domain, introduce tuple-based systems, and context-aware middleware.

The tutorial will also provide common characteristics of mobile computing middleware and outline the open issues and the future directions of the research in this field.

Cecilia Mascolo is a Lecturer in the Department of Computer Science, University College London. She holds an MSc and a PhD in Computer Science from the University of Bologna. She has published extensively in the areas of software engineering, mobile computing, mobile code, ad-hoc and active networks. Cecilia is also interested in the use of mark-up languages for mobile computing applications.

She has delivered tutorials on Mobile Computing Middleware (an instance of the tutorial was delivered at the International Conference on Middleware 2001) and on XML. She is principal investigator in British funded projects on “Use of Mobile Code for Mobile Computing Middleware”, “Mobile Computing Middleware in Health-Care” and co-investigator in a programmable network project. Before joining UCL, she spent one academic year as a visiting academic at Washington University in St. Louis (MO, USA) working on fine-grained mobility.

Cecilia is a member of the ACM and of the IEEE Computer Society.

Network Security

Monday, May 20, 2002 - 14.15:18:00

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With the advent of Internet, security breaches became a major concern for business applications and network operations. More recently security has also been viewed as a key issue in emerging networking research areas like ad hoc networks, mobile communications and multicast.

This tutorial will address the main communication security requirements and corresponding solutions from the perspective of Internet protocols and in some emerging networking fields. First a detailed overview of basic mechanisms including cryptographic techniques for data protection, authentication, key management, and network access control techniques used in firewalls will be presented.

IPsec protocols and key management schemes will then be introduced as an application of basic security mechanisms along with an overview of the Transport Layer Security protocol (SSL). In the last part of the tutorial, specific security requirements of multicast and related research work will be outlined.

Refik Molva is a professor at Institut Eurécom in Sophia Antipolis, France since 1992. He is leading the network security research group that currently focuses on multipoint security protocols, multi-component system security, and security in ad hoc networks. His past projects at Eurécom were on mobile code protection, mobile network security, anonymity and intrusion detection.

Beside security, he worked on distributed multimedia applications and was responsible for the BETEUS european project on CSCW over a trans-european ATM network. Prior to joining Eurécom, he worked for IBM as a Research Staff Member in the Zurich Research Laboratory where he was one of the key designers of the KryptoKnight security system. He also worked as a network security consultant in the IBM Consulting Group in 1997. He is the author of several publications and patents in the area of network security and has been part of several evaluation committees for various national and international bodies including the European Commissio

Assets Inventory and Monitoring in a Networked World

Monday, May 20, 2002 - 9.00:12:45

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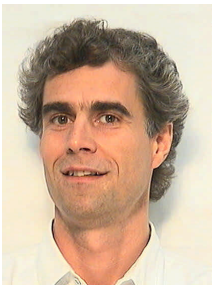
In today's dynamic information society, organizations critically depend on the underlying computing infrastructure. Tracking computing devices as assets and their usage helps in the provision and maintenance of an efficient, optimized service. A precise understanding of the operational infrastructure and its users also plays a key role during the negotiation of outsourcing contracts and for planning mergers and acquisitions. Building an accurate inventory of computing assets is especially difficult in unknown heterogeneous systems and networking environments without prior device instrumentation. User mobility and mobile, not-always-signed-on, computing devices add to the challenge. We propose to complement basic network-based discovery techniques with the combined log information from network and application servers to compute an aggregate picture of assets, and to categorize their usage with data-mining techniques according to detected communication patterns.

This tutorial is divided into two parts:

1. Network-based asset discovery and tracking. Passive network mapping enables the discovery and identification of network assets without generating any kind of traffic. Active mapping techniques explore the network from a starting point using repetitive algorithms, interacting with network services and target systems to discover hosts as well as their operating systems and services. The more we know, the more we can find out. The accurate tracking of mobile devices is a prerequisite for further asset analysis. However, the automatic discovery of assets within an administrative domain is quite challenging, as networks become increasingly heterogeneous and security shields make it difficult to perform an exhaustive network discovery. We will exemplify discovery and reporting techniques using a small selection of applications developed and used by the authors.
2. Enterprise asset management techniques. Network discovery, physical inventories and traditional asset management systems are positioned in the scope of corporate asset life-cycle processes. Device instrumentation furthers the accuracy and automation of asset tracking. Management models include WBEM and WMI. Demographic questionnaires and various daemons confirm this data and connect to enterprise servers. Further sources of data are enterprise server logs. The mining of all this heterogeneous data represents an enormous challenge, but asset and usage categorizing and warehousing may eventually allow questions to be answered about the cost, utility, and risk associated with individual assets.

Luca Deri is currently sharing his time between NETikos S.p.A., where he develops mobile applications, and the University of Pisa, where he has been appointed as lecturer. He received his Ph.D. in Computer Science with a thesis on Software Components from the University of Berne, Switzerland, in 1997. He previously worked as research scientist at the IBM Zurich Research Laboratory, and as research fellow at the University College of London. His professional interests include network management and security. His home page is http://luca.ntop.org/.



Dieter Gantenbein is a research staff member at the IBM Zurich Research Laboratory. In 1983 he received the M.S. degree in Computer Science from Rutgers University, New Brunswick, NJ, and joined the IBM Zurich Research Laboratory. He implemented various OSI communication protocols, and has contributed to international projects groups such as RACE and the ACTS MISA Consortium. He contributed to the IBM TMN and NWAYS ATM switch products. Since 1999 he is project leader for the IDD Intelligent Due Diligence tool used by IGS for network-based asset discovery and tracking services.

Mobile IP in the Current and Future Internet

Monday, May 20, 2002 - 9.00:12:45

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Mobility is a fact of modern life. As mobile computing devices such as laptops and PDAs become more important in business and personal life, and as wireless networking products and services continue to proliferate, the desire to compute and to connect to the network "anytime, anywhere" is natural. However, the wide variety of such devices and networking technologies creates an incompatible array of "closed" solutions.

Mobile IP is a technology defined and standardized by the Internet Engineering Task Force (IETF), the principal protocol standards development organization for the Internet, to allow mobile devices to transparently move about and be connected to the Internet in an open, compatible way. Devices using Mobile IP use a single IP address and are able to participate fully in the Internet as if they were in their home network, no matter where they connect to the Internet. Since Mobile IP operates at the IP layer, it is compatible with any lower networking layer that supports IP; it thus allows mobile computers not only to move about from place to place, but also to move transparently between differing lower layer technologies such as different types of wired or wireless networking services.

In this tutorial, we will examine the design and operation of Mobile IP, from the view of how the protocol operates and the capabilities that the protocol provides to mobile users in the Internet. After a summary of the fundamental problems and design challenges addressed by Mobile IP, we will discuss the operation of Mobile IP in the current Internet (using IP Version 4, or IPv4) and in the new version of IP (IP Version 6, or IPv6) designed to replace IPv4 to provide growth potential and support for new capabilities for the future Internet.

David B. Johnson is an Associate Professor of Computer Science and Electrical and Computer Engineering at Rice University, and is a member of Rice's Computer Systems Laboratory and Center for Multimedia Communication. Prior to joining the faculty at Rice in 2000, he was an Associate Professor of Computer Science at Carnegie Mellon University, where he had been on the faculty for eight years. He received the Ph.D. degree in computer science in 1990 from Rice University.

Professor Johnson is leading the Monarch Project at Rice University (previously at Carnegie Mellon University), developing adaptive networking protocols and architectures to allow truly seamless wireless and mobile networking. Related to this research, he has also been very active in the Internet Engineering Task Force (IETF), were he was one of the main designers of the IETF Mobile IP protocol for IPv4 and has been the primary designer of Mobile IP for IPv6. Professor Johnson has been Technical Program Co-Chair for MobiCom'97 and MobiHoc 2002, and has served as a member of the Technical Program Committee for over 25 international conferences and workshops. He is an editor for the journals Mobile Networks and Applications (MONET), Wireless Networks (WINET), IEEE/ACM Transactions on Networking (ToN), Mobile Computing and Communications Review (MC2R), and IEEE Pervasive Computing. He is also an Executive Committee member and the Treasurer for SIGMOBILE, the ACM Special Interest Group on Mobility of Systems, Users, Data, and Computing. He is a member of the ACM, IEEE, IEEE Computer Society, IEEE Communications Society, USENIX, Sigma Xi, and the Internet Society.

Communications through Virtual Immersive Technologies

Monday, May 20, 2002 - 14.15:18:00

Francesco Vatalaro	Giuseppe Riva	Fabrizio Davide
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The evolution of technology in support of the Knowledge Society of the years 2000's will be rooted into three dominant trends: (a) pervasive diffusion of intelligence in the space around us, through the development of network technologies towards the objective of the so-called "*Ambient Intelligence*" (AmI); (b) increasingly relevant role of mobility, through the development of mobile communications, from the UMTS, towards the so-called "*Fourth Generation*" (4G); (c) increase of reachness and completeness of communications, through the development of multimedia technologies, towards the "*Immersive Virtual Telepresence*" (TIV), including an increased attention to the aspects of human perception and of person-machine interaction.

The tutorial intends to provide an insight on some of the main technologies that will allow the development of this new perspective, as well as on related human factors.

- Scenarios for virtual immersive technologies (F. Vatalaro)
- Development of mobile communications: from 3G onward (F.Vatalaro)
- Virtual communications: hardware, software tools, and terminals (F. Davide)
- Virtual communications: telepresence, social interactions and human factors (G. Riva)

Francesco Vatalaro received the Dr. Ing. degree in Electronics Engineering from the University of Bologna, Italy. He was with Fondazione Ugo Bordoni, FACE Standard, and Selenia Spazio, Italy. In 1987, he became an Associate Professor of Radio Systems at the University of Roma Tor Vergata, Italy, where he is presently a Professor. In 1998, he was a Visiting Professor at the University of Southern California, and in 2000 a Visiting Professor at UCLA, both in Los Angeles, CA. Since 1985 he collaborates in and coordinates several telecommunications projects within national Italian and European programmes. He was a co-winner of the 1990 "Piero Fanti" INTELSAT/Telespazio international prize. He is a member of the Editorial Board of the Int. J. of Satellite Communications, J. Wiley. He is the Chairman of the IEEE joint Vehicular Technology/Communications Society Italy Chapter, and is a member of several Scientific Committees. He is the author of about 150 scientific papers.

Optical Networks

Sunday, May 19, 2002 - 14.30:18:15

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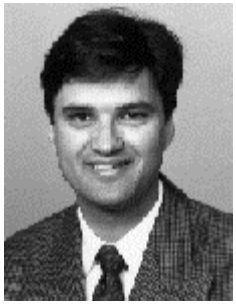
In this half-day tutorial, we will present the current state of the art in optical networks. We will begin by discussing the various optical devices used in optical networks. Then, we will present wavelength-routed networks, which is currently the dominant architecture for optical networks. We will discuss wavelength allocation policies, calculation of call blocking probabilities, and network optimization techniques. Subsequently, we will focus on the various protocols that have been proposed for wavelength-routed networks. Specifically, we will present a framework for IP over optical networks, GMPLS, LDP and CR-LDP with extensions for optical networks. Finally, we will conclude our tutorial with a discussion on Optical Burst Switching (OBS), a new emerging technology.

Harry G. Perros received the B.Sc. degree in Mathematics in 1970 from Athens University, Greece, the M.Sc. degree in Operational Research with Computing from Leeds University, UK, in 1971, and the Ph.D. degree in Operations Research from Trinity College, Dublin, Ireland, in 1975. From 1976 to 1982 he was an Assistant Professor in the Department of Quantitative Methods, University of Illinois at Chicago. In 1979 he spent a sabbatical term at INRIA, Rocquencourt, France. In 1982 he joined the Department of Computer Science, North Carolina State University, as an Associate Professor, and since 1988 he is a Professor. During the academic year 1988-89 he was on a sabbatical leave of absence first at BNR, Research Triangle Park, North Carolina, and subsequently at the University of Paris 6, France. Also, during the academic year 1995-96 he was on a sabbatical leave of absence at Nortel, Research Triangle Park, North Carolina.

He has published extensively in the area of performance modeling of computer and communication systems, and has organized several national and international conferences. He also published a monograph entitled “Queueing networks with blocking: exact and approximate solutions,” Oxford Press, as well as a book entitled “An Introduction to ATM Networks,” John Wiley. He is the chairman of the IFIP W.G. 6.3 on the Performance of Communication Systems. He has offered several professional courses in the areas of ATM Networks and Optical Networks.



George N. Rouskas received the Diploma in Computer Engineering from the National Technical University of Athens (NTUA), Athens, Greece, in 1989, and the M.S. and Ph.D. degrees in Computer Science from the College of Computing, Georgia Institute of Technology, Atlanta, GA, in 1991 and 1994, respectively. He is an Associate Professor in the Department of Computer Science, North Carolina State University, where he received tenure one year early. During the 2000-2001 academic year he spent a sabbatical term at Vitesse Semiconductor, Morrisville, NC, and in May and June 2000 he was an Invited Professor at the University of Evry, France.

He is a recipient of a 1997 NSF Faculty Early Career Development (CAREER) Award, and a co-author of a paper that received the Best Paper Award at the 1998 SPIE conference on All-Optical Networking. He also received the 1995 Outstanding New Teacher Award from the Department of Computer Science, North Carolina State University, and the 1994 Graduate Research Assistant Award from the College of Computing, Georgia Tech. He was a co-guest editor for the IEEE Journal on Selected Areas in Communications, Special Issue on Protocols and Architectures for Next Generation Optical WDM Networks, published in October, 2000, and is on the editorial boards of the IEEE/ACM Transactions on Networking, Computer Networks, and the Optical Networks Magazine. He has offered several professional courses in the areas of TCP/IP, the Internet, and Optical Networks.