
Introduction

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Biographical notes: Yaoxue Zhang received his PhD in Computer Networking from Tohoku University, Japan in 1989, and became a faculty member at the Department of Computer Science and Technology at Tsinghua University, China in 1990. Currently, he is a member of the Chinese Academy of Engineering and Professor of Computer Science at Tsinghua University. His main research areas include computer networking, operating systems, as well as ubiquitous and pervasive computing. He has published over 180 technical papers in international journals and conferences, as well as nine monographs and textbooks. He is the recipient of the Best Paper Award in the 21st IEEE AINA International Conference in 2007, and the winner of the Top Patent Award of China in 2006.

Jianhua Ma has been a Professor at the Faculty of Computer and Information Sciences of Hosei University, Japan since 2000. Previously, he had 15 years' teaching/research experience at NUDT, Xidian University

and the University of Aizu (Japan). He has published over 200 papers, and edited over 20 books. His research interests include multimedia, ubiquitous computing, social computing, cloud computing, cyber intelligence, etc. He is a Chair of IEEE CIS Task Force on Autonomic and Trusted Computing, and a co-founder of IEEE Task Force on Ubiquitous Intelligence and Computing.

Xiaoming Fu received his PhD in Computer Science in 2000 from Tsinghua University, China. He moved to Technical University Berlin, Germany as a scientific staff before joining the University of Göttingen where he is currently a Full Professor. His research interests lie in architectures, protocols and applications of internet-based systems. Currently, he is the Vice Chair of the IEEE Communications Society Technical Committee on Computer Communications (TCCC) and chair of the Internet Technical Committee (ITC). He has served as a special issue Guest Editor for IEEE Network and Computer Networks (Elsevier) and an editorial board member of Computer Communications (Elsevier) and IEEE Transactions on Networks and Service Management.

Martin Stiernerling received his PhD in Computer Science in 2011 from University of Göttingen in Germany. He works at the NEC Laboratories Europe where he is currently a senior researcher. His areas of research interest are on internet architecture, internet signaling protocols, network management, and overlay/peer-to-peer systems. He served as a Guest Editor of IEEE Network Special Issues on Implications and Control of Middleboxes in the internet. In the internet Engineering Task Force (IETF) he is the Area Director for the transport area, co-author of multiple RFCs, was a Chair of the NSIS and PSPP working groups, as well as a Chair of the IRTF Virtual Networks Research Group.

In the context of cloud computing, computation and storage resources are virtualised, and many elements including software, platform and infrastructure are delivered as a service which can be deployed and scaled out quickly on demand. Transparent computing (TC) is a recently proposed new paradigm designed for providing user-controllable cloud services. To achieve such user controllability, the computing platforms underlying the cloud service provisioning, including the operating system, are not necessarily closely bounded with a single computer, thus becoming also a service. In this paradigm, any computational devices, including desktops, laptops, pads, mobile phones and even sensors, can be dynamically installed according to users' preference and the devices' specifications. A selected OS is streamed on demand and temporarily resides on a device so in a way that allows the transparent computer/device (TC/D) to be very light, low cost and highly reliability. It is the OS selectability that enables a TC/D to get services across OS-dependent clouds and allows a user to get desired transparent services (TSs) from different clouds.

In this special issue, we are pleased to introduce a series of state-of-art research contributions that address the broad challenges of TC and TSs, covering TC hardware, OSes, management, security, and applications. These articles cover the subject from a variety of perspectives, offering the readers a comprehensive understanding of the

principles, concepts and latest developments concerning TC. A total of six papers were finally selected for this special issue out of 18 submissions, after going through a strict two-round peer review process. They cover a broad range of the field of TC and services. While some papers present more general issues with TC and understanding their implications, others focus on new approaches to improve TC.

It has been debated whether a cloud operating system is really needed, and if yes, how it looks like. In the first paper, entitled ‘TransOS: a transparent computing-based operating system for the cloud’, Zhang and Zhou argue that a cloud operating system should be able to support different kinds of applications and services across diffuse and heterogeneous hardware and software. The authors propose such a cloud operating system, so-called TransOS, with which users are enabled to choose any desired services, not necessarily concerned about the details of underlying technologies. TransOS manages all networked and virtualised hardware and software (including traditional operating, e.g., Linux or Windows) to provide integrated services for users.

In the second paper, ‘Transparent mobile service terminal: an overview’, Qi, Yu, Zhang, Shaker, Jarmuszewski and Mankaruse recognise the benefits of TC for the client side in addition to the server side, and propose a smart/adaptive communication technique where the device selects the appropriate wireless access protocol to obtain services without user interaction. The authors develop TMST, a detailed hardware user interface to TSSs, as well as the notion of transparent network operating system (TNOS), where the memory of the mobile terminal is treated as a part of the cache of the entire OS.

While the second paper focuses more on the interface between hardware user interface in the terminal side to TC service, in the third paper ‘Analysis and a case study of transparent computing implementation with UEFI’, Ming addresses the issue of how to support and implement TC from a software perspective, by exploiting the new generation BIOS interface, the unified extensible firmware interface (UEFI) which defines the interface between the software stack and hardware platform. A case study of a wireless TC tablet is also provided with detailed analysis.

Mobile phones have become a primary means for internet access for many users but they have only limited battery life, low processing power, and limited storage capacities. In the fourth paper ‘SMILE: streaming management of applications and data for mobile terminals’, Zhao, Han, Xue and Chen propose a streamed application and data management system based on TC, to support more secure, better managed mobile phones. Experimental results show that the proposed system is feasible and efficient for future mobile computing applications.

TC and other cloud computing paradigms separate between the software (service) and hardware (client). In the fifth paper, ‘Transparent services selecting and loading with wearable devices’, Jing, Cheng, Zhou and Wang further extend the client terminal from PC to wearable embedded devices with heterogeneous structure, and propose a transparent service selecting and loading architecture (TSSLA) to select the proper service from the service pool using dynamic context-matching method. Moreover, the authors design and implement a new wireless on-demand programme loading method to load the ready-to-run programme onto the specific client, such as wearable embedded devices.

In the last paper, entitled ‘A privacy protection model for transparent computing system’, Xue and Dai tackles the issue of protecting data in TC systems, especially to enhance the privacy protection. They develop a system-based privacy protection model

for TC systems, based from mandatory access control, and employ a five-state formal model to verify the major security requirements are satisfied.

We hope that these papers will help readers understand the state-of-the-art advances on the TC, providing some visions of how cloud computing may be designed, implemented, exploited or improved.

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