

Managing Networks and Services of the Future

Edmundo R. M. Madeira · Bruno Schulze

Published online: 11 February 2009
© Springer Science+Business Media, LLC 2009

Abstract Today, we see several emerging environments, with a large diversity of devices, networks, providers and service domains, characterized as the networks and services of the future. This special issue contains four papers on how to manage important topics of these environments: policy model to support ontology-driven reasoning for autonomic computing, SOA-based NGM management, metrics to distinguish application traffic, and SLA design and service provisioning for out-sourced services.

Keywords Autonomic networking · Next Generation Networked Applications and Services · IP Multimedia Subsystem · Business-Driven IT Management

The evolution of the Internet in the last few years has been remarkably high. Networks with an increasing access link and core bandwidth, plus the new applications consuming this bandwidth, are everywhere. Moreover, the growing number of heterogeneous wireless access networks, such as Wi-Fi, WiMax, 3G and beyond cellular networks, is allowing ubiquitous access to the Internet through sophisticated devices by which people are “interconnected” all the time. In this scenario, we include:

- emerging networks, such as Next Generation Networks (NGNs), peer-to-peer (P2P) and community networks, ad hoc and self-configurable networks,

E. R. M. Madeira
Institute of Computing, University of Campinas (UNICAMP), Campinas, SP, Brazil
e-mail: edmundo@ic.unicamp.br

B. Schulze (✉)
Department of Computer Science, National Laboratory of Scientific Computing (LNCC),
Av Getulio Vargas 333, Quitandinha, 25651-075 Petropolis, RJ, Brazil
e-mail: schulze@lncc.br

multi-sensor and self-organizing networks, overlay networks, wireless broadband networks, personal and vehicular networks, Dense Wavelength Division Multiplexing (DWDM) optical networks, content delivery networks, and delay tolerant networks; and

- emerging services, such as grid services, virtual topologies and Virtual Private Network (VPN) services, Voice over IP (VoIP) services, and so on.

These emerging environments with a large diversity of devices, networks, providers and service domains, may be characterized as the networks and services of the future. The challenge is to investigate the management of these networks and services. The development of new models and architectures is particularly crucial to manage these networks and services, as well as to enable new management technologies, like autonomic computing and self-management, grid and P2P mechanisms, and virtualization techniques. There is also a demand for novel business approaches for management of Information Technology (IT) services in this scenario.

It is with great pleasure that we introduce you to this special issue with the best work presented at LANOMS 2007, the 5th Latin American Network Operations and Management Symposium, held in Petropolis, RJ, Brazil, during September 10–12, 2007. For the past few years, LANOMS has become a conference of truly international coverage, bringing together researchers and practitioners, and enabling them to share their insight, results, and experience in the multi-faceted areas of Systems, Networks and Services. This is a testimony to the fact that the interest in these subjects continue. This special issue contains four papers extended from works presented at LANOMS'07 [1], covering some important issues of the networks and services of the future.

According to ITU-T, the aim of Next Generation Networked Applications and Services (NGNs) is to let users with unfettered network access along with access to competing service providers, and services of their choice as well as supporting generalized mobility which will allow consistent and ubiquitous provision of services to users. In the similar way that NGN architectures are developed, the approaches to managing these networks and the services they provide must also evolve. Therefore, looking five, ten or more years ahead, management systems must evolve to meet to the needs of next generation of communications networks and services. This means that traditional approaches to network and service management may be insufficient to meet to the new requirements of these networks and services, and the design of network management architectures must be reconsidered in sight of the developments in this area.

The first paper, “The Design of a New Policy Model to Support Ontology-Driven Reasoning for Autonomic Networking”, by J. Strassner, J. N. de Souza, S. van der Meer, S. Davy, K. Barrett, D. Raymer and S. Samudrala describes a novel policy model that has been designed to address some of NGNs challenges as a contribution to bring them to reality. This new policy model is based on the original DEN-ng policy model, but changes it to make it more semantically accurate. This in turn enables it to be used with other knowledge engineering tools, such as ontology and machine learning, to reason about policies. This new policy model is part of the

FOCALE architecture which is based on context-aware policy management. Changes in context modify the set of policies that are being used, so this in turn changes the allowed functionality that can be used in the system. Hence, changes in user needs and environmental conditions can be adjusted by the FOCALE architecture.

The IP Multimedia Subsystem (IMS) emerged as the de facto standard for fixed, mobile, cable convergent next generation telecommunication networks. The second paper “From IMS Management to SOA-based NGN Management” by N. Blum, T. Magedanz, F. Schreiner and S. Wahle first outlines the challenges that have to be met by Service-oriented Architecture (SOA)-based NGN Management systems in order to cope with future requirements. After illustrating how current standardization consortia pave the way towards unified and converged SOA-based management systems for NGN infrastructures, the paper introduces FOKUS’ Next Generation Network Business and Operations Support System, a SOA-based management framework for NGNs. Based on this framework, this paper reports on prototype implementations for NGN service assurance and NGN service fulfilment.

Skype, a P2P VoIP Internet application, has gained huge popularity in recent years, in particular due to its capability to dynamically adapt itself to operate behind middle boxes such as firewalls or network address translators (NATs). A usual way adopted by Skype to delude these network devices is to use port 80, normally expected to comprise HTTP traffic. E. Freire, A. Ziviani, and R. Salles in their paper “On Metrics to Distinguish Skype Flows from HTTP Traffic” propose metrics and investigate statistical tests intended to clearly distinguish Skype flows from HTTP traffic. The study is validated using real-world experimental datasets gathered at a commercial Internet Service Provider. The experimental results suggest that the proposed methodology may be seen as a promising building block towards a system to detect general protocol anomalies in HTTP traffic.

A relatively recent research area in IT Service Management is called Business-Driven IT Management (BDIM). BDIM aims to formalize the linkage between the technical IT world and the business world with a view to enabling IT decision makers to base their decisions on their business effects rather than (only) on their technical effects. This promises to increase the value of IT services to the business and to make IT more responsive to business needs. The fourth paper entitled “SLA Design and Service Provisioning for Outsourced Services” by F. Marques, J. Sauv e and A. Moura expands on previous results concerning the design of server farms and shows that, when considering “business”, there are actually two businesses involved, the service provider and the service client, each having potentially conflicting objectives. The paper shows how infrastructure design can be performed in a way that is beneficial, in terms of profit, to both businesses. As an added value, the approach shows how Service Level Agreement parameters such as response time and availability thresholds can be optimally established.

We would like to express our thanks to all authors for their contributions to revise and extend the papers, as well as to the reviewers who helped the authors to improve the quality of the papers. This special issue introduces some challenging aspects of the networks and services of the future. Enjoy your reading.

Reference

1. de Souza, J.N., Schulze, B., Sauv , J.P., Madeira, E.R.M., Ziviani, A.: Bringing autonomic principles for managing next generation networks and services: a report on LANOMS 2007. *J. Netw. Syst. Manage.* **16**(1), 120–128 (2008)

Author Biographies

Edmundo R. M. Madeira is an Associate Professor at the Institute of Computing of State University of Campinas—UNICAMP, Brazil. He received his Ph.D. in Electrical Engineering from State University of Campinas—UNICAMP, Brazil, in 1991. He has published over 100 papers in national and international conferences and journals. He has also supervised more than 30 master and Ph.D. students. He was the General Chair of the MATA'04 (IEEE/IFIP International Workshop on Mobility Aware Technologies and Applications), Technical Program Committee Chair of LANOMS'03, Technical Program Committee Co-chair of IPOM'05 (IEEE International Workshop on IP Operations and Management) and LANOMS'07, and Workshop Co-chair of NOMS'08. He is a member of the Editorial Board of *Journal of Network and Systems Management*. His research interests include Computer Networks, Network Management and Distributed Systems.

Bruno Schulze is Professor and Senior Research Scientist of the National Lab for Scientific Computing—LNCC and Senior Research Scientist of the Brazilian National Research Council, CNPq. He has been an invited editor of several special issues of *Concurrency and Computation: Practice and Experience Journal*, on Middleware for Grid Computing. He also has been actively involved in several Technical Program Committees, organizing and chairing of national and international workshops and conferences on Middleware, Grid Computing and Networking. His research interests include Network Management, Distributed Computing, Scalable Computing, Mobile Computing, Ad Hoc and Sensor Networks, and Sensor Grids.