

Home networking: performance and architecture challenges

Khaldoun Al Agha · Walter Grote · Yutaka Takahashi

© Institut TELECOM and Springer-Verlag France 2008

Home networking is a developing area of research in telecommunications. The historical development of this sector has been shifting from node to network backbone design, and more recently, to access technologies, that is, from the core to the periphery of the network. One of the important problems being addressed nowadays is the so called “last mile” connectivity. A number of recent technologies—like WiMAX, xDSL, and Fiber To the Home—have been developed to meet this challenge. Solutions of this kind are making it possible to bring broadband connections to companies, business, and homes. What is left is the so called “last meter” problem and this is one of the areas where home networking will play an important role. True telecommuting will only be possible with present day technologies if broadband connections are made possible up to the application-oriented device. This also opens the possibilities to include new and existing devices that in the past were not being considered as part of the network. Small electronic devices are taking part of our everyday life and change our habitat so that we may optimize the way we fulfil all our daily tasks. Communi-

cations between those devices are complex since they deal with scalability, privacy, energy consumption, and new applications.

The authors of those papers that were selected from among the papers presented at the IFIP Home Networking Conference held in December 2007 in Paris, France, were invited to submit their full papers after possible extension, and we received ten papers. It is our great regret that although all the submitted papers were of high quality, only five of them were accepted after a careful review due to technical constraints of the journal.

In the first paper, Anna Pizzinat, Franck Payoux, Benoît Charbonnier, and Sylvain Meyer explore a new architecture that permits to extend the high bit coverage area in UWB standard using radiofrequency to optical signal transceivers and optical fibers. They show by means of analysis, simulation, and measurements that in spite of high attenuations to be expected from the high frequency use of UWB, it is possible to provide full network coverage in indoor environments. This offers excellent possibilities for new home networking services that need gigabit per second transmission rates.

Walter Grote, Alex Grote, and Isabel Delgado present a performance analysis to study the goodput of Wi-Fi-based home networks for mixed traffic. Two different analytical models are proposed and compared to each other, validating one of them by means of simulation. By applying these models, significant improvements on goodput can be obtained by changing configurable parameters of present day mobile devices.

The third paper of this collection, presented by Helmut Hlavacs, Roman Weidlich, Karin A. Hummel, Amine M. Houyou, Andreas Berl, and Hermann de Meer proposes a new architecture that achieves a distributed energy allocation by sharing computational resources in home environ-

K. Al Agha (✉)
LRI—Bât 490, Université Paris-Sud XI,
91405 Orsay Cedex, France
e-mail: alagha@lri.fr

W. Grote
EE Department, Universidad Tecnica Federico Santa María,
Valparaíso 2390123, Chile
e-mail: walter.grote@usm.cl

Y. Takahashi
Graduate School of Informatics, Kyoto University,
Kyoto 606-8501, Japan
e-mail: takahashi@i-kyoto-u.ac.jp

ments. As for peer-to-peer systems, the proposed architecture offers the possibility to share operations and optimize the energy consumption.

Joseph Rahmé, Aline Carneiro Viana, and Khaldoun Al Agha offer a new routing mechanism for sensor networks in the fourth paper. By balancing traffic load on possible routes while keeping complete connectivity of the network, they show that it is possible to lower energy consumption, thus optimizing overall performance both in capacity and in network survival.

The last paper which is proposed by Zulkuf Genc, Bao Linh Dang, Jing Wang, and Ignas Niemegeers, proposes a review of applications and systems that use the 60 GHz band and then presents an adaptation of them for home networking.

This special issue will offer readers different aspects of the home networking, starting from the physical and MAC layer analysis and optimization and going through the routing process and its energy-consumption-based optimization, to finish by a presentation of potential applications. We foresee that the problems and solutions addressed in this issue will be of relevance in the near future if they are accepted by the business community as important means to improve productivity and efficiency. If this happens, then the market size will make it possible that these technology improvements will make their way to the home modifying our living and working patterns. The important scaling factor of this kind of communication pushes us to optimize much functionality related to processing, energy, and applications.