

# Minimization of Power Consumption in IP Networks

(Pt11)First Author\*, Second Author\*\*, Third Author\*

Seng-Kyoun Jo\*, Young-Min Kim\*, Namkyung Lee\*, Jussi Kangasharju\*\* and Max Muehlhaeuser\*\*\*

\*Electronics and Telecommunications Research Institute, Republic of Korea

\*\*Department of Computer Science, University of Helsinki, Finland

\*\*\*Department of Computer Science, Technical University of Darmstadt, Germany

**Abstract**—This paper proposes an energy-aware packet delivery operation through network node clustering for green communications. Energy consumption has become a key factor for the evaluation of performance index in telecommunication industry. In order to prevent a waste of energy in wired network, the proposed algorithm configures energy-aware cluster consisting of one header node and multiple member nodes. Then only the header node performs packet routing and its member nodes forward packet using tag. Simulation results show that the proposed algorithm introduces more energy efficient performance than previous works.

**Keyword**—power consumption, wired network, network node clustering, energy efficiency, green network



**Seng-Kyoun Jo** received the bachelor's degree in the Department of Electronic and Information Engineering from the Korea Aviation University in 2004. He received the MS degree in the Department of Information and Telecommunications Engineering from KAIST in 2006. Since 2006, he has been a senior engineering staff of ETRI(Electronics and Telecommunication Research Institute). He has also been a Rapporteur of Q9/13 in ITU-T since 2013. His current research interests include energy saving network, smart user interface, trust management in ICT.



**Young-Min Kim** received the M.S. and Ph.D. degrees from the Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea, in information and communication in 2006 and 2011, respectively. In 2011, he joined the Electronics and Telecommunication Research Institute (ETRI) and is working on the development of the smart border router. His research mainly focuses on energy saving routing, network architecture, network protocols, and the QoS framework in telecommunication networks. He is a member of the IEEE.



**Namkyung Lee** received M.S. and Ph.D. degrees in 1996 and 2001, respectively, in Korea Aerospace University. He is currently a principal research engineer and team leader in intelligent convergence media research department, ETRI. His main research interests include Web of Object, IoT, smart media, etc.



**Jussi Kangasharju** received his MSc from Helsinki University of Technology in 1998. He received his Diplome d'Etudes Approfondies (DEA) from the Ecole Supérieure des Sciences Informatiques (ESSI) in Sophia Antipolis in 1998. In 2002 he received his PhD from University of Nice Sophia Antipolis/Institut Eurecom. In 2002 he joined Darmstadt University of Technology (TUD), first as post-doctoral researcher, and from 2004 onwards as assistant professor. In 2007 he successfully passed his 3-year evaluation for a contract extension at TUD. Since June 2007 Jussi is a professor at the department of computer science at University of Helsinki. Between 2009 and 2012 he was the director of the Future Internet research program at Helsinki Institute for Information Technology (HIIT). Jussi's research interests are information-centric networks, content distribution, opportunistic networks, and green ICT. He is a member of IEEE and ACM.



**Max Muehlhaeuser** is a Full Professor of Computer Science and head of the Telecooperation Lab at Technische Universität Darmstadt, Germany. His Lab conducts research on smart ubiquitous computing environments for the ‘pervasive Future Internet’ in three research fields: middleware and infrastructures, novel multimodal interaction concepts, and human protection in ubiquitous computing (privacy, trust, & civil security). He is also a directorate member of CASED, the center for advanced security research, and deputy speaker of the Future Internet collaborative research center MAKI. He received his Doctorate from the University of Karlsruhe and founded a research center for Digital Equipment (DEC). Since 1989, he worked as either professor or visiting professor at universities in Germany, Austria, France, Canada, and the US.