

Tutorial T-7: Distributed Mobility Management towards Software Defined Networking

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Tutorial Overview

The cellular networks, which are currently serving 6 billion cellular phones and mobile devices globally, have been using centralized mobility management for the hierarchical networks. The Internet is distributed and is more flattened, i.e., less hierarchical. As the cellular networks converge with the Internet and may become more flattened, the needed mobility management functions are expected to be distributed in the dataplane. With the fast growth of wireless devices, the data traffic in the Internet from these wireless devices is exceeding that of fixed hosts and in 5G networks it is expected to a few orders of magnitude with m2m, IOT, and other emerging wireless nodes with different mobility needs. A fundamental change to mobility management is needed.

The existing mobility management standards, the issues of mobility for the future mobile Internet, the trend of the mobile Internet are explained. Then, the proposed distributed mobility at Internet Engineering Task Force is introduced. Next, this tutorial provides how Software Defined Networking (SDN) can be applied for Distributed Mobility Management (DMM) while introducing current SDN activities in the IETF, e.g., how the architecture and functions of SDN are built and used for control and data planes of DMM.

This tutorial explains the problems of existing mobility management standards as the existing centralized cellular networks merges with the Internet which is distributed and more flat. It explains the standards work on distributed mobility in IETF. It reviews the current practices, the proposed distributed approaches to distributed mobility management and the challenges. It will provide a fundamental understanding of broad subject of mobility management but will be presented in terms of easily understandable concepts.

Outline

- 1 Trend in wireless mobile Internet
- 2 Cellular networks and Internet: growth, comparison and convergence
- 3 Why mobility management
- 4 Review of existing mobility management protocol standards in IETF
- 5 Why is existing mobility management insufficient
 - 5.1 Centralized and hierarchical Cellular networks versus distributed Internet
 - 5.2 Issues with existing centralized mobility management
 - 5.3 Network evolution towards flattened wireless Internet
 - 5.4 Non-optimal route problem with existing centralized mobility management
 - 5.5 Rapid growth in mobile devices and scalability problem
 - 5.6 Mobility management overhead problem
- 6 Fundamentals of distributed mobility
 - 6.1 How does mobility management fit into the distributed Internet
 - 6.2 Use cases of distributed mobility
 - 6.3 Network-based distributed mobility
 - 6.4 Host-based distributed mobility
- 7 Ongoing work and IETF

- 7.1 Distributed mobility requirements
- 7.2 Gap analysis and Current practices
- 7.3 Working team activities for distributed mobility
- 8 Software Defined Networking for mobility management
 - 8.1 Overview of Software Defined Networking (SDN)
 - 8.2 SDN activities in the IETF
 - 8.3 SDN for mobility management
 - 8.4 Examples
- 9 Challenges and ongoing work

Presenter Biographies

Jong-Hyouk Lee received his B.S. degree in Information System Engineering from Daejeon University in 2004 and carried the M.S. and Ph.D. work in Computer Engineering at Sungkyunkwan University, Korea (M.S., 2007; Ph.D., 2010). In 2009, he joined the project team IMARA at INRIA, where he undertook the protocol design and implementation for IPv6 vehicular (ITS) communication and security. He started his academic profession at the Network, Security, and Multimedia (RSM) Department of TELECOM Bretagne, France in 2012 as an Assistant Professor. In September of 2013, he moved to Sangmyung University, Korea. He is involved in standardization activities at the ISO TC204 WG16, ETSI TC ITS, and IETF. He twice received Excellent Research Awards from the School of Information and Communication Engineering, Sungkyunkwan University, Korea. He won the Best Paper Award at the IEEE WiMob 2012 and received 2015 Best Land Transportation Paper Award from the IEEE Vehicular Technology Society. He was a tutorial speaker at the IEEE WCNC 2013 and IEEE VTC 2014 Spring. In November 2014, he was selected as the Young Researcher of the Month by the National Research Foundation of Korea (NRF) Webzine. Dr. Lee is a senior member of the IEEE. He is an associate editor of Wiley Security and Communication Networks and IEEE Transactions on Consumer Electronics. Research interests include authentication, privacy, mobility management, and protocol analysis.

H. Anthony Chan received his PhD in physics at University of Maryland, College Park in 1982 and then continued post-doctorate research there in basic science. After joining the former AT&T Bell Labs in 1986, his work moved to industry-oriented research in areas of interconnection, electronic packaging, reliability, and assembly in manufacturing, and then moved again to network management, network architecture and standards for both wireless and wireline networks. He was the AT&T delegate in several standards work groups under 3GPP. He moved to academia as professor at University of Cape Town in 2004, and moved again to industry research as he joined Huawei Technologies in 2007. His current research is in emerging broadband wireless network technologies. He contributed to mobility standards in both IETF and IEEE and is the editor of an IETF DMM Working Group draft on the requirements on distributed mobility management

Dr. Chan is a Fellow of IEEE, chair of IEEE Standard 802.21c Task Group on Single Radio Handover Optimization, Vice-chair of IEEE standard 802.21 Working Group on Media Independent Handover, honorary professor at The University of Hong Kong, and adjunct professor at Hong Kong Polytechnic University. He has authored/co-authored over 200 conference and journal papers, a research handbook,

several book chapters, and 16 patents. He is a Distinguished Speaker of IEEE ComSoc and IEEE CPMT Society, and had delivered 40 conference tutorials / short courses and 6 invited speech / keynotes.