

Achieving High Spectral Efficiency in IP Wireless Networks Through Robust Header Compression

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Abstract

The past decade has witnessed a strong trend of the convergence towards a packet-switched all-IP infrastructure in wireless networks. The domination of IP packets in cellular data communications has made header compression a vital process in wireless networks because of its important role in substantially improving spectrum efficiency by increasing packet payload. As competition intensifies for the limited bandwidth resource among a growing number of wireless applications, services, and users, it no longer suffices to only focus on PHY/MAC layers for spectral efficiency improvement. In this work, we present an innovative, “trans-layer” approach to integratively improve overall network efficiency. We propose an innovative approach by modeling header control as a partially observable Markov decision process (POMDP) in order to maximize the success rate and hence the efficiency of ROHC decompression. Unlike the “cross-layer” concept, our POMDP framework for ROHC relies on “trans-layer” information observed through multiple interactive network layers, for optimized header compression design and control decisions. We develop novel methodologies and architectures to jointly optimize header compression and lower layer decisions in wireless networks to achieve significant improvement of transmission efficiency and robustness.

Speaker’s Biography

Dr. Zhi Ding (S'88-M'90-SM'95-F'03, IEEE) is a Professor of Electrical and Computer Engineering at the University of California, Davis. He received his Ph.D. degree in Electrical Engineering from Cornell University in 1990. From 1990 to 2000, he was a faculty member of Auburn University and later, University of Iowa. Prof. Ding has held visiting positions in Australian National University, Hong Kong University of Science and Technology, NASA Lewis Research Center and USAF Wright Laboratory. His major research interests lie in the general field of signal processing and communications. Prof. Ding has active collaboration with researchers from many universities including those in Australia, China, Finland, Japan, Canada,

Taiwan, Korea, and Singapore. He has coauthored over 300 technical papers and two books. Dr. Ding is a coauthor of the text: *Modern Digital and Analog Communication Systems*, 4th edition, Oxford University Press, 2009.

Dr. Ding is a Fellow of IEEE and has been an active member of IEEE, serving on technical programs of several workshops and conferences. He served both as a Member and also the Chair of the IEEE Transactions on Wireless Communications Steering Committee from 2007-2001. Dr. Ding was the Technical Program Chair of the 2006 IEEE Globecom and the General Chair of the 2016 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). He served as an IEEE *Distinguished Lecturer* (Circuits and Systems Society, 2004-06, Communications Society, 2008-09). He received the 2012 Wireless Communications Recognition Award from the IEEE Communications Society.