Centrality-Based Network Coding Node Selection Mechanism for Improving Network Throughput

Tae-hwa Kim*, Hyungwoo Choi*, Hong-Shik Park*

* Department of Information & Communications Engineering, KAIST (Korea Advanced Institute of Science and Technology)

Abstract — The problem of minimizing the number of coding nodes is caused by network coding overhead and is proved to be NP-hard. To resolve this issue, this paper proposes Centrality-based Network Coding Node Selection (CNCNS) that is the heuristic and distributed mechanism to minimize the number of network coding (NC) nodes without compromising the achievable network throughput. CNCNS iteratively analyses the node centrality and selects NC node in the specific area. Since CNCNS operates with distributed manner, it can dynamically adapt the network status with approximately minimizing network coding nodes. Especially, CNCNS adjusts the network performance of network throughput and reliability using control indicator. Simulation results show that the well selected network coding nodes can improve the network throughput and almost close to throughput performance of conventional RLNC.

Keywords — Network coding, Throughput, Centrality, Degree, Weight

Tae-hwa Kim received the M.S. degree from the Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea, in information and communication in 2007. She is currently studying for a Ph.D. degree at KAIST. Her research mainly focuses on network coding, QoS, multimedia service, WIMAX.

Hyungwoo Choi received the M.S. degree from the Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea, in information and communication in 2007. He is currently studying for a Ph.D. degree at KAIST. His research mainly focuses on wired/wireless resource control, traffic load-balancing, QoS control.

Hong-Shik Park received the B.S. degree from Seoul National University, Seoul, South Korea, in 1977, and the M.S. and Ph.D. degrees from the Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea, in electrical engineering in 1986 and 1995, respectively. In 1977, he joined the Electronics and Telecommunication Research Institute (ETRI) where he worked on the development of the TDX digital switching system family, including TDX-1, TDX-1A, TDX-1B, TDX-10, and ATM switching systems. In 1998, he moved to the Information and Communications University, Daejeon, South Korea, as a faculty member. Currently, he is a professor in the Department of Electrical and Electronics Engineering, KAIST, Daejeon, South Korea. His research interests are network architecture, network protocols, and the performance analysis of telecommunication systems. He is a member of the IEEE, IEEK, and KICS of South Korea.