Active Network Interface: Opportunities and Challenges

Dhabaleswar K. (DK) Panda
Network-Based Computing Laboratory
Dept. of Computer and Info. Science
The Ohio State University

Abstract

Modern Network Interface Cards (NICs) incorporate programmable processors, DMA channels, and a significant amount of memory on them. Thus, they are becoming faster, smarter, and intelligent and are being designated as “Active Network Interfaces.” Similar to an executive offloading common tasks to his/her secretary, a modern NIC provides flexibility to offload parts of a communication protocol from its host (CPU) to itself. Such flexibility leads to a completely new way of designing communication services (point-to-point communication, collective communication, synchronization, and QoS) for clusters with high performance, scalability, and low CPU utilization. The active NICs also provide opportunities for designing other services (such as firewall, intrusion detection, and load balancing) efficiently for cluster-based servers. In this talk, I will present such opportunities and the associated challenges in depth. Next, I will present results from many projects focusing along this objective. In the end, I will provide a short overview of the emerging InfiniBand architecture which uses active NICs extensively.

Brief Biography

Dhabaleswar K. (DK) Panda is a Professor of Computer Science at the Ohio State University. He obtained his Ph.D. in computer engineering from the University of Southern California. His research interests include parallel computer architecture, high-performance computing, user-level communication protocols, interprocessor communication and synchronization, network-based computing, and Quality of Service. He has published over 100 papers in major journals and international conferences related to these research areas. Dr. Panda collaborates with industry (IBM, Intel, Dell, Mellanox) and National labs (Sandia, Los Alamos, and Pacific Northwest) along many of these research areas. He has served on Program Committees and Organizing Committees of several parallel processing and high-performance computing conferences and on editorial boards for several parallel processing journals. Dr. Panda is a recipient of the NSF Faculty Early CAREER Development Award, the Lumley Research Award (1997 and 2001) at the Ohio State University, and an Ameritech Faculty Fellow Award. Dr. Panda's research is supported by funding from NSF, DOE, NLM, Sandia, Los Alamos, PNL, IBM, and Ameritech. Dr. Panda is listed as a distinguished scientist in “Who's Who in America” and in “American Men & Women of Science.”