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Southern Minnesota Section Newsletter

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Specialized Computer Architectures for Networking

by Jim Rose

One of the fields of computer architecture that is ripe for innovation is in the area of network processing. Network speeds are increasing faster than those of typical processors. In addition, the processing of data traveling through the network is growing more complex over time.

As a result, general purpose processing is no longer sufficient for meeting the requirements of today's, let alone tomorrow's, networks. This presentation will take a look at some of the processing demands of network traffic and how this processing is accomplished.

If a computing system is connected to two or more other systems then information must be routed between them. One or more "routers" are involved in this process. Each of these will typically classify the information (contained in a frame), determine a route, schedule the frame for transfer, and finally transfer the data. In addition, the data in a frame may need to be altered depending on the demands of the network. This processing often includes the change of an address in the header of a frame and the recalculation of the frame's checksum. The processing in a router can also go deeper in the frame to handle the implementation of such features as virtual networks, access control, data encryption, or even higher level functions such URL parsing. For all of these, we have to determine if the processing should be done in hardware, software, or a combination of the two.

For this discussion, a background understanding of the routing of data through a network will first be developed. Then we will explore some the functions required to accomplish this routing. The necessary suite of these functions varies depending on the location of the router in the network (e.g., whether the function is near the edge of the network or at the core). Therefore, we will discuss how the functions and demands vary depending on the location of the router. In addition, based on the system requirements (e.g., performance, power, and cost), the functions can be implemented in a variety of ways. Some of the techniques that have been used will be discussed.

Finally, a few of the characteristics and requirements of archititectures used in routers near the core of networks will be presented in detail. The IBM PowerNP 4GS3 is used as an example of how these functions can be implemented and the requirements met. If time permits, we can also explore some of the other architectures implemented in the industry.

IEEE Section Meeting

Jim Rose, IBM

Specialized Computer Architectures for Networking

Monday, March 19, 6:30 pm
Mayo Medical Sciences Building
(321 3rd Avenue SW, Rochester)

☞ *Pizza & socializing at 6:30 pm* ☜

Jim Rose *is a senior engineer in the Microelectronics Division of IBM. During his eight years with IBM he has concentrated on the performance optimization of various components of computer architecture, primarily in server products. During the last year he has focused on the performance of network processors -- specifically computer architectures optimized for routing network traffic.*

Jim completed his bachelor's degree in Electrical Engineering at Kansas State University in 1982. He then worked in the industrial automation industry for approximately four years where he designed real-time computer systems for industrial control. Later he attended the University of Wisconsin - Madison where he completed a master's degree in Computer Engineering, a master's degree in Computer Science, and a Ph.D. in Computer Engineering (with an emphasis on computer architecture and computer-aided-design).

Nominees & Volunteers Needed

IEEE Southern Minnesota Section officers will be elected for the 2001-2002 term at our May section meeting. The following four officers will be elected: chair, vice chair, secretary, treasurer.

If you are an IEEE member in good standing, and if you would like to run for one of these offices – or nominate someone else – please contact section chair Rob Harveland (r.harveland@ieee.org, 253-0780).

We are also actively looking for volunteers to serve on various committees

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Southern Minnesota Section

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