

# ISCA 2006 Tutorial

## **A Tutorial Title (a half-day tutorial)**

*Network Systems Design with Network Processor Technology*

## **B Presenter and Contact Information**

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## **C Abstract and Keywords**

Abstract: This tutorial discusses the design and implementation of "network systems" such as Firewalls, Ethernet switches, and Internet routers. It covers design principles and issues of traditional protocol processing systems and network processor technology. This tutorial is a concise version of the course offered by Dr. Cheng at Lehigh University: Network Systems Design (URL: <http://www.cse.lehigh.edu/~cheng/Teaching/CSE398-05/schedule.html>) with collaborations with researchers from Agere Systems, Inc.

Keywords: Router architecture, network processors, high-speed packet processing, packet classification

## **D Scope**

It is an in-depth study of network systems design with network processor technology.

## **E Potential Audience and Prerequisite**

The attendees could be anyone who is interested in learning how to offer high-speed packet processing power in the network devices. The attendees are expected to have basic knowledge about computer networking.

## **F Motivation**

Network processor technology is an essential approach to offer high-speed packet processing power in network devices for high-performance routing/switching, core network service provisioning, policy support, multimedia home networks, and network quality-of-service (QoS) support.

## **G Objective**

The participants will learn *(i)* the design and implementation principles of "network systems" such as Firewalls, Ethernet switches, and Internet routers; and *(ii)* design principles and issues of traditional protocol processing systems and network processor technology for high-speed packet processing.

## **H Outline**

Part I: Traditional Network Systems (1 hour)

- Introduction on computer networks
- Computer architecture of network systems
- Packet processing algorithms
- Packet processing functions
- Protocol software
- Hardware architecture for packet processing
- Classification and forwarding
- Switching fabrics

#### Part II: Network Processor Technology (1 hour)

- Network processor introduction
- Complexity of network processor design
- Network processor architectures
- Scaling a network processor
- Design tradeoffs and consequences

#### Part III: Example Network Processor (1 hour)

-- with lab demos co-designed with Dr. Dale Parson of Agere Systems, Inc.

- Overview of Agere network processor and FPL classification language
- System architecture and modeling
- Stateful network processor applications
- Policing, buffer management and traffic shaping
- Network processing trends

### **I List of Handouts**

Corresponding to the outline above, a hard copy of about 180 slides will be handed out to the tutorial attendees.

### **J Major References**

- [1] D. Comer, *Network Systems Design using Network Processors, Agere Version*, Prentice Hall, October 2004, ISBN: 0131489275.

### **K Supplementary Materials**

This tutorial has been offered at HPSR 2005 (2005 IEEE Workshop on High Performance Switching and Routing, Hong Kong, May 12-14, 2005; <http://www.cs.ust.hk/hpsr05/>). It is a concise version of the course offered by Dr. Cheng at Lehigh University: CSE398 -- Network Systems Design (<http://www.cse.lehigh.edu/~cheng/Teaching/CSE398-05/schedule.html>) with collaborations with researchers from Agere Systems, Inc.

### **L Biographical Sketch**

Dr. Liang Cheng's biographical information is available at the following URL:

<http://www.cse.lehigh.edu/~cheng/>