



## **Recent Advances in Communication and Internet Technology**

### **Guest Editorial**

Rapid progress in communication technology in recent years has brought almost exponential growth of the Internet and communications as a whole. With a more capable Internet than ever before, various challenges are being encountered by researchers both in the academia and the industry. Many different applications and services are evolving with a potential to dominate the scenario. To encourage promotion of knowledge and disseminate state of the art research in these areas, the idea of this special issue on *Recent Advances in Communication and Internet Technology* of Telecommunication Systems journal was launched.

The response to the call for papers was very encouraging. A handsome number of our fellow colleagues carrying out research in the area submitted papers for publication in this special issue, resulting in 29 submissions for peer review. In addition, we invited established researchers to present articles for the benefit of readership of this issue.

We were delighted to observe that most of the submissions were of excellent quality, and were reporting interesting research results. A careful peer review process of the papers was conducted, with the primary aim of ensuring a fair treatment to all the submissions. Therefore, we set a target of having at least three reviewers per paper. Again, we contacted our honored colleagues in related fields to cooperate in the process. Despite having no prior acquaintance or contact, many of them responded positively to conduct the reviews voluntarily. We were on with the review which had been based on the voluntary efforts of more than 80 individuals. Some papers got reviewed by more than three experts. Our sincerest gratitude to those who spared their valuable time to allow us to move ahead with this mission.

The step that followed was to summarize the reviewers' comments, take a look at the papers, and reach a decision. This phase, as anybody would comprehend, is the most crucial one from guest editors' points of view. On the basis of reviewers' reports and exercising our discretion where necessary, we decided to accept/conditionally accept 14 submissions. Papers appearing in this special issue cover a wide spectrum of communication and Internet technology.

Issues related to QoS assurance through differentiated service or MPLS has drawn focus of several contributions. A proposal for egress router scheduling, named as Shaped Deficit Round Robin (SDRR), has been presented in the paper "A Class of Shaped Deficit

Round Robin (SDRR) Schedulers”. The scheme offers better performance when tested with output peak rate shaping, weighted throughput and worst case packet latency per flow. Capacity planning for Expedited Forwarding and Best Effort traffic in differentiated service networks has been addressed in another work titled “Capacity Planning of DiffServ Networks with Best-Effort and Expedited Forwarding Traffic”. The authors propose Lagrangian Relaxation and Subgradient Optimization method to reach their target. Traffic engineering using MPLS is at the focal point of the contribution “Performance Analysis for QoS Provisioning in MPLS Networks”. The authors consider what a Label Switched Router do in the presence of both real time and non-real time applications. For real time applications, delay sensitivity and for non-real time applications, packet loss concerns have been dealt with. Another work, “A Comparison of the Utilization Efficiency between a Stateful and a Stateless Admission Control in IP Networks in a Heterogeneous Traffic Case”, presents a comparison between stateful (e.g., intserv) and stateless service (e.g., diffserv). The scalability issues are well handled in diffserv. But it fails at overloaded conditions for a specific class. The authors propose an admission control function which can determine whether it is appropriate to admit one service differentiated flow along the nominated network path. The paper also discusses the bottlenecks like potential loss of efficiency with respect to ideal stateful admission control.

Delay concerns for real time UDP applications are also addressed in “Adaptive Payout Buffer Algorithm for Enhancing Perceived Quality of Streaming Applications”. Here the authors focus on payout buffer algorithms. Depending on the Mean Opinion Score of played audio and network parameters, the authors come up with a new payout buffer algorithm considering user’s perceived quality of real-time applications.

“Channel Allocation Scheme for Handoff Control in Wireless Ad Hoc Network with Group Mobility” is a work on group mobility in ad hoc networks that will attract the readers with its proposed flow handoff mechanism. The method relies on mobility prediction and remote information to support a burst handoff call traffic occurring due to group mobility.

Readers will also find the “Proposal for *st*-Routing Protocol” interesting. Here, *st*-numbering from graph theory is applied for making routing decisions in the network. This new mechanism, though in a theoretical stage for the moment, can yield efficient routing in appropriate cases.

This special issue contains an article on dynamic multicasting. The title is “A Distributed Routing Method for Dynamic Multicasting”. The authors propose a heuristic solution that addresses multicast tree cost minimization. This scheme, however requires information about a node’s staying duration in the multicast network at the time of joining it. Experiments show that this algorithm approximates the ideal value most closely.

One of the contributions, “Advances in Active Queue Management (AQM) Based TCP Congestion Control”, deals with Active Queue management issues. But the key point here is, rather than dealing with congestion reactively, this mechanism handles

congestion or incipient congestions proactively. Use of proportional integral derivative feedback control is made.

Peer to peer communication has recently been a matter of interest for many researchers. This special issue features one work, “A Peer-to-Peer Message Exchange Scheme for Large-Scale Networked Virtual Environments” in this area. The authors notice that for a massively participated application, the scalability depends on the manner in which update messages are exchanged among users. Therefore, they design a peer-to-peer communication architecture for chatting application that does not require costly servers or special infrastructure.

The majority of applications over the Internet use TCP as the transport protocol. We have a contribution, “A Proposal for Efficient TCP Flow Control over Satellite Networks”, in this special issue that emphasizes the needs to improve TCP performance over satellite links. The work addresses the problems that are associated and provide their solutions to yield high performance. The proposal is named TCP Seamless by the authors. The reasoning is, in case a segment loss occurs due to link error only, ideally, TCP performance will not be affected.

In mobile wireless networks, resource management issues have always been challenging. One of the contributions titled “Adaptive Resource Management in Mobile Wireless Networks Using Feedback Control Theory” proposes the idea of feedback control approach for the purpose. The scheme dynamically adjusts the number of guard channels depending on the feedback regarding call dropping probability. The effects of the choice of parameters have also been studied in the process.

Normally the code blocking property of OVSF is alleviated using code reassignments. But this incurs high delay and decreased throughput. The paper “A Code Assignment Algorithm for Nonblocking OVSF Codes in WCDMA” proposes a new nonblocking OVSF that does not require code reassignments.

Another contribution, titled “Lossy Communicating Finite State Machines”, deals with a network of Communicating Finite State Machine (CFSM). The authors deal with a new type of action, i.e., the deletion action. This leads to the concept of Lossy CFSM (LCFSM). The LCFSM model can be used to specify and verify unreliable communication channels. LCFSM can also be used to model datagram losses in the presence of buffer space shortage.

We have one invited papers entitled “Realizing the Ubiquitous Network: The Internet and Beyond” which presents an outline of a project STONE related to ubiquitous networking. The authors take into account two major future network characteristics, namely, “3C everywhere” and “physical interaction”. They plead the idea of creating a device independent service for any user. STONE (Service Synthesizer On the Net) has been implemented at the University of Tokyo. The aim is to provide distributed transparency, service consistency and context-awareness.

In conducting the entire process, several persons provided us with invaluable help. The person who deserves a very special thanks is Salim Zabir of the Tohoku University who was deeply involved in every stage of the process, including call for papers, arranging the reviews, and organizing the reviews reports. We would also like to mention the

names of Naoki Nakamura, Hiroko Yasuda and Patty Wood who helped in the various steps of organizing the special issue. Without their help, a smooth handling of different steps would have been difficult if not impossible.

Finally, we would expect that people working in related fields will find this special issue useful. Thanks again to all of our colleagues – the authors, the reviewers and even the ones who could not accept our proposal of reviewing papers for their preoccupation.

**Guest Editors: Norio Shiratori**

*Tohoku University, Japan*

**Mohammed Atiquzzaman**

*University of Oklahoma, USA*