

FOREWORD

The current Internet is an outgrowth of the ARPANET (Advanced Research Projects Agency Network) that was initiated four decades ago. The TCP/IP (Transmission Control Protocol/Internet Protocol) designed by Vinton Cerf and Robert Kahn in 1973 did not anticipate, quite understandably, such extensive use of wireless channels and mobile terminals as we are witnessing today. The packet-switching technology for the ARPANET was not intended to support real-time applications that are sensitive to delay jitter. Furthermore, the TCP/IP designers assumed that its end users – researchers at national laboratories and universities in the United States, who would exchange their programs, data, and email – would be trustworthy; thus, security was not their concern, although reliability was one of the key considerations in the design and operation of the network.

It is amazing, therefore, that given the age of the TCP/IP, the Internet has successfully continued to grow by supporting the ever increasing numbers of end users and new applications, with a series of ad hoc modifications and extensions made to the original protocol. In recent years, however, many in the Internet research community began to wonder how long they could continue to do “patch work” to accommodate new applications and their requirements. New research initiatives have been launched within the past several years, aimed at a grand design of “a future Internet.” Such efforts include the NSF’s FIND (Future Internet Design) and GENI (Global Environment for Network Innovations), the European Community’s FP 7 (Frame-network Program, Year 7), Germany’s G-Lab, and Japan’s NWGN (New Generation Network).

It is therefore extremely timely that Drs. Raychaudhuri and Gerla are publishing this book at this juncture, because better understanding of rapidly evolving wireless technologies and emerging new applications will be crucial in deciding the right architecture for the future Internet. It is not clear at this point which approach among several alternatives proposed or being pursued – ranging from

so-called clean-slate architectures to continuous enhancements of the current IP network – will eventually prevail, but there is no question that the *future Internet* architecture must be built with wireless technologies as its major components, and mobility of end users/terminals and security of applications and services must be adequately supported.

The conventional architecture of treating a wireless network as an L-2 level *access* network connected to the core network (i.e., L-3 layer) through a gateway is becoming outdated. As pervasive computing in smart devices and wireless sensors/actuators attached to numerous things are expected to become predominant end users/devices in a future network, a novel network architecture and protocols with end-to-end control and routing, including heterogeneous wireless subnetworks as an integrated part of the entire network, will be called for to provide mobility services with satisfactory performance, security, and scalability. Up to now, wireless technologies have been largely treated as synonymous with wireless *communication* links, where a wireless channel serves merely as an interface between the end mobile user and the core network. In the future network, however, we anticipate that in-network *computing* (or *processing*) of data from sensors and *storing* (or *caching*) of data based on its content ought to be performed.

The introductory chapter of this book presents a variety of emerging wireless networking scenarios and identifies requirements for a new architecture and protocol for each of the mobile networking scenarios. These requirements are then aggregated into a number of key protocol features. Technical issues associated with implementing these wireless/mobility requirements into a unified comprehensive future Internet architecture protocol are then discussed. In the concluding chapter, Drs. Raychaudhuri and Gerla review the overall challenge of evolving the current Internet to meet these mobile networking needs and provide a roadmap for the future.

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