

## Book review of ‘Network Services: QoS, Signalling, Processes’ by Harry Perros

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Bob Warfield

University of Melbourne

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- **Summary:** This article reviews *Networking Services: QoS, Signalling, Processes* [Amazon Digital Services: ASIN BooIJFZTWC], by Harry Perros, Computer Science Department, North Carolina State University, USA; 2014, 516 pp.

### Introduction

Rushing out of your office for your next meeting, you grab your smartphone and phone a colleague. Still talking on the phone, you hop into a taxi. You expect your mobile call to be of a certain quality: you should get a connection within a short delay; you and your colleague should be able to hear each other clearly – even recognise each other’s voices; and the call should not drop out despite the taxi going through a tunnel. Many technologies are brought to bear to make the phone call possible, and to deliver the quality that you are paying for.

The book *Networking Services: QoS, Signalling, Processes* by Harry Perros deals with the very important topic of delivering networking services over the Internet, such as Voice over IP, video conferencing, and IPTV. The impressive breadth of coverage is obvious from a listing of the topics covered. After the Introduction, Part 1 (Processes) covers definitions, characteristics, and frameworks, plus process modelling. Part 2 deals with Quality of Service & Quality of Experience. Part 3 is about signalling to establish a service (mainly SIP and IMS). Part 4 deals with QoS in the Transport Network: MPLS, and congestion control. The final Part gives an introduction to capacity planning, including queueing and simulation.

The topics covered are sometimes the subject of separate text books. However, all those topics (and perhaps more) have a direct bearing on the quality of networking services. Therefore, with the aim of giving some guidance as to whether the reader should buy the book, this review dips into selected parts of this very broad range of topics.

## Quality of Experience and Quality of Service

The book begins by introducing the topic of Quality of Experience and Quality of Service. The former term relates to customer perceptions and opinions, while the latter term refers to Network Performance. The author emphasises end-to-end delay, jitter, and packet loss rate (though not throughput and availability). The author also emphasises the value of connection-oriented networks (using MPLS as an example) for guaranteeing end-to-end QoS, and also foreshadows that IntServ and DiffServ are covered in later Chapters. Also introduced is the concept of Next Generation Networks. The Introduction finishes with a survey of the important standards organisations. I consider it very useful to include this material in engineering education. Standards work is fundamental to telecommunications, but understanding the processes behind competing proposals is often elusive for student engineers, and indeed practitioners.

The book moves on to consider basic economic and marketing aspects of services (such as co-production of value), and covers the modelling of business processes. Including these topics in a treatment of service quality is very welcome, since many problems arise not from the network itself but from the processes by which services are delivered. Perhaps the classic problem is the perceived unreliability of the promise “our technician will be there to install your service between 2PM and 5PM tomorrow”.

Both ‘objective’ and ‘subjective’ quality are dealt with in Chapter 4. Models for predicting the user experience of voice and video services are discussed. This is fundamental to making some estimate of what the customers will think of a service, based on measurements of network performance parameters. The coverage in the book provides very useful material that has great value but is often overlooked. Apparently engineers, mistakenly, tend to consider that the opinions of customers are not ‘objective’ enough.

## The Session Initiation Protocol (SIP)

The signalling protocol SIP and its use in the IP multimedia system (IMS) are well covered. The SIP section contains a very informative description of the SIP protocol, its procedures and its message/method contents. The descriptions of the important header fields in SIP are excellent. The brief explanations about why things are done one way and not another are helpful to the reader's understanding of the protocol. The diagrams are clear and complement the text well. The omission of a statement of the purpose of the SIP signalling at the network level (that is, to find the destination terminal and exchange IP addresses) could leave the reader confused at times. The emphasis on the two SIP 'add-on' features of Presence and Instant Messaging before explaining the basic SIP procedure was confusing.

The examples of use of SIP in the IP Multimedia Sub-system (IMS) used by large networks were useful but there is little information about other uses of SIP such as in most VoIP Service Provider networks. A few out-of-date References and minor editorial mistakes detracted slightly from the good protocol descriptions.

## Other topics

IntServ, DiffServ, and MPLS (multiprotocol label switching), including Label Distribution Protocols, are all covered in Part 4. Chapter 11 of Part 4 surveys some congestion control technology, though does not cover TPC Flow Control or Congestion Avoidance and Control.

Capacity planning, queueing, and simulation are the final topics. The treatment of planning is high-level and descriptive. Of course, as a small chapter in the book, this material serves as a brief introduction to a large body of knowledge. As such it will be very valuable educational material for newcomers, and a useful reference for practitioners. Some minor glitches appear in the Queueing and Simulation parts. In Section 15.2 the definition of the Percentile of the Waiting Time is given as “The percent of the waiting that a customer has to wait more than a given amount of time” which is not likely to clarify the concept for a newcomer. Towards the bottom of the second paragraph of 15.3.1 the expression for the Poisson probability mass function uses the term  $e^{-\lambda}$  as an exponent instead of including the factor  $e$  to the power of  $-\lambda$ . The intention is clear, but again a newcomer may be confused by this simple error in superscripting. Readers with familiarity with the basic principles will not be too concerned by small problems of this sort.

## Conclusions

Given the topics already covered, it would seem churlish to ask for more. However there are some aspects of quality in the telecommunications industry that still remain to be considered. Application performance measurement and management is a trend in Network Management which comes the closest yet to measuring quality as it is actually delivered to customers. Carrier Ethernet technology is notable for its emphasis on standardised management interfaces, and end-to-end quality management. Quite plausibly this may overshadow the treatment of quality in Layer 3, though it will not provide guaranteed quality through the TCP/IP global Internet. Arguably, Net Neutrality is not entirely a technical issue, and so may not be expected in a technical textbook. However the Net Neutrality debate is shaping the way quality is delivered over the Internet, particularly in the USA, and therefore deserves discussion.

The great strength of the book “*Networking Services: QoS, Signalling, Processes*” lies in the range of technical topics included. Many practicing engineers, as well as students, would benefit from considering all the material in the book. The experience as well as the breadth and depth of the author’s knowledge all contribute to a stimulating and valuable learning experience for both students and practitioners. Balancing that considerable strength, a small weakness arises from many small inconsistencies and typographic errors, which would be fixed by thorough proofreading. Are those small items merely quibbles, or are they significant issues? As is the case with networking services, the answer will depend on the perception of the end user. This particular end user will be very happy to use the book as a valuable guide to the broad areas of signalling and quality in networking, with the reservation that some details require critical evaluation rather than passive acceptance.

## Acknowledgements

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