

July 2006

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Book Review – Wireless Networking in the Developing World

In the period 1994 to 2000 I was privileged to be an instructor with the Internet Society's Developing Countries Workshops. My track was T4, Network Management, and in a relatively intense week myself, Barbara Fraser, Nur Zincir, David Conrad, and Scott Bradner and a collection of amazingly enthusiastic individuals from around the world looked at topics related to the management of Internet networks. The final snapshot of the course from 2000 is at <http://www.potaroo.net/t4>.

It was a real challenge to gather together good material for the course, and, as instructors, were all aware that there is only so much presentation material you can pack into one week, and we were constantly on the lookout for good training material that would accompany the students of the course back to their workplaces, and help them make a difference where they lived and worked.

So I was really pleasantly surprised to see this book come out early this year. Were it available at the time I'm sure that we would've found some way to make good use of it in the network management course. In any case I'd thoroughly recommend this book to anyone who reads this column. Not only is it a good read, but it is an excellent example of the type of material that really helps in the area of practical training that can help enthusiastic individuals realize their aspirations to make a difference in their communities.

Wireless Networking in the Developing World
Rob Flickenger et al,
234 pages, Published January 2006,
Available at <http://wndw.net>
ISBN: 1-4116-7837-0

To quote from the book's web site:

This book was created by a team of individuals who each, in their own field, are actively participating in the ever expanding Internet by pushing its reach farther than ever before. Over a period of a few months, we have produced a complete book that documents our efforts to build wireless networks in the developing world.

Even though I don't live and work in what is commonly regarded as part of the developing world I found this to be a unique and informative book, as its practical descriptions of wireless networking have application in many environments.

Given the widespread availability of the raw materials of computers, open source software, Wi-Fi equipment, various pieces of recycled kitchen-ware, scrap metal and plastic, and a wealth of on-line information resources it is possible to construct inexpensive high speed wireless network systems almost anywhere these days. However, perhaps the most visible missing component of the overall picture, but also the most valuable, is a practical path through this wealth of information on how to construct wireless networks, and a path that is based on the recent experiences of others who have constructed cost effective and practical wireless networks in communities in the developing world. This book sets out to meet that goal.

The book starts with a description of radio physics covering the basics of the topic. It builds upon this a description of the typical radio design trade-offs between information capacity and radio penetration, and describing the commonly encountered factors of absorption, reflection, diffraction and interference. I found the practical approach to Fresnel zone calculation and the description of the relationship between distance and antenna height so well-done that I was tempted to embark on the design of a neighbourhood Wi-Fi straight away!

In the opening chapter there are a set of practical questions and pointers to where the book provides material to assist in answering them. To give a feel for the technical level of this book, a few examples of the questions that the book addresses are : “How can I use solar panel to power my wireless node while keeping it online overnight? Page 184.”, or “How good is the range of my access point? Page 51”, and “What other books should i read to improve my wireless networking skills? Page 242”.

The initial chapter on network design is somewhat of a hybrid section, covering a mix of physical layout of a wireless network and TCP/IP considerations. There were the usual summaries of IP address structure and an introduction to routing. There is, however, a more detailed study of the deployment of the OLSR routing protocol. This is a link state routing protocol that is open source, supportable by Linux-based Access points and accommodates link quality metrics into the routing protocol metric. I found this section's consideration of the link budget a useful practical description of the considerations that are unique to the wireless world, and the worked examples are excellent, together with some useful references to online tools. This is a relatively dense chapter where many topics are covered in a relatively short space. I suspect that an interested reader would want to drill down further before feeling confident enough to manage a service network, but some carefully chosen references to further reading are there, so that the reader can follow up this introductory material with more specialized references.

The section on antennas and transmission lines was also well structured. I'd heard of using cylindrical cans as Wi-Fi antennas, but knew little of the detail of how to actually do it. This book not only explains their design, but provides a step-by-step illustrated guide to their construction. It also provides a good description of what is involved in outdoor installation of wireless equipment. The consideration of commercial solutions as compared to the DIY approach was carefully presented, as was the section devoted to security considerations

Aside from the technical considerations the book also has some very interesting case studies of wireless networking projects, and was careful to include both success stories and failures. The issues in the developing world about combining technical capability with practical business solutions for communities that can be financially self-sustaining are indeed challenging, as the case studies show. They provide not only useful information about related experiences in setting up such network services, but also show how such projects can be assessed in a constructive manner.

Having spent some time working in this area myself as part of the ISOC Developing Countries Workshop training team one develops an appreciation of what constitutes truly useful and valuable training material, and this book is perhaps the best example I've seen yet. Its practical, helpful, technically accurate, and relatively complete in terms of coverage of material. Where the book does not dive into fine detail it provides useful references for further reading. The book is thoughtfully written in a simple non-nonsense style and does not hide behind technical jargon. Above all, its material that can instil confidence that these networks can readily be built and operated by people like you and me.

I certainly wouldn't call myself an expert after reading this book, but the next time a radio technician arrives in the office and starts talking about radiation patterns, front-to-back ratios and the relative merits of omnis and yagis, at least I'll have an idea of what is being said. Even better, I might even be able to show him my own modest efforts in DIY Wi-Fi networking by then!

This is not a conventional technical book in the sense that it does not come with a conventional technical book price tag. The book is published in a manner as to be readily available in the developing world, so an online publication model has been used here. The PDF is freely available under a Creative Commons Attribution-ShareAlike 2.5 license at <http://wndw.net>, and they have managed to squeeze all 254 pages into an impressively small 1.92Mbyte file. Related resources, and ways that you can assist in this project, can be found at <http://wndw.net>

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The above views do not necessarily represent the views or positions of the Asia Pacific Network Information Centre, nor those of the Internet Society.

About the Author

GEOFF HUSTON holds a B.Sc. and a M.Sc. from the Australian National University. He has been closely involved with the development of the Internet for many years, particularly within Australia, where he was responsible for the initial build of the Internet within the Australian academic and research sector. He is author of a number of Internet-related books, and is currently the Senior Internet Researcher at APNIC, the Regional Internet Registry serving the Asia Pacific region. He was a member of the Internet Architecture Board from 1999 until 2005, and served on the Board of the Internet Society from 1992 until 2001.