Foreword

Networking is young. Many of us, with only a touch of grey in our hair, can easily remember the days before the World-Wide-Web, when looking up an obscure fact meant a trip to the library. We remember the infancy of email, back when we might send an email to a research colleague, but certainly not to our parents. Home networking was totally unnecessary, since the single terminal at my home connected quite nicely to the university's computer via a 1200 baud modem over a normal telephone line.

Now, scarcely a generation later, an inexpensive home network connects my laptop, computers, and digital television recorder. It is inconceivable that I would go on a trip without my laptop, and I expect Internet access in my hotel room along with the television and telephone (which I am far less likely to use). As I wait in line at the grocery store, I will probably check my email on my cell phone. I expect to be connected, to be networked, wherever I go.

As networking enters the next generation, there are a multitude of challenges. The Internet Protocol (IP), for better or worse, is firmly in place. Telecommunication providers are competing to gain market share by expanding their networks to provide data, video, and voice, while providing some guarantee of performance and quality of service. Cellular networks must co-exist with local broadband networks such as WiFi yet interact with satellite networks. Governments and businesses are struggling to adapt to this new information infrastructure.

This handbook identifies key issues that networks face as they enter the next generation and highlights promising technologies. The first section focuses on the shared core network and multiple access networks, examining modeling, security, performance, and delivery methods. The next section more deeply examines the service layer, emphasizing service control and quality of service — key components necessary for the integration of data, video, and voice. That section is complemented by the third section, which examines the terminal / antenna systems that will be necessary and their channel characteristics.

The final section is particularly far-reaching, considering the societal impact of these next-generation networks. What role does information technology play in the development of e-government? What will supplant my primitive home network a decade from now? How will the telecommunications industry change? How will the network consider my location to better support e-commerce? Do we have any hope of answering these questions in some unified framework?

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Considering its genesis, applications of telecommunications and networking have evolved over a rather extensive period. From the humble beginnings of the telegraph in the 1840's, this evolution continues at an ever-increasing pace. Advancements like the telephone in 1876, wireless telecommunication in the 1880's, and transatlantic wireless communication at the start of the twentieth century have planted the seed for a vision of instant, seamless global communication. The integration of voice, data, and image created the emergence of new media. With this new media came new opportunities in commerce, governance, and social networking. This handbook offers a

comprehensive snapshot of the state of this new media, the technology behind it, the applications afforded by it, and the challenges to the direction in which it is currently headed.

It is difficult to predict the ultimate goal of next generation networks, or even the next 'big thing.' Current thinking suggests its direction will be some hybrid of wired and wireless networking, will facilitate new, more tightly integrated applications, and likely move us closer to perpetual real-time global telecommunications involving ultra-portable multimedia appliances. Today we see the application of some of these appliances, but with convergence comes both new opportunities and challenges. Privacy, for example, is a current issue that continues to be threatened by smart, ubiquitous networking.

When Netscape 1.0 was released in 1994, the Internet became an overnight success, as they say, 100 years in the making. Internet traffic grew exponentially in days, and phrases like 'in Internet time' offer a reflection of the increased speed with which applications and development continue to progress. Today's trends, such as Web 2.0, illustrate the continued growth of applications unimagined a very short time ago.

With such applications comes a need for ubiquitous, perpetual wireless network technologies. This handbook discusses these technologies from a series of perspectives. It starts by looking at new and emerging models to increase interoperability of multiple network architectures, moving from past goals of rapid application development to current demands for network performance. New applications will demand greater bandwidth for more devices seeking multicast capabilities. With market penetration of cellular telephones approaching half the world's population and applications on network devices rapidly converging, these are important issues. Service providers will be challenged to offer new types of service at faster speed to increasing numbers of consumers. The 'always connected lifestyle' described in the book poses daunting performance and provision challenges for next generation networks. What these connections will offer in terms of business, government, and personal lifestyle remains to be seen. One can only conclude from perusing a timeline of developments in the technology, and applications of that technology, that change will continue with a voracious appetite for new bandwidth, network appliances, and corresponding services.

This book offers a comprehensive view of new technologies, applications, and directions for next generation networks. As the Chinese curse is said to state: 'May you live in interesting times'. We do. The book discusses forthcoming challenges and issues, and offers a broad snapshot of the state and directions of wireless networking in 2008. It will be intriguing to follow the next ten years of network developments, and then to look back to this manuscript to see exactly how close our visions proved to be. If anything, I expect we will have underestimated the magnitude and complexity of the changes ahead, bold as our predictions may be. I hope you find the material in this book as comprehensive, compelling and exciting as I do.

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