ATM Networks
Concepts and Protocols

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ATM Networks Concepts and Protocols

Second Edition

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Dedication Page

To My mother Sneha Lata Kasera
for making me what I am

Sumit Kasera

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Preface

Raison d'être

It goes without saying that we are now living in a networked world; a world where networking technologies plays a very important role in our lives. Be it the railway booking counter, or automated banking, be it the ubiquitous Internet or the global wireless telephony systems, a life without networks is inconceivable.

Among the plethora of networking technologies that have emerged in the last two decades, ATM is considered to be a breakthrough one. The popularity and pervasiveness of ATM lies in the fact that it seamlessly integrates local area network and wide area network—a concept also referred to as *single network for desktop-to-the-core*. Moreover, ATM provides a single platform for voice, video and data, thereby leveraging the process of *network convergence.* Apart from this, ATM also provides quality of service. All these factors are considered unique selling points of ATM technology.

When I first laid my hands on ATM technology and wanted to know more on the subject, I found to my surprise that there was hardly any book that provided a conceptual treatment to ATM. This was despite the fact that ATM technology had attracted widespread interest. Majority of the books were a shadow of ATM standards, derived from ITU-T and ATM Forum publications. Moreover, these books had too many underlying assumptions and were hopefully inadequate in giving an insight into the topic. The concepts got hidden in too many abbreviations and too many jargons. The result was that people were more concerned with whether ATM was a 'telecommunication network' or a 'datacommunication network', rather than trying to understand what either of them meant. I also observed that authors of technical books wrote with the assumption that technical stuff ought to be complicated because it is technical. Contrary to the above viewpoint, I believed that everything is more or less simple unless made otherwise.

Given this, I felt a need to write a book on the subject that was simple, and easy to understand; a book that could solve the problems that I was facing when I was studying; a book that provided a comprehensive overview of ATM, and a book that offered fewer assumptions. This thought provided the motivation to write a book.

Second Edition

The first edition of this book was released in last quarter of 2000. This book comprised of basic concepts of networking as well as details of ATM Networks. The organization of the book made many reviewers opine that the target audience was unclear. One of the reviewers felt that "If the target audience is someone who doesn't know networking, they won't be trying to learn ATM, and if one is trying to learn ATM, the basic networking details are far higher than expected." With such review comments, it was clear that lot of material on the basic concepts of networking were misfit and demanded another form or another manifestation.

The options were not many. They could be deleted and hence lost forever. Alternatively, they could be posted on the Internet in a rather raw form. The third option was to put some effort and work on the contents to give it a meaningful shape. To decide this, a quick survey was conducted among the readers of the book; Gurpreet Singh, Yogesh Garg, Paras Shah and L. Sreenivasan were those who provided valuable comments. They were unanimous that the basic concepts should not get lost and that breaking the book into two separate books was a very good idea. The clear verdict led to the birth of this edition (second edition) of ATM networks focusing only on ATM technology and from the first edition – a new book on Communication Networks. The book "Communication Networks: Principles and Practice" is an introductory text on networking. It is recommended that readers go through this text or any equivalent text that provides introductory concepts of networking like OSI reference model. At appropriate places, summarized information from that book is extracted and provided in this book.

Truly, breaking the first edition into two books has meant that the second edition is a complete revamp from the first edition. While the first edition had only ten chapters, the second edition has twenty-chapters. The following summarizes the key changes from the first edition:

- Re-organizing the book in five parts, each focusing on a set of topics.
- Adding a new part 'Application Areas of ATM', that covers various applications of ATM. This part has four chapters including 'ATM in MPLS network', 'Voice over ATM', 'ATM in DSL' and 'ATM in Third Generation (3G) Networks'.
- Adding new chapters of 'AAL2 Signalling', 'ATM Security' and 'ATM Network Architecture and Interfaces'.
- Adding dedicated sections added for 'Abbreviations', 'References and Bibliography', and 'Glossary'.
- Adding 'Review Questions' and 'Further Reading' sections at the end of each chapter.

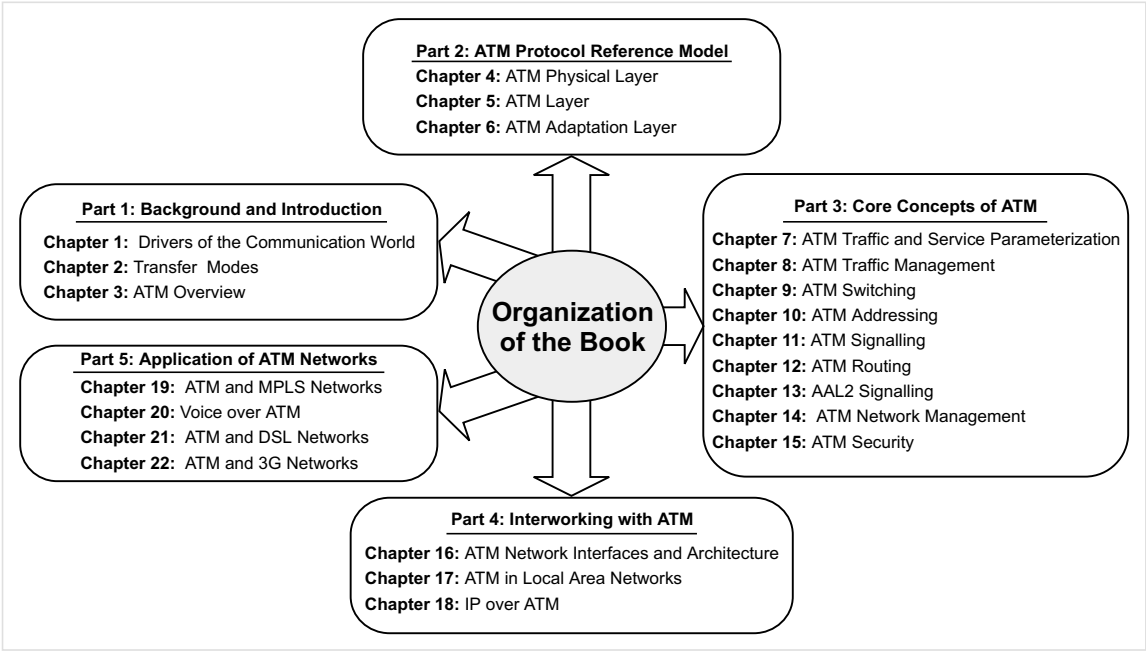
The Book

This book tries to cover all the important topics related to ATM. Towards this end, the book is organized into five parts (as shown in Figure P.1).

Part 1 introduces some of the important topics / concepts to the readers. To start with, Chapter 1 looks at the technological and marketing drivers that impact a given technology. This is

FIGURE P.1

Organization of This Book



useful in the sense that it provides the perspective as to *why ATM is what it is*. Chapter 2 looks at the important concept of transfer mode and explains what are the benefits of asynchronous mode. Chapter 3 not only provides an overview of ATM but also summarizes contents of the whole book.

Part 2 covers the three layers of ATM protocol reference model. This includes the physical layer covered in Chapter 4, the ATM layer in Chapter 5 and the ATM Adaptation Layer (AAL) in Chapter 6.

Part 3 covers the core concepts of ATM, which include parameterization of traffic and services in ATM networks (Chapter 7), elements of Traffic management (Chapter 8), switch design and architecture (Chapter 9), addressing (Chapter 10), point-to-point and point-to-multipoint signalling (Chapter 11), routing based on PNNI protocol (Chapter 12), AAL2 signalling (Chapter 13), ATM Network management (Chapter 14) and ATM Security (Chapter 15).

Part 4 covers the interworking aspects of ATM. In this part, Chapter 16 describes the ATM network architecture and important interfaces defined for interworking. ATM in LAN environment and LAN Emulation (LANE) are explained in Chapter 17. Classical IP over ATM provides mechanisms to transfer IP datagrams over ATM networks. This standard also defines the means for address resolution. This technique is explained in Chapter 18. Another technique for IP over ATM is Multiprotocol over ATM (MPoA). The MPOA technique is also explained in Chapter 18.

Part 5 covers the application aspects of ATM. This includes ATM in MPLS Networks (Chapter 19), Voice over ATM (Chapter 20), ATM in DSL Networks (Chapter 21) and ATM in Third Generation (3G) Networks (Chapter 22).

Web-site

To have a greater interaction with the readers even after the publication of the book, the authors have created a website http://atmbook.tripod.com/ and a mirror website managed by the publisher http://www.tatamcgrawhill.com/digital_solutions/sumitnishit. These website offers the following:

- Preface
- Table of Contents
- Errata
- Feedback and Review Comments
- References
- Other Related Material

Readers are encouraged to visit the website and use the available material.

Suggestions

Your comments, feedback and constructive criticism are valuable to me; so, please free to drop an email at **s.kasera@lycos.com**. I would be glad to incorporate your comments in the subsequent edition of the book.

Notes to Readers

- Since standardization is an ongoing activity, some of the standards quoted in this book have been superseded by newer specifications. Some of these have been explicitly mentioned in the reference section. For others, the reader is advised to cross-check from the appropriate governing body. For ATM Forum specifications, the reader could browse www.atmforum.com. For ITUT recommendations, could go to www.itu.ch. For Internet RFCs, the reader could browse http://www.ietf.org/rfc.html.

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Sumit Kasera

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Sumit Kasera