CONTENTS

Preface xiii
About the Author xv

1 INTRODUCTION TO IP MULTICAST 1
  1.1 Introduction 1
  1.2 Why Multicast Protocols are Wanted/Needed 3
  1.3 Basic Multicast Protocols and Concepts 5
  1.4 IPTV and DVB-H Applications 11
  1.5 Course of Investigation 21
Appendix 1.A: Multicast IETF Request for Comments 21
Appendix 1.B: Multicast Bibliography 23
References 23

2 MULTICAST ADDRESSING FOR PAYLOAD 26
  2.1 IP Multicast Addresses 26
   2.1.1 Limited Scope Addresses 29
   2.1.2 GLOB Addressing 30
   2.1.3 Generic IPv4 Addressing 30
  2.2 Layer 2 Multicast Addresses 31
   2.2.1 Ethernet MAC Address Mapping 31
  2.3 MPEG-Layer Addresses 33
References 38

3 MULTICAST PAYLOAD FORWARDING 39
  3.1 Multicasting on a LAN Segment 40
  3.2 Multicasting between Network Segments 40
  3.3 Multicast Distribution Trees 41
  3.4 Multicast Forwarding: Reverse Path Forwarding 47
  3.5 Multicast Forwarding: Center-Based Tree Algorithm 48
  3.6 Implementing IP Multicast in a Network 49
References 50
9 IP MULTICASTING IN IPv6 ENVIRONMENTS

9.1 Opportunities Offered by IPv6
9.2 Introductory Overview of IPv6
  9.2.1 IPv6 Benefits
  9.2.2 Traditional Addressing Classes for IPv4
  9.2.3 Network Address Translation Issues in IPv4
  9.2.4 IPv6 Address Space
  9.2.5 Basic Protocol Constructs
  9.2.6 IPv6 Autoconfiguration
9.3 Migration and Coexistence
9.4 Multicast with IPv6
  9.4.1 IPv6 Multicast Addresses
  9.4.2 MAC Layer Addresses
  9.4.3 Signaling
  9.4.4 RP Approaches
References

10 MULTICAST LISTENER DISCOVERY

10.1 Overview of MLDv1
10.2 Message Format
10.3 Protocol Description
10.4 Node State Transition Diagram
10.5 Router State Transition Diagram
10.6 Overview of MLDv2
  10.6.1 Protocol Overview
  10.6.2 Building Multicast Listening State on Multicast Address Listeners
  10.6.3 Exchanging Messages between the Querier and the Listening Nodes
  10.6.4 Building Multicast Address Listener State on Multicast Routers
10.7 Source Filtering
References
11 IPTV APPLICATIONS 234

11.1 Overview and Motivation 234

11.2 Basic Architecture 236

11.2.1 Content Aggregation Subsystem 244
11.2.2 Uniform Transcoding Subsystem 245
11.2.3 Conditional-Access Management Subsystem 251
11.2.4 Encapsulation Subsystem 258
11.2.5 Long-Haul Distribution Subsystem 262
11.2.6 Local Distribution Subsystem 264
11.2.7 Middleware Subsystem 267
11.2.8 Set-Top Boxes 267
11.2.9 Catcher (for VoD Services) 269

Appendix 11.A: Serial Digital Interface Basics 269

Appendix 11.B: MPEG Basics 271

11.B.1 MPEG-2 Transport/Multiplexing Mechanisms 271
11.B.2 IPTV/IP Transmission over TS Logical Channels 279
11.B.3 Compression Technology 281

Appendix 11.C: Encapsulation for Transmission of IP Datagrams over MPEG-2/DVB Networks 298

References 300

12 DVB-H: HIGH-QUALITY TV TO CELL PHONES 303

12.1 Background and Motivation 304

12.2 Basic DVB-H Technology 311

12.2.1 DVB-H Mobile Devices 315

Appendix 12.A: Open Mobile Video Coalition Efforts 317

References 318

Glossary 319

Index 349