



Internet Routing Architectures

Second Edition

The definitive BGP resource



Internet Routing Architectures, Second Edition

Sam Halabi with Danny McPherson

Cisco Press

Cisco Press
800 East 96th Street
Indianapolis, IN 46240 USA

Internet Routing Architectures

Table of Contents

Contents

Part I: The Contemporary Internet

Chapter 1 Evolution of the Internet

- Origins and Recent History of the Internet
- Network Access Points
- Routing Arbiter Project
- The Very High-Speed Backbone Network Service
- Transitioning the Regional Networks from the NSFNET
- NSF Solicits NIS Managers
- Other Internet Registries
- Internet Routing Registries
- The Once and Future Internet
- Looking Ahead
- Frequently Asked Questions
- References

Chapter 2 ISP Services and Characteristics

- ISP Services
- ISP Service Pricing, Service-Level Agreements, and Technical Characteristics
- Looking Ahead
- Frequently Asked Questions

Chapter 3 IP Addressing and Allocation Techniques

- History of Internet Addressing
- IP Address Space Depletion

Table of Contents

Looking Ahead

Frequently Asked Questions

References

Part II: Routing Protocol Basics

Chapter 4 Interdomain Routing Basics

Overview of Routers and Routing

Routing Protocol Concepts

Segregating the World into Autonomous Systems

Looking Ahead

Frequently Asked Questions

References

Chapter 5 Border Gateway Protocol Version 4

How BGP Works

BGP Capabilities Negotiation

Multiprotocol Extensions for BGP

TCP MD5 Signature Option

Looking Ahead

Frequently Asked Questions

References

Part III: Effective Internet Routing Designs

Chapter 6 Chapter Tuning BGP Capabilities

Building Peer Sessions

Sources of Routing Updates

Overlapping Protocols: Backdoors

The Routing Process Simplified

Controlling BGP Routes

Route Filtering and Attribute Manipulation

BGP-4 Aggregation

Table of Contents

Looking Ahead

Frequently Asked Questions

References

Chapter 7 Redundancy, Symmetry, and Load Balancing

Redundancy

Symmetry

Load Balancing

Specific Scenarios: Designing Redundancy, Symmetry, and Load Balancing

Looking Ahead

Frequently Asked Questions

References

Chapter 8 Controlling Routing Inside the Autonomous System

Interaction of Non-BGP Routers with BGP Routers

BGP Policies Conflicting with Internal Defaults

Policy Routing

Looking Ahead

Frequently Asked Questions

Chapter 9 Controlling Large-Scale Autonomous Systems

Route Reflectors

Confederations

Controlling IGP Expansion

Looking Ahead

Frequently Asked Questions

References

Chapter 10 Designing Stable Internets

Route Instabilities on the Internet

BGP Stability Features

Looking Ahead

Table of Contents

Frequently Asked Questions

Part IV: Internet Routing Device Configuration

Chapter 11 Configuring Basic BGP Functions and Attributes

Building Peering Sessions

Route Filtering and Attribute Manipulation

Peer Groups

Sources of Routing Updates

Overlapping Protocols: Backdoors

BGP Attributes

BGP-4 Aggregation

Looking Ahead

Chapter 12 Configuring Effective Internet Routing Policies

Redundancy, Symmetry, and Load Balancing

Following Defaults Inside an AS

Policy Routing

Route Reflectors

Confederations

Controlling Route and Cache Invalidation

BGP Outbound Request Filter Capability

Route Dampening

Looking Ahead

Part V: Appendixes

Appendix A: BGP Command Reference

Appendix B: References for Further Study

Interesting Organizations

Research and Education

Miscellaneous

Books

Table of Contents

Internet Request For Comments

Appendix C: BGP Outbound Route Filter (ORF)

When to Use BGP ORF

Configuration

EXEC Commands

Closing Remarks

Appendix D: Multiprotocol BGP (MBGP)

The Motivation Behind the New Command-Line Interface

Organizing Command Groups in the New Configuration

activate

network

Peer Groups

Route Maps

Redistribution

Route Reflector

Aggregation

List of BGP Commands

Upgrading to the AF Style

References

Index