

# IP Routing Fundamentals

- [Introduction](#)
- [An Introduction to Internetworking](#)
- [Understanding Internetwork Addresses](#)
- [Routers and LANs](#)
- [Routers and WANs](#)
- [Internet Protocols Versions](#)
- [Transmission Technologies](#)
- [The Mechanics of Routing Protocols](#)
- [RIP](#)
- [RIP V2](#)
- [IGRP](#)
- [Enhanced IGRP](#)
- [OSPF](#)
- [Building Internetworks](#)
- [Internetworking with Dissimilar Protocols](#)
- [The Future of Routing](#)



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HOME CONTENTS PREVIOUS NEXT GLOSSARY FEEDBACK SEARCH HELP

# Internetworking Fundamentals

- [IP Routing Fundamentals](#)
- [IP Routing Primer](#)
- [Internetworking Technologies Handbook \(2nd Edition\)](#)

HOME CONTENTS PREVIOUS NEXT GLOSSARY FEEDBACK SEARCH HELP

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## IP Routing Primer

- [Preface](#)
- [Topology and Router Configurations](#)
- [Routing Metrics and Distances](#)
- [Discontiguous Networks, Summarization, and Subnet 0](#)
- [Using IP Unnumbered and VLSM](#)
- [Default Routing](#)
- [IP Troubleshooting Scenarios](#)
- [Bridging IP Between Dissimilar Media](#)
- [Hexadecimal and Binary Numbering and IP Addressing](#)
- [Appendix A: RFCs](#)

# Internetworking Terms and Acronyms

- [Introduction](#)
- [Numerics](#)
- [A](#)
- [B](#)
- [C](#)
- [D](#)
- [E](#)
- [F](#)
- [G](#)
- [H](#)
- [I](#)
- [J](#)
- [K](#)
- [L](#)
- [M](#)
- [N](#)
- [O](#)
- [P](#)
- [Q](#)
- [R](#)
- [S](#)
- [T](#)
- [U](#)
- [V](#)
- [W](#)
- [X](#)

- [Z](#)
- [ITA New Terms October 2000](#)

[HOME](#)

[CONTENTS](#)

[PREVIOUS](#)

[NEXT](#)

[GLOSSARY](#)

[FEEDBACK](#)

[SEARCH](#)

[HELP](#)

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Instructions regarding use of the multi-document search feature provided with this product.

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# Table of Contents

## [Introduction](#)

# Introduction

Routing is simultaneously the most complicated function of a network and the most important. Most knowledgeable people agree that networking and routing technologies have been around about 25 years. The concept of routing actually dates back to the late 1950s, when computing was still an arcane science in its infancy. Precious few organizations had a single computer, much less multiple computers that needed to be linked together. Internetworking, the interconnection of multiple computers, was still more of a futuristic vision than a reality. This vision predicted a day when computers would be widely implemented and interconnected via a ubiquitous global internetwork: the Internet.

The challenge in building and using a global internetwork is developing the means to find, access, and communicate with remote hosts. Ostensibly, a global internetwork would offer redundancy. In other words, there could be many different physical paths through a network between any given pair of hosts. Mechanisms would be needed that could discover remote networks and hosts and explore the different possible paths (or routes) through the network to those networks and hosts.

Finally, some way to apply either logic or mathematics would be needed. Logically, if there are many different routes to a specific destination, they can't all be equal. Some routes would likely offer either shorter overall paths or better performance than others. Thus, it would be logical to compare all the possible routes and then select the best route or routes. In time, these mechanisms would become known as *routers*. The process of discovering, calculating, and comparing routes to remote networks and hosts is routing.

This book will help you explore the mechanics of routers and routed and routing protocols, and build internetworks using routing technologies. Although this book was designed primarily for the novice, it contains detailed technical examinations of many of today's leading routing protocols. These examinations are sufficiently detailed to be valuable to technical professionals at all levels of expertise. Consequently, you will find this book an indispensable technical reference long after you have mastered the basic theory and mechanics of routing and routing protocols.

Part I of this book, "[Internetworking Fundamentals](#)," provides an overview of internetworking, including the implications of using routers in both LANs and WANs. This overview is provided using the Internet Protocol (IP), which is the predominant routed protocol in use today. IP has grown substantially since its inception approximately two decades ago. Its once simple addressing architecture has become quite complicated during its life. An entire chapter is devoted to examining IP's addressing. This includes the original class-based address architecture, subnet numbers, and classless interdomain routing (CIDR) addresses. This chapter also provides a glimpse at how IP's addresses will change with the IPv6, the next