



About This Guide

This section discusses the objectives, audience, organization, and conventions of the **Internetwork Design Guide**.

Document Objectives

This guide presents a set of general guidelines for planning internetworks and provides specific suggestions for several key internetworking implementations. This guide focuses on design issues of large-scale implementations for the following environments:

- Large-scale Internetwork Protocol (IP) internetworks
 - Enhanced Interior Gateway Routing Protocol (IGRP) design
 - Open Shortest Path First (OSPF) design
- IBM System Network Architecture (SNA) internetworks
 - Source-route bridging (SRB) design
 - Synchronous Data Link Control (SDLC) and serial tunneling (STUN), SDLC Logical Link Control type 2 (SDLLC), and Qualified Logical Link Control (QLLC) design
- Asynchronous Transfer Mode (ATM) internetworks
- Packet service internetworks
 - Frame Relay design
- Dial-on-demand routing (DDR) internetworks

Note The term *router* is used throughout this guide to refer to internetworking devices that also offer bridging and gateway functions. Routers are sometimes called *intermediate systems*. End stations are also called *end systems*.

The objective of this guide is to help you identify and implement *practical* internetworking strategies that are flexible enough to fit a variety of situations and that can also scale up as your network requirements change. The **Internetwork Design Guide** focuses on identifying the essential technologies and appropriate implementations for specific environments. It is not the final word in internetwork design. Do not try to use this as a step-by-step handbook for designing every facet of your internetwork.

This manual, the **Internetwork Design Guide** publication, helps you identify router features and capabilities that meet specific internetworking requirements. It is not a comprehensive encyclopedia of network design strategy. The emphasis is not on issues such as maximum cable runs or the relative merits of IEEE 10BaseT and thin Ethernet.

The central elements of this guide are the technology chapters, which consist of the following:

- Technology-specific issues
- Router-related implications of design implementation
- Implementation recommendations

The technology chapters do not cover every possible implementation, but they address a variety of environments that are commonly encountered when designing internetworks.

Note The *Internetworking Case Studies* publications are companion guides to this design guide. Case studies provide internetwork scenarios with detailed configuration examples for specific Cisco features.

Audience

This guide is intended for the network administrator who designs and implements router-based internetworks. Readers should know how to configure a Cisco router and should be familiar with the protocols and media that their routers are configured to support. Knowledge of basic network topology is essential.

Document Organization

This document consists of the following chapters:

- Chapter 1, “Internetworking Design Basics,” provides introductory material that outlines the key issues in designing effective large-scale internetworks, contrasts bridging and routing, and describes the three key service layers associated with internetworks: access, distribution, and backbone. The chapter also provides a general mapping of feature capabilities into this hierarchical approach to internetwork design.
- Chapter 2, “Designing Large-Scale IP Internetworks,” focuses on routing protocols for large-scale IP internetworks and describes the characteristics of two routing protocols: Enhanced IGRP and Open Shortest Path First (OSPF).
- Chapter 3, “Designing SRB Internetworks,” describes the issues that pertain to designing internetworks that use source-route bridging and remote source-route bridging.
- Chapter 4, “Designing SDLC, SDLLC, and QLLC Internetworks,” provides information about designing internetworks that use routers in IBM front-end processor (FEP) environments.
- Chapter 5, “Designing ATM Internetworks,” focuses on Asynchronous Transfer Mode (ATM) technology and LAN Emulation (LANE).
- Chapter 6, “Designing Packet Service Internetworks,” focuses Frame Relay to describe the implementation of packet-switching services in terms of hierarchical network design, topology, broadcast issues, and performance.
- Chapter 7, “Designing DDR Internetworks,” describes the design of dial-on-demand routing (DDR) internetworks. DDR provides connectivity across Public Switched Telephone networks and works with access lists to determine the kinds of packets that initiate a connection.

- Chapter 8, “Designing ISDN Internetworks,” describes issues that pertain to designing internetworks that use Integrated Services Digital Network (ISDN) technology. The chapter includes techniques for maximizing performance and minimizing connection costs.
- Chapter 9, “Designing Switched LAN Internetworks,” focuses on the operation of LAN switches and compares them with routers. The chapter provides vital information on scalability and the use of routers and virtual LANs (VLANs) in switched LAN internetwork designs.
- Chapter 10, “Designing Internetworks for Multimedia,” describes the evolution of video and audio capture and compression standards and how these standards affect the way that multimedia applications run in networks today. This chapter shows the transition of a traditional LAN design (capable of handling modest multimedia applications) to switched LAN designs capable of handling bandwidth-intensive multimedia applications.
- Appendix A, “Subnetting an IP Address Space,” provides a detailed example of subnetting a Class B network.
- Appendix B, “IBM Serial Link Implementation Notes,” clarifies some common misconceptions about half-duplex, full-duplex, and multipoint connections.
- Appendix C, “SNA Host Configuration for SRB Networks,” describes the configuration of IBM devices, such as FEPs, VTAM-switched major nodes, and 3174 cluster controllers, and provides information about configuration values that optimize the device’s connection to a router.
- Appendix D, “SNA Host Configuration for SDLC Networks,” provides configuration information about FEPs and 3174 cluster controllers in routed SDLC environments.
- Appendix E, “Broadcasts in Switched LAN Internetworks,” presents the results of testing the effect of broadcasts on UNIX, PC, and Macintosh hosts running IP, IPX, and AppleTalk in a flat network topology.
- Appendix F, “References and Recommended Reading,” lists books, periodicals, technical publications, and standards that provide additional information that will help you design efficient internetworks.

Document Conventions

This guide uses the following conventions:

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.



Caution Means *reader be careful*. It means that you are capable of doing something that might result in equipment damage, or that you might have to take something apart and start over again.

- Command descriptions use these conventions:
 - Commands and keywords are in **boldface** font.
 - Arguments for which you supply values are in *italic* font.

- Examples use these conventions:
 - Examples that contain system prompts denote interactive sessions, indicating that the user enters commands at the prompt. The system prompt indicates the current command mode. For example, the prompt `router(config)#` indicates global configuration mode.
 - Terminal sessions and information the system displays are in `screen` font.
 - Exclamation points (!) at the beginning of a line indicate a comment line.