



1. Introduction

IPv6, the next generation of the Internet Protocol, is redefining how users and machines communicate with each other across networks. The current version of the Internet Protocol, IPv4, can neither support the growing number of devices connected to the Internet nor encourage the development of new services. These concerns, among other issues, are driving the Internet to upgrade to IPv6. IPv6 provides critical performance and architectural improvements for all networks, and it promotes a freely evolving Internet.

Google's corporate network is a heterogeneous environment consisting of equipment from a host of sources, myriad technologies, and numerous internally developed custom applications and services. The Google network uses a variety of topologies and access mechanisms to provide connectivity to tens of thousands of employees distributed across offices, corporate data centers, and other locations around the world.

This book provides a detailed case study of Google's enterprise IPv6 deployment. We first provide the reader with a basic introduction to the IPv6 protocol characteristics and discuss the issues that IPv6 addresses in an enterprise organization. After showing the evolution of our IPv4-only network to dual-stack (IPv4 and IPv6) over the past several years and the underlying technology trends driving those changes, we explain how to apply these technology drivers to enable new network topologies and services that are not subject to the limitations of the older IPv4 protocol. We cover some advanced topics that provide guidance on scalable and reliable IPv6 deployment. We follow this with a detailed description of the way we implemented IPv6 throughout Google's global network in a relatively short time with a small core group. Finally, we tell about the challenges we faced during the various implementation phases and the network design we used for IPv6 connectivity.

This book is aimed at system administrators, network architects, and enterprise IT managers alike. We assume that the reader is familiar with general enterprise network architecture, requirements, and problems. For those who are not yet familiar with IPv6, we provide some IPv6 concepts and background, followed by a deep dive into IPv6 network design, planning, and deployment methodology.

We hope this book will increase awareness about the new version of the IP protocol and to provide guidance to organizations and administrators who are either planning to deploy IPv6 or are simply seeking to gain a better understanding of it.

