File-System Interface

For most users, the file system is the most visible aspect of an operating system. It provides the mechanism for on-line storage of and access to both data and programs of the operating system and all the users of the computer system. The file system consists of two distinct parts: a collection of files, each storing related data, and a directory structure, which organizes and provides information about all the files in the system. File systems live on devices, which we explore fully in the following chapters but touch upon here. In this chapter, we consider the various aspects of files and the major directory structures. We also discuss the semantics of sharing files among multiple processes, users, and computers. Finally, we discuss ways to handle file protection, necessary when we have multiple users and we want to control who may access files and how files may be accessed.

Bibliographical Notes

Database systems and their file structures are described in full in [Silberschatz et al. (2010)].

A multilevel directory structure was first implemented on the MULTICS system ([Organick (1972)]). Most operating systems now implement multilevel directory structures. These include Linux ([Love (2010)]), Mac OS X ([Singh (2007)]), Solaris ([McDougall and Mauro (2007)]), and all versions of Windows ([Russinovich and Solomon (2005)]).

The network file system (NFS), designed by Sun Microsystems, allows directory structures to be spread across networked computer systems. NFS Version 4 is described in RFC3505 (http://www.ietf.org/rfc/rfc3530.txt). General discussion of Solaris file systems is found in the Sun *System Administration Guide: Devices and File Systems* (http://docs.sun.com/app/docs/doc/817-5093).

DNS was first proposed by [Su (1982)] and has gone through several revisions since. LDAP, also known as X.509, is a derivative subset of the X.500 distributed directory protocol. It was defined by [Yeong et al. (1995)] and has been implemented on many operating systems.

Bibliography

[Love (2010)] R. Love, *Linux Kernel Development,* Third Edition, Developer's Library (2010).

[McDougall and Mauro (2007)] R. McDougall and J. Mauro, *Solaris Internals,* Second Edition, Prentice Hall (2007).

[Organick (1972)] E. I. Organick, *The Multics System: An Examination of Its Structure*, MIT Press (1972).

[Russinovich and Solomon (2005)] M. E. Russinovich and D. A. Solomon, *Microsoft Windows Internals,* Fourth Edition, Microsoft Press (2005).

[Silberschatz et al. (2010)] A. Silberschatz, H. F. Korth, and S. Sudarshan, *Database System Concepts,* Sixth Edition, McGraw-Hill (2010).

[Singh (2007)] A. Singh, *Mac OS X Internals: A Systems Approach*, Addison-Wesley (2007).

[Su (1982)] Z. Su, "A Distributed System for Internet Name Service", *Network Working Group, Request for Comments: 830* (1982).

[Yeong et al. (1995)] W. Yeong, T. Howes, and S. Kille, "Lightweight Directory Access Protocol", *Network Working Group, Request for Comments: 1777* (1995).