

A Fast File System for UNIX*

Marshall Kirk McKusick, William N. Joy C.

Samuel J. Leffert, Robert S. Foley

Computer Systems Research Group

Computer Science Division

Department of Electrical Engineering and Computer Science

University of California, Berkeley

Berkeley, CA 94720

ABSTRACT

A reimplementation of the UNIX file system is described. The reimplementation provides substantially higher throughput rates by using more flexible allocation policies that allow better locality of references and can be adapted to a wide range of peripheral and processor characteristics. The new file system clusters data that is sequentially accessed and provides two-track sizes to allow fast access to large files while not wasting large amounts of space for small files. File access rates of up to six times faster than the traditional UNIX file system are experienced. Long needed enhancements to the programmer's interface are discussed. These include a mechanism to place arbitrary locks on files, extensions of the same space across file systems, the ability to use long file names, and provisions for administrative control of resource usage.

Revised February 15, 1984

CR Categories and Subject Descriptors: D.4.3 [Operating Systems]: File Systems Management - file organization, directory structures, access methods; D.4.2 [Operating Systems]: Storage Management - allocation/deallocation strategies; secondary storage devices; D.4.5 [Operating Systems]: Performance - measurements, operational analysis; H.1.2 [Information Systems]: Information Storage - file organization

Additional Keywords and Phrases: UNIX, file system organization, file system performance, file system design, application program interface.

General Terms: file system, measurement, performance.

*UNIX is a trademark of Bell Laboratories.

© William N. Joy is currently employed by Sun Microsystems, Inc., 1500 Garcia Avenue, Menlo Park, CA 94025.

© Samuel J. Leffert is currently employed by Lucalite Ltd., 301 Box 1006, San Rafael, CA 94503.

The work was done under grant from the National Science Foundation under grant NSF-80-05516, and the Defense Advanced Research Projects Agency under grants N00014-80-1-0711 awarded to Naval Electronics Systems Command under Contract No. N00014-80-1-0711.