Introduction to Windows File System Development

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Abstract

File Systems Development on Windows is different than on Linux or UNIX systems, both in the range of options and development environment. For all systems, developing a file system yields similar benefits by providing common services to a broad range of applications.

From a file systems development perspective, this tutorial provides a basic OS overview: Kernel, I/O Subsystem, Virtual Memory Manager, and Object Manager.

Windows naming differs from traditional POSIX operating systems so the tutorial discusses the name space, including 16-bit UNICODE character support and 32K maximum path names.

Additionally, the tutorial discusses the Windows kernel mode driver model, which allows dynamic loading and unloading of file system drivers. It discusses three distinct types of common file systems for Windows: physical media, network, and virtual (pseudo). It covers commonality and differences between the VFS interface and the Windows interface, for those interested in cross-platform support.

Further, the tutorial discusses *layered* file systems using "file system filter drivers"; while considered simpler to build, the pragmatic reality is that they are often more challenging to develop than traditional file systems.

In addition, the tutorial describes the Windows file system development environment including IDE, compilers, debuggers, installers, and conformance tests. Because Windows requires cryptographically signed drivers, the tutorial will describe this process.

Finally, the tutorial will briefly describe FUSE on Windows, an alternative to constructing a kernel mode file system driver, which is highly compatible with the FUSE interface on UNIX and Linux systems.

Topics include:

- Windows kernel architecture
- I/O Subsystem
- Virtual Memory Subsystem

- Name space management
- File Systems Drivers
- File System Filter Drivers
- Development Tools
- Building, testing, validating, and deploying File System drivers
- FUSE on Windows as an alternative

Author

Tony Mason is a PhD Student at the University of British Columbia, focusing on non-hierarchical file system name spaces and persistent memory. He has been developing file systems for the past 29 years, including on UNIX and Windows systems. Since 1996, he has taught numerous courses in Windows kernel mode development, including device drivers, kernel debugging, file systems, and file system filter driver development. Tony is co-author of *Windows NT Device Driver Development* [1] and *lex & yacc* [2].

Bibliography

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[2] J. R. Levine, J. R. Levine, T. Mason, and D. Brown, *Lex & yacc.* " O'Reilly Media, Inc.", 1992.