READY TO USE

Universal Disc Format

ANSWERING AN EVER-GROWING DEMAND FOR SMART STORAGE

The explosion of mobile digital information and entertainment devices such as MP3 players, mobile phones, PDAs, GPS systems and digital cameras, among others, has led consumers to expect digital experience *anywhere* and *anytime*. In its bid to keep pace with rising customer aspirations, infotainment industry is now toying with a smart storage solution: Universal Disc Format (UDF) file system, for the expanding universe of infotainment-on-the-go needs nothing short of a truly valuable system capable of simultaneously/interchangeably running every possible form of digital information and entertainment content.

TATA

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engineering creativity

Your car is not longer just a mode of transport, but a multimedia entertainment hub on wheels, as well, packed with cutting edge electronics devices for audio playback, movies, satellite radio, navigation, and more. With every passing day, chances are that you will be spending ever-longer hours in your car. This makes a strong case for in-car infotainment.

Perhaps never before has your home seen such flooding of electronic devices – DVD players, recorders, camcorders and so on – bringing diverse file types in its wake. To ensure these devices work in sync, you would need smart storage solutions.

The more you depend on digital information, the more storage space and storage options your communication devices (e.g., mobile phones, PDAs, laptops and PCs) would need. Your expanding universe of infotainment-on-the-go needs nothing short of a truly valuable system capable of simultaneously/interchangeably running all of your digital information and entertainment content.

The worry factor: Inter-media exchange of digital content

Digital content is typically in the form of CD, DVD and, lately, BluRay Disc & HD DVD, Flash/HDD based wired/wireless storage devices, and media players. Exchange of digital content between these media is a major worry factor. Optical media use UDF file systems to store and retrieve content while Flash and HDD media use different PC based file systems: FAT32/NTFS/EXT2/EXT3. Flash and HDD media are based on file systems not best suited for multi-media content storage and retrieval.

Every operating system in existence today uses a proprietary file system format, preventing the porting of removable writable media across operating systems. For example, writable media created using OS/2 native HPFS file system format cannot be read/modified with Windows NT native file system. A new file system has to be created and defined to address this limitation.

Putting worries to rest

For easy access and readability by a computer, information is stored digitally on a storage medium in specific, pre-defined locations. File locations are decided depending on the operating system and the logical file format. Every operating system has its unique way of storing and finding information. This makes it difficult for removable media to work with different operating systems. It takes a vendor-independent, universal disc format (UDF) file system to create a platform for easy data interchange and sharing in a computer network.

What is UDF?

UDF, a universal vendor-independent file system, is designed for data interchange and portability, allowing one operating system to read/write/modify data created by another operating system. UDF is a subset of and is fully compliant with ISO 13346 - the International Standards Organization interchange standard for non-sequential recording (NSR) of data. UDF is a subset of ISO 13346 as defined by the Optical Storage Technology Association (OSTA), a non-profit trade association actively promoting the use of writable optical technologies and products for storing computer data and images.

And why UDF matters?

UDF primarily maximizes robustness of data interchange, assures data uniformity, supports platform-unique file information, and minimizes the cost and complexity of

implementing ISO 13346. UDF defines information stored by a specific/all operating system(s) and how to process operating system-specific information. It is, therefore, ideal for any application/usage requiring file interchange among different operating systems.

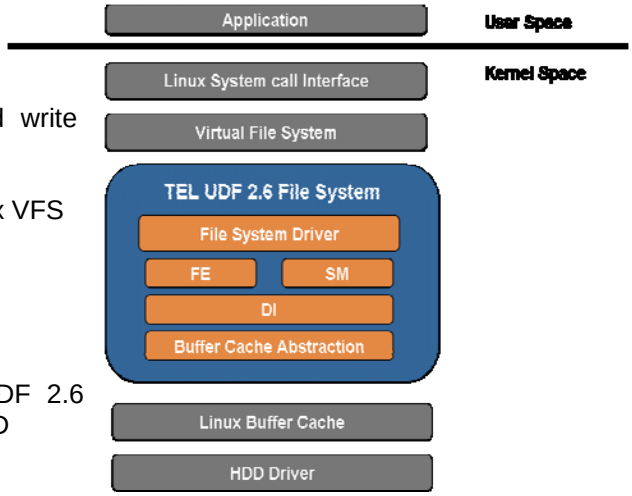
By providing read-write interoperability with major operating systems and compatibility with re-writable/write-once media, UDF did the right thing the right way at the right time. Small wonder, then, that UDF is wresting market share away from the ISO9660 file system, which second generation optical media such as DVD, BD-R find increasingly inadequate.

Tata Elxsi UDF for optimal storage & retrieval, bandwidth & free space management and more

- Optimized for storage and retrieval of audio/video content
- HDD bandwidth effectively managed for concurrent multiple recordings and playbacks
- Efficient metadata handling
- Better free-space management
- Direct input/output handling

Tata Elxsi UDF 2.6 file system - IP features

- File system implementation providing read and write support for UDF 2.60 version only
- Developed and tested for hard disk devices
- Dynamically loadable module registered with Linux VFS
- POSIX API-compliant interfaces
- Modular and layered architecture
- Re-entrant, multi-tasking supported
- Sequential allocation while recording
- OS-independent core file system modules
- Current FS support for 'Write once' as per UDF 2.6 specification; Deleted space not reclaimed for HDD



System requirements for the UDF file system

Hardware requirements

System configuration	Intel P4, 2.8GHz P4, 512MB RAM, ATA/SATA HDD (Minimum 40GB)
Hard disk device/Partition for formatting UDF 2.6 file system	ATA/SATA HDD Minimum 20GB

Software requirements

Operating system	Fedora core distribution: FC4 and Linux kernel version 2.6.17
GCC Version for compiling kernel and file system driver module	Version 4.0.0

About Tata Elxsi

Tata Elxsi, the technology arm of the Tata Group - one of India's largest and most respected business conglomerates with US$ 72.8 billion in market capitalization - is an acknowledged leader in streaming media application file systems. Tata Elxsi provides highly robust and efficient file systems for streaming media applications, supporting their portability across diverse platforms. All Tata Elxsi file systems are optimized for improved reliability and high performance.

Tata Elxsi's core practice areas cover embedded product design services, industrial design & engineering, animation & VFX services, and systems integration services. With high quality, cost effective, time-to-market solutions across the product design lifecycle, Bangalore-headquartered Tata Elxsi serves verticals such as networking & communication, automotive, consumer electronics, media & entertainment, semiconductors, and scientific instrumentation. The company's strong and multi-faceted team provides expertise in VLSI design, embedded software, networking, telecom, multimedia, storage, visual & high performance computing, mechanical product design and digital content creation services.

Tata Elxsi draws on its knowledge base of over fifteen years in delivering product designs, and a large talent pool of over 3500 technologists. The company's passion for excellence is backed by SEI CMMi Level 5, ISO 9001: 2000 and BS 7799 certified processes. Tata Elxsi is the world's first company to be certified at SEI CMMi Level 5 for product design workflows – a testimony to its quality focus, which translates into higher reliability, lowered design risks and improved time-to-market.

Tata Elxsi has 13 sales and support offices in India and 20 international offices. This is supported by India development centers in Bangalore, Chennai, Coimbatore, Hyderabad, Pune and Thiruvananthapuram, and a near-shore center in Japan.