

ENGLISH FILE UPPER INTERMEDIATE TEACHERS BOOK Online PDF

English File Upper Intermediate Teachers Book: A Comprehensive Guide for Educators

The **English File Upper Intermediate Teachers Book** is an essential resource for language teachers aiming to deliver engaging, effective, and comprehensive English lessons to students at the upper intermediate level. As part of the renowned English File series, this teachers' guide offers a wealth of teaching tips, lesson plans, assessment tools, and supplementary materials designed to enhance the classroom experience. Whether you are a seasoned educator or new to teaching English, understanding the features and benefits of this teachers book can significantly improve your teaching efficacy and your students' learning outcomes.

Overview of the English File Upper Intermediate Teachers Book

What is the English File Series?

The English File series is a widely acclaimed collection of ESL/EFL textbooks developed by Oxford University Press. Known for its engaging content, authentic materials, and balanced focus on grammar, vocabulary, pronunciation, and skills development, the series caters to learners across various levels—from beginner to advanced. The Upper Intermediate Teachers Book complements the Student Book, providing teachers with additional tools to facilitate effective lessons.

Key Features of the Teachers Book

- **Comprehensive Lesson Plans:** Detailed lesson structures aligned with the Student Book units.
- **Teaching Tips:** Practical advice on classroom management, student engagement, and differentiated instruction.
- **Assessment and Evaluation:** Activities and tests to monitor progress and identify areas needing reinforcement.
- **Extra Practice Materials:** Supplementary exercises to extend learning or target specific skills.
- **Audio and Visual Resources:** Access to audio scripts, pronunciation guides, and multimedia suggestions.
- **Teacher Development:** Guidance on integrating skills, cultural content, and technology into lessons.

Advantages of Using the English File Upper Intermediate Teachers Book

Structured and Flexible Lesson Planning

The teachers book provides clear, step-by-step lesson plans that help teachers organize their classes efficiently. The flexibility within these plans allows educators to adapt activities based on their students' needs, making it suitable for various teaching contexts, whether in traditional classrooms, online platforms, or blended environments.

Enhanced Student Engagement

With a range of interactive activities, real-world contexts, and multimedia resources, the teachers book encourages dynamic teaching approaches. This results in increased student motivation and participation, which are crucial for language acquisition at the upper intermediate level.

Alignment with Learning Outcomes

The content and activities are designed to align with common European Framework of Reference for Languages (CEFR) standards, ensuring that students develop the competencies expected at the upper intermediate level. Teachers can confidently use this resource to prepare learners for real-life communication scenarios and standardized assessments.

Support for Differentiated Instruction

The Teachers Book offers strategies and activities to cater to diverse learning styles and abilities, ensuring that each student receives appropriate support and challenge. This is particularly important at the upper intermediate stage, where learners often have varied proficiency levels and learning goals.

Using the Teachers Book Effectively: Tips for Educators

Plan Ahead and Customize

- Review the lesson plans thoroughly before class.
- Customize activities to suit your class dynamics and student interests.
- Incorporate multimedia resources for a more engaging lesson.

Leverage Assessment Tools

- Use the included tests and quizzes to regularly assess student progress.
- Identify areas where students need additional practice and adapt your teaching accordingly.

Integrate Cultural Content

The series emphasizes cultural awareness, so use the teachers book to incorporate cultural discussions and authentic materials that promote intercultural competence.

Encourage Student Interaction

- Foster pair and group work activities outlined in the teachers book.
- Use discussion prompts and role-plays to facilitate communicative competence.

Utilize Audio and Visual Resources

Make the most of the supplementary media suggested, such as audio recordings, videos, and online materials, to diversify your teaching methods.

Additional Resources and Support for Teachers

Online Platforms and Digital Resources

Oxford University Press offers digital supplements, teacher forums, and downloadable materials that complement the Teachers Book. These resources can help you stay updated with best practices and access additional activities.

Professional Development Opportunities

Participate in workshops, webinars, and courses focused on teaching English as a second language, many of which reference or utilize the English File series as a core resource.

Community and Peer Support

Join online communities of English teachers to share experiences, lesson ideas, and troubleshoot challenges related to using the Teachers Book and other teaching materials.

Conclusion: Elevating Your Teaching with the English File Upper Intermediate Teachers Book

The **English File Upper Intermediate Teachers Book** stands out as a comprehensive,

user-friendly, and pedagogically sound resource that empowers teachers to deliver high-quality English language instruction. Its detailed lesson plans, practical teaching tips, and supplementary materials make it an invaluable asset for enhancing classroom engagement and improving student outcomes. By leveraging this resource effectively, educators can create a dynamic learning environment that motivates students, develops their skills, and prepares them for real-world communication challenges.

Investing time in understanding and utilizing the features of the Teachers Book will not only streamline your lesson planning but also enrich your teaching practice, leading to more confident, competent, and motivated learners. Whether in a traditional classroom or an online setting, the English File Upper Intermediate Teachers Book is your trusted partner in achieving language teaching excellence.

English File Upper Intermediate Teachers Book: A Comprehensive Guide for Educators

Teaching English at the upper-intermediate level can be both challenging and rewarding. Whether you're new to the English File Upper Intermediate Teachers Book or a seasoned educator seeking a refresher, understanding its structure, content, and pedagogical approach is essential for delivering effective lessons. This guide provides an in-depth analysis of the Teachers Book, highlighting its features, teaching strategies, and how to maximize its potential in your classroom.

Introduction to the English File Upper Intermediate Teachers Book

The English File Upper Intermediate Teachers Book is an integral resource designed to complement the Student Book, offering teachers detailed guidance, answer keys, and supplementary materials. It aims to facilitate engaging, communicative, and student-centered lessons that develop all four language skills—listening, speaking, reading, and writing—while also emphasizing grammar and vocabulary expansion.

This Teachers Book is structured to support teachers at every stage of the lesson planning process, providing clear instructions, teaching tips, and additional resources to enhance classroom effectiveness.

Core Features of the Teachers Book

- Detailed Lesson Plans

Each unit in the Teachers Book aligns with the Student Book, offering comprehensive lesson plans that include:

- Lesson objectives: Clear goals for student learning.
- Timing suggestions: Approximate durations for each activity.
- Step-by-step instructions: Guidance on delivering activities effectively.
- Answer keys and transcripts: For exercises, listening scripts, and speaking tasks.
- Optional extension activities: Ideas for further practice or enrichment.

- Teaching Tips and Methodology

The Teachers Book emphasizes a communicative approach, encouraging interactive lessons. It provides:

- Strategies for encouraging student participation.
- Advice on managing different classroom dynamics.
- Tips for scaffolding complex language points.
- Recommendations for integrating technology and multimedia.

- Supplementary Materials

Additional resources include:

- Photocopiable activities: Worksheets, vocabulary exercises, and grammar practice.
- Audio scripts and recordings: To facilitate listening activities.
- Vocabulary and grammar notes: To clarify key points for teachers.

Pedagogical Approach and Methodology

The English File Upper Intermediate Teachers Book adopts a balanced approach combining task-based learning, lexical focus, and integrated skills development. Here's how it supports effective teaching:

Communicative Language Teaching

Activities are designed to simulate real-life situations, encouraging students to use language meaningfully. For example, role-plays, discussions, and problem-solving tasks foster authentic communication.

Focus on Vocabulary and Lexical Chusters

Recognizing the importance of vocabulary knowledge at the upper-intermediate level, the book emphasizes lexical chunks, collocations, and idiomatic expressions, helping students gain fluency and naturalness in speech.

Grammar in Context

Grammar points are introduced within meaningful contexts rather than isolated drills. The Teachers Book offers guidance on how to highlight grammatical structures subtly and effectively.

Listening and Speaking Integration

Listening activities often precede speaking tasks, building confidence and comprehension skills before oral production. Teachers are guided on how to facilitate discussions and pronunciation practice.

Navigating the Structure of the Teachers Book

Units and Sections

Each unit typically follows a consistent format:

- Warm-up activities: Engage students and activate prior knowledge.
- Vocabulary: Introduction, practice, and production exercises.
- Grammar: Explanation, controlled practice, and freer activities.
- Skills development:
 - Listening: comprehension tasks with pre-, during-, and post-listening activities.
 - Speaking: pair and group work activities.
 - Reading: comprehension and analysis exercises.
 - Writing: guided practice leading to independent writing.

Review and Revision

At the end of each unit, there are review sections that consolidate learning, encourage reflection, and prepare students for assessments or real-world application.

How to Maximize the Use of the Teachers Book

Plan with Flexibility

While the Teachers Book provides detailed lesson plans, adapt activities based on your students'

needs and classroom context. Use the suggested timings as a flexible guide.

Incorporate Supplementary Materials

Enhance lessons using photocopiables and multimedia resources. For example, integrate authentic videos or articles to enrich topics.

Differentiate Instruction

Adjust activities for diverse learner levels. Use scaffolding techniques for weaker students and extension tasks for advanced learners.

Foster Student Engagement

Encourage student-led activities, debates, and peer teaching, utilizing the Teacher's notes and tips to facilitate smooth transitions.

Evaluate and Reflect

Use the assessment suggestions to monitor progress. Reflect on what activities worked well and adjust future lessons accordingly.

Practical Tips for Teachers Using the Teachers Book

- Pre-lesson preparation: Familiarize yourself with the lesson plan, answer keys, and supplementary materials.
- Classroom management: Use suggested opening activities to establish rapport and set the tone.
- Encouraging participation: Employ strategies from the Teacher's Tips to motivate quieter students.
- Monitoring and feedback: Use the answer keys to provide immediate feedback, and record student progress for future planning.
- Incorporate technology: Use online resources and audio recordings suggested in the Teachers Book to diversify activities.

Conclusion

The English File Upper Intermediate Teachers Book is a comprehensive, teacher-friendly resource that supports educators in delivering engaging, effective, and balanced English lessons. Its detailed lesson plans, pedagogical guidance, and supplementary materials make it an invaluable asset for fostering language development at the upper-intermediate level. By understanding its features and

leveraging its resources creatively, teachers can create dynamic classroom environments that inspire learners to achieve their language goals.

Whether you're preparing your first lesson or refining your teaching approach, this Teachers Book offers the tools and confidence necessary to succeed. Embrace its structure, adapt its activities, and let it serve as your guide to fostering confident, competent English speakers.

QuestionAnswer What are the key features of the English File Upper Intermediate Teacher's Book? The Teacher's Book provides detailed lesson plans, answer keys, additional activities, pronunciation guidance, and teaching tips to facilitate effective instruction and support students' learning progress. How does the English File Upper Intermediate Teacher's Book support differentiated instruction? It offers additional exercises, extension activities, and suggested modifications to help teachers tailor lessons to varied student needs and learning styles. Are there audio and video resources included with the Teacher's Book? While the Teacher's Book primarily provides guidance, it is designed to be used alongside the Student's Book, which includes audio and video materials. Some editions may include links or references to multimedia resources. How can teachers effectively use the pronunciation guidance in the Teacher's Book? Teachers can incorporate the phonetic exercises and pronunciation tips into lessons to help students improve their speaking skills and reduce common pronunciation errors. Does the Teacher's Book provide assessment tools for progress tracking? Yes, it includes tests, review activities, and assessment suggestions to monitor student progress and inform instruction. How does the Teacher's Book align with the overall curriculum of the English File series? It complements the Student's Book by providing detailed teaching notes, cultural context, and supplementary activities that reinforce the series' communicative approach. Can the Teacher's Book be used for both classroom and online teaching environments? Yes, its comprehensive guidance and activities can be adapted for face-to-face or virtual teaching, making it versatile for various teaching formats. What are some common challenges teachers face when using the English File Upper Intermediate Teacher's Book, and how can they overcome them? Common challenges include time management and adapting activities for diverse learners. Overcoming these involves familiarizing with the teacher's notes beforehand and customizing activities to suit class needs. Is the English File Upper Intermediate Teacher's Book suitable for self-study or teacher training programs? While primarily designed for classroom use, it can serve as a valuable resource for teacher training and self-study to deepen understanding of teaching strategies and course content.

Related keywords: English File Upper Intermediate, teachers book, teacher's guide, classroom resources, teaching materials, lesson plans, language teaching, ESL teaching, teacher's manual, educational resources

WINDOWS NT FILE SYSTEM INTERNALS EN ANGLAIS

windows nt file system internals en anglais

Understanding the internal architecture of the Windows NT file system is essential for IT professionals, cybersecurity experts, and developers working with Windows-based environments. The Windows NT operating system, introduced in the early 1990s, revolutionized Windows architecture by providing a robust, secure, and scalable platform. Its file system internals are complex but crucial for ensuring data integrity, security, and performance. This article provides a comprehensive overview of Windows NT file system internals, exploring key components, data structures, and operational mechanisms.

Overview of Windows NT File System Architecture

The Windows NT file system architecture is designed to abstract hardware details and provide a consistent interface for applications and users. It comprises several layers, including hardware abstraction, the I/O manager, file system drivers, and the user-mode interface.

Key Components of the File System

- NTFS (New Technology File System): The primary file system used in Windows NT and later versions, known for its advanced features like journaling, security descriptors, and support for large files.
- File System Drivers: Kernel mode drivers responsible for managing specific file systems such as NTFS, FAT32, or exFAT.
- Object Manager: Manages kernel objects, including files, directories, and symbolic links.
- Cache Manager: Handles caching of data to improve performance.
- I/O Manager: Coordinates all input/output operations between user applications and hardware devices.

Core Data Structures in NTFS

The effectiveness of the NTFS file system relies heavily on several core data structures that organize and manage data on disk.

Master File Table (MFT)

- Central to NTFS, the MFT contains a record for every file and directory.
- Each record is a fixed-size data structure (typically 1 KB).
- Stores metadata such as filename, timestamps, permissions, and pointers to data extents.
- Enables quick file access and efficient management of files.

File Record

- Represents individual files or directories.
- Contains attributes like standard information, filename, security descriptors, data runs, and more.
- Uses a structured format with attribute headers and data.

Attributes

- Basic units of information stored about files.
- Types include Standard Information, File Name, Data, Security Descriptor, and others.
- Can be resident (stored within the MFT record) or non-resident (pointing to external clusters).

Data Runs

- Describe how file data is laid out on disk.
- Use a run-length encoding scheme to specify sequences of clusters.
- Enable efficient mapping of logical file offsets to physical disk locations.

NTFS File System Internals and Operations

Understanding how NTFS reads, writes, and manages files is key to grasping its internal mechanisms.

File Creation and Opening

- When a file is created or opened, the system searches the MFT for a matching record.
- If creating a new file, a new record is allocated, initialized, and linked into directory structures.
- Opening a file involves locating its record and establishing a handle.

Reading and Writing Data

- Data is accessed through data runs in the file's attributes.
- For resident data, the data resides within the MFT record.
- For non-resident data, the data runs provide a mapping to disk clusters.
- The Cache Manager optimizes repeated access by caching data in memory.

File Deletion and Truncation

- Mark the file as deleted by updating its MFT record.
- The actual data remains on disk until overwritten or the space is reclaimed through defragmentation.

Security and Permissions in NTFS

Security is integral to NTFS, with features enabling fine-grained access control.

Security Descriptors

- Store permissions, ownership, and audit settings.
- Associated with files and directories via attributes.
- Use Access Control Lists (ACLs) to specify permissions for users and groups.

Access Control Lists (ACLs)

- Contain Access Control Entries (ACEs) that define permissions.
- Enable complex security policies.
- Are checked during file access operations to enforce security.

Journaling and Data Integrity

NTFS employs journaling to maintain data integrity, especially in case of system crashes or power failures.

Log File and Transactional Operations

- NTFS maintains a log (USN journal) recording changes.
- Uses transactions to ensure consistency; either all changes are committed or none.
- Reduces the risk of file system corruption.

Recovery Mechanisms

- On startup, NTFS replay logs to recover incomplete transactions.

- Ensures filesystem integrity and consistent state.

Advanced Features of Windows NT File System

NTFS supports numerous advanced features that enhance performance, security, and usability.

File Compression

- Allows compression of files and directories to save space.
- Transparent to users and applications.

Encryption

- Supports Encrypting File System (EFS) for data security.
- Uses public-key cryptography to encrypt file contents.

Disk Quotas

- Enable administrators to limit disk space usage per user.
- Helps manage storage resources effectively.

Sparse Files and Reparse Points

- Sparse files optimize storage by not allocating space for empty regions.
- Reparse points facilitate symbolic links, mount points, and volume management.

Performance Optimization and Caching

Windows NT optimizes disk and memory usage through caching and scheduling.

Cache Manager

- Caches frequently accessed data in RAM.
- Reduces disk I/O latency.

Prefetching and Read-Ahead

- Anticipates data needs based on access patterns.
- Improves performance during sequential reads.

I/O Scheduling

- Manages disk access requests to optimize throughput and reduce latency.
- Uses algorithms like FIFO, C-SCAN, and others.

Conclusion

The Windows NT file system internals are a sophisticated amalgamation of data structures, mechanisms, and features designed to provide efficient, secure, and reliable data management. From the core Master File Table to advanced security features and journaling, every component plays a vital role in ensuring the robustness of Windows operating systems. A thorough understanding of these internals is invaluable for system administrators, developers, and cybersecurity professionals aiming to optimize, troubleshoot, or secure Windows environments.

Keywords for SEO optimization: Windows NT file system internals, NTFS architecture, Master File Table, Data runs, Security descriptors, Journaling, File system security, Windows NT file management, NTFS features, Windows file system structure.

Windows NT File System Internals: An In-Depth Examination

The Windows NT file system internals form a complex yet highly optimized architecture that underpins one of the most widely used operating systems globally. As the backbone of Windows NT-based platforms—including Windows 10, Windows Server, and even earlier versions—understanding how the file system operates at a low level is essential for system administrators, security professionals, developers, and researchers alike. This article aims to explore the detailed internal mechanisms of the Windows NT file system, including its architecture, data structures, and operational procedures, providing a comprehensive understanding of how Windows manages files, directories, and storage.

Introduction to Windows NT File System Architecture

The Windows NT architecture introduced a robust, modular, and scalable approach to file management, contrasting sharply with older DOS-based systems. At its core, the Windows NT file system is designed to abstract hardware details, provide security, and ensure data integrity across various storage devices. The architecture can be broadly divided into several components:

- File System Drivers (FSDs): Responsible for interfacing with specific storage media (e.g., NTFS, FAT).
- Object Manager: Manages kernel objects, including files and directories.
- Cache Manager: Implements caching strategies to optimize I/O operations.
- Memory Management: Handles buffers, caches, and buffer pools associated with file I/O.

Among the various file systems supported, NTFS (New Technology File System) is the most prevalent and sophisticated, offering features like journaling, encryption, compression, and security descriptors.

NTFS: The Heart of Windows NT File System Internals

NTFS has been the primary file system for Windows NT since its inception, designed with a focus on reliability, scalability, and advanced features.

Key Features of NTFS

- Journaling: Maintains a transaction log to recover from crashes.
- Security: Implements Access Control Lists (ACLs) and security descriptors.
- Metadata: Uses Master File Table (MFT) to track all files and directories.
- Sparse Files & Compression: Supports efficient storage.
- Encryption: Integrates with Encrypting File System (EFS).
- Disk Quotas & Sparse Files: Manage storage allocations effectively.

Master File Table (MFT): The Core Data Structure

At the heart of NTFS lies the Master File Table (MFT), a relational database that contains a record for every file and directory. Each MFT record is a fixed-size 1 KB structure, which includes:

- File Record Header: Identifies the record and its status.
- File Attributes: Metadata such as timestamps, security, and data content.
- Resident and Non-Resident Data: Data stored directly within the MFT (resident) or elsewhere on disk (non-resident).

The MFT allows for rapid access to file metadata and supports features like defragmentation, security, and recovery.

Deep Dive into NTFS Data Structures

Understanding NTFS internals necessitates a detailed look at its core data structures.

1. FILE_RECORD_HEADER

Every record in the MFT begins with this header, which contains:

- File reference number
- Sequence number
- Flags indicating the record's status (e.g., in use, deleted)
- Pointers to attribute lists

2. ATTRIBUTES

Attributes describe various aspects of files and directories, such as:

- Standard Information: Timestamps, link counts
- File Name: Unicode name, parent directory reference
- Data: Actual file contents or pointers to data
- Security Descriptor: Security information
- Object IDs: Unique identifiers for tracking

Attributes can be resident or non-resident:

- Resident: Data stored directly within the MFT record.
- Non-resident: Data stored elsewhere; the attribute contains extents pointing to data clusters.

3. Attribute List

For large files or files with multiple attributes, an attribute list attribute references additional attributes spread across the disk.

4. Indexing Structures

Directories are implemented as B+ trees, enabling efficient lookups:

- Index Root: Contains the initial part of the directory index.
- Index Allocation: Stores additional index blocks when directories grow large.

- Index Headers: Manage the structure and integrity of index nodes.

File and Directory Operations Internally

The internal operations of Windows NT's file system involve complex sequences of steps, often optimized for performance and reliability.

File Creation and Opening

- The system locates the directory's index structure.
- Searches the B+ tree for the filename.
- If not found, creates a new MFT record, allocates disk space, and updates the directory index.
- Returns a handle for further operations.

Reading and Writing Files

- The system examines the file's data attributes.
- For resident data, reads/writes are direct.
- For non-resident data, the system interprets extents and performs sequential or random disk I/O via the cache manager.

Security and Permissions Handling

- Each file/directory has a security descriptor stored as an attribute.
- Access requests are checked against ACLs.
- Security auditing and inheritance are managed through these descriptors.

Advanced Features and Internal Mechanisms

The internal workings extend beyond basic file management to include features that improve robustness and security.

1. Journaling and Crash Recovery

NTFS uses a transaction log (the journal) to record metadata changes before they are committed to disk. This ensures:

- Consistency after crashes
- Atomic updates
- Faster recovery times

2. File Compression and Encryption

- Compression alters how data extents are stored.
- EFS encrypts file data using cryptographic keys, stored securely within the security descriptors.

3. Disk Quotas and Sparse Files

- Quotas limit user storage consumption.
- Sparse files optimize storage by only allocating space for data that is actually written.

Security and Integrity at the File System Level

Security is deeply integrated into Windows NT file system internals:

- Security Descriptors: Store ACLs, owner, and group information.
- Access Tokens & Impersonation: Enforce permissions during I/O operations.
- Integrity Checks: Use checksum and journaling to verify data integrity.

While NTFS remains highly sophisticated, it faces challenges such as:

- Fragmentation affecting performance
- Security vulnerabilities at the driver level
- Compatibility issues with newer storage technologies (e.g., SSDs)

Recent developments focus on:

- Enhancing support for large disks and files
- Integrating with cloud storage solutions
- Improving resilience and recovery mechanisms

Conclusion

The Windows NT file system internals reveal a layered, resilient, and feature-rich architecture designed for high performance, security, and reliability. From its foundational data structures like the MFT and B+ trees to its advanced features such as journaling, encryption, and quotas, NTFS exemplifies a modern file system engineered for robust enterprise and consumer use. As storage technologies evolve, understanding these internals becomes vital for developers, security analysts, and system architects aiming to optimize or secure Windows-based environments.

By dissecting these internal mechanisms, professionals can better diagnose issues, develop low-level tools, and contribute to future advancements in Windows file system technology.

Question What are the main components of the Windows NT file system architecture? The main components include the NTFS driver, the Master File Table (MFT), the File Record, the Log File, the Bitmap, and the Directory Indexing structures, all working together to manage file storage, retrieval, and integrity. How does the NTFS handle file permissions and security? NTFS uses Access Control Lists (ACLs) embedded within file metadata to define permissions for users and groups, supporting detailed security settings, including discretionary access controls and system-level security features. What is the Master File Table (MFT) and how does it function in NTFS? The MFT is a central database that stores metadata about every file and directory on the volume, including attributes, security information, and data location, enabling efficient file management and access. How does NTFS ensure data integrity and recoverability? NTFS uses a transaction-based logging system via the USN Journal and the Log File (transaction log), which helps recover from crashes by replaying logs and maintaining consistency of the file system. What are the differences between the NTFS Master File Table and FAT file systems? Unlike FAT, which uses a simple File Allocation Table to track clusters, NTFS stores extensive metadata in the MFT, supports larger file sizes, improved security, journaling, and better fault tolerance. How does NTFS handle large files and disk space management? NTFS employs features like extents and a dynamic bitmap to efficiently manage large files and disk space, reducing fragmentation and improving performance for large data sets. What is the role of the Master File Table Record and how is it structured? Each MFT record contains attributes such as file name, data, security descriptors, and timestamps; it is structured with a fixed-size record that allows quick access and updates to file metadata. How do NTFS directory structures optimize file searching and access? NTFS uses B+ trees for directory indexing, which enable fast lookup, insertion, and deletion of files within directories, greatly improving search performance especially in directories with many files.

Related keywords: Windows NT, file system, internals, NTFS, kernel mode, file management, disk management, registry, I/O subsystem, file allocation table

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