**File Compression Metrics and Display Options**

When displaying file compression results, several types of information can be shown to convey efficiency, performance, and details.

1. **Size Metrics** (Most Critical)

* **Original Size**: Size before compression (e.g., 250 MB).
* **Compressed Size**: Size after compression (e.g., 75 MB).
* **Size Reduction**: Absolute savings (e.g., 175 MB saved).
* **Compression Ratio**: Ratio of original to compressed size (e.g., 3.33:1).
* **Savings Percentage**: (1 - (Compressed/Original)) × 100% (e.g., 70% reduction).

2. **Performance Metrics**

* **Compression Time**: Time taken to compress (e.g., 12.5 seconds).
* **Decompression Time**: Time to restore the original file (e.g., 3.2 seconds).
* **Speed**: Throughput (e.g., 150 MB/s during compression).

3. **File-Specific Details**

* **Filename**: Name of the compressed file.
* **File Type**: Format (e.g., .txt, .jpg, .zip).
* **Compression Method**: Algorithm used (e.g., DEFLATE, LZMA, Zstandard).
* **Compression Level**: If applicable (e.g., Level 9 (Ultra)).

4. **Comparative Metrics**

* **Space Saved**: Absolute reduction (e.g., Saved 175 MB).
* **Efficiency**: Compression ratio or percentage relative to other methods.

5. **Batch Processing Stats** (For multi-file compression)

* **Total Files Processed**: e.g., 42 files compressed.
* **Aggregate Size Metrics**: Combined original/compressed sizes for all files.
* **Average Savings**: Mean compression ratio/percentage across files.

6. **Integrity & Security**

* **Checksum**: Hash values (e.g., SHA-256) for data integrity.
* **Encryption Status**: Whether encryption was applied (e.g., AES-256).

7. **Resource Usage**

* **CPU Utilization**: e.g., 85% CPU usage.
* **Memory Used**: e.g., 512 MB RAM.

8. **Algorithm-Specific Details** (Advanced)

* **Dictionary Size**: For LZ77-based algorithms.
* **Window Size**: Sliding window parameter.
* **Entropy**: Theoretical compression limits (e.g., for lossless).

9. **Visual Feedback**

* **Progress Bar**: Real-time compression progress.
* **Speed Graph**: Compression rate over time.

Example Output:

File: report.pdf

Original: 200.0 MB → Compressed: 50.0 MB

Savings: 150.0 MB (75% reduction)

Ratio: 4.00:1

Time: 8.4 sec | Speed: 23.8 MB/s

Method: Zstandard (Level 11)

Checksum: SHA-256 ✓

Key Considerations:

* **Lossy vs. Lossless**: Lossy compression (e.g., images/audio) may include **quality metrics** (e.g., PSNR: 42 dB).
* **User Context**: Command-line tools (e.g., gzip, 7z) show concise stats, while GUI tools (e.g., WinRAR) visualize progress.
* **Verbosity Levels**: Advanced tools (e.g., pigz -v) offer detailed logs.

Common tools like **WinRAR**, **7-Zip**, or gzip -v use subsets of these metrics. The most critical are **original/compressed sizes**, **savings percentage**, and **time**.