File Maintenance Tool

A **safe, scheduled file maintenance utility** for Windows that:

- Scans configured folders
- Identifies files older than a given number of days
- Optionally backs them up to a local or network location
- Deletes the original files
- Cleans up empty directories
- Manages log retention
- Runs with **bounded resource usage** (safe for busy PCs and SMB shares)

Designed for **unattended execution** (Windows Task Scheduler) and **network environments**.

🛠 How It Works

The `file-maintenance` tool performs automated cleanup and optional backups of old files based on configurable rules.

The process follows a predictable and safe execution flow:

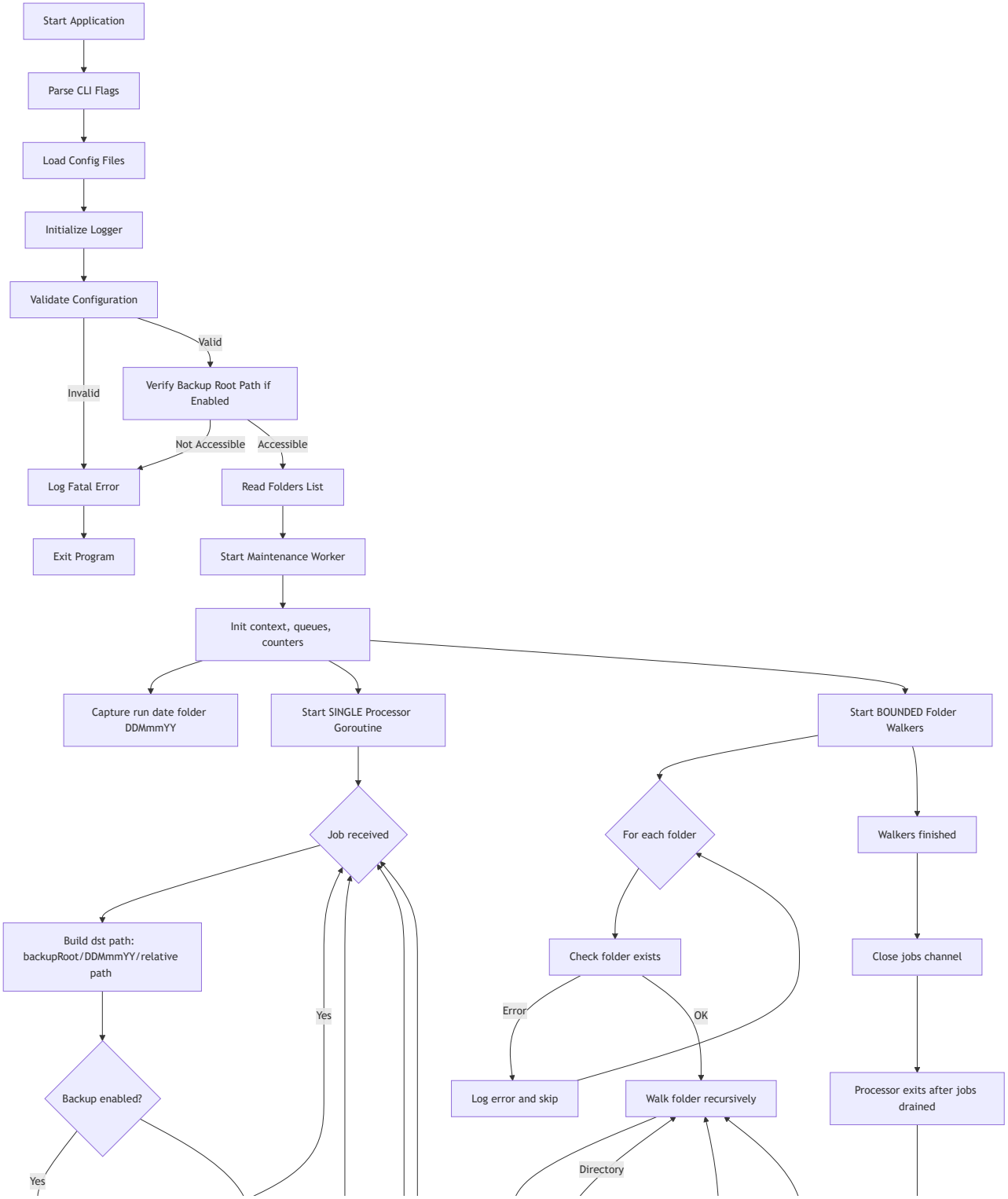
1. **Startup & Configuration**
    - CLI flags are parsed
    - Configuration files are loaded
    - Logging is initialized
    - Critical paths are validated
2. **Safety Checks**
    - Ensures target folders exist
    - Verifies backup destination is accessible
    - Terminates early on fatal misconfiguration
3. **Maintenance Worker**
    - Initializes execution context, queues, and counters
    - Captures a run-specific backup date (DDMmmYY)
    - Starts:
        - Bounded folder walkers (discovery only)
        - A single processor goroutine (file operations)
4. **Backup & Cleanup**
    - Eligible files are enqueued for processing
    - Backup destination path is built as:

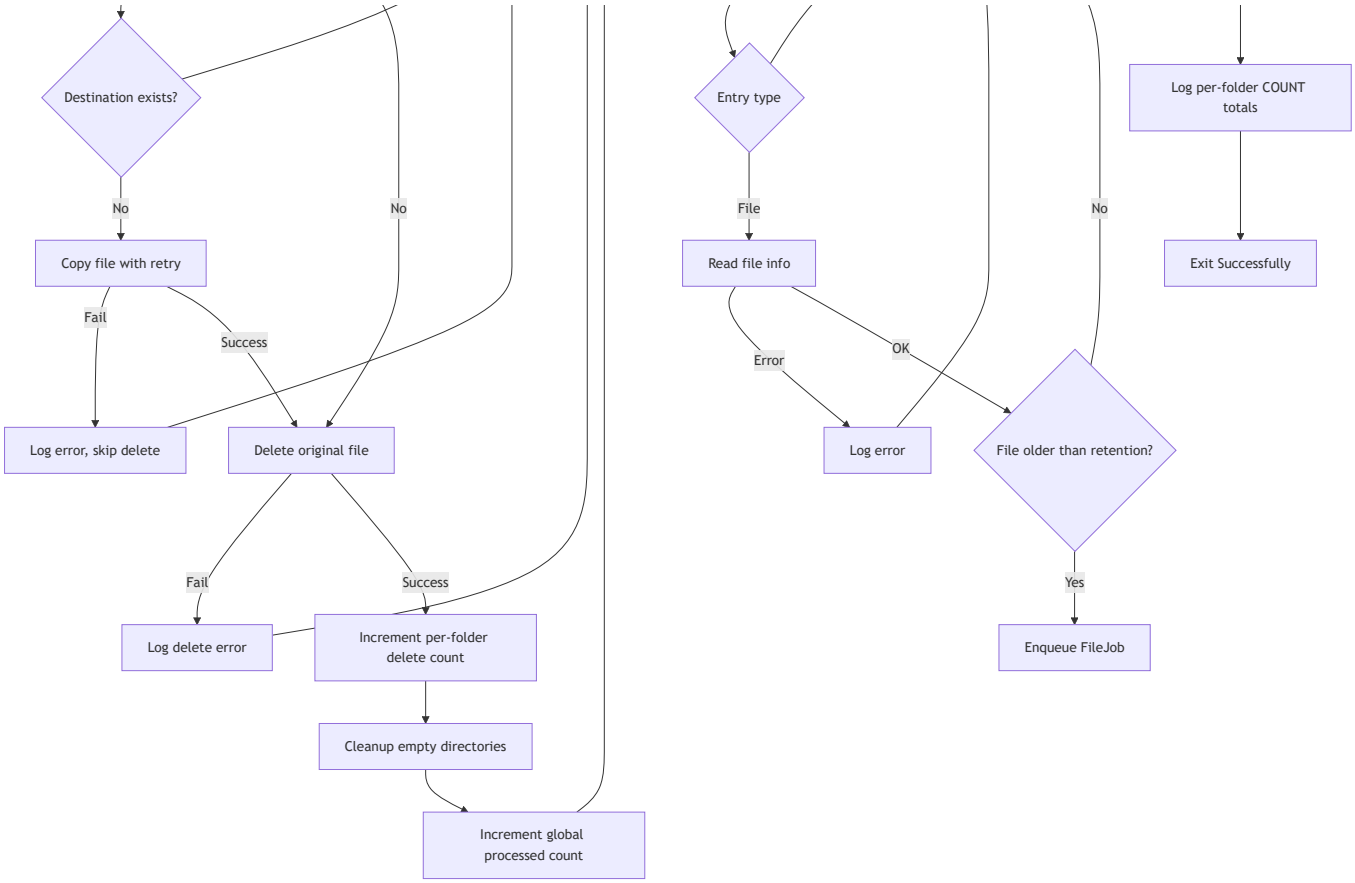
```
backupRoot/DDMmmYY/relative-path
```

- Files are copied with retry + backoff
- Original files are deleted only after successful backup
- Empty directories are cleaned bottom-up

5. **Logging & Exit**

- All actions are logged (success, warning, error)
- Logs are flushed before clean exit





> The execution flow reflects a **single-processor design** for file operations: folder scanning may be concurrent, but backup and deletion always occur one file at a time. Backups are grouped under a per-run date folder (`DDMmmYY`).

⚑ Command-Line Flags

Retention & Deletion

Flag	Default	Description
`-days`	`7`	Only files older than this many days are eligible for deletion
`-no-backup`	`false`	Delete files without backup
`-log-retention`	`30`	Log retention in days

Paths & Configuration

Flag	Default	Description
`-config-dir`	`<exe>/configs`	Config directory
`-log-dir`	`<exe>/logs`	Log directory
`-no-logs`	`false`	Console-only logging

Resource Controls

Flag	Default	Description

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`-walkers`	`1`	Concurrent folder walkers
`-queue-size`	`300`	Job queue size
`-max-files`	`0`	Max files per run
`-max-runtime`	`30m`	Max runtime
`-cooldown`	`0`	Cooldown between files
`-retries`	`2`	Copy retries

✨ Key Features

- ☑ **Backup before delete** (default, strongly recommended)
- 🗂 **Date-based backups**
  - One folder per run (`DDMmmYY`)
  - Preserves full relative directory structure
- 🛡 **Path-safe backups** (prevents directory traversal)
- 🧵 **Bounded concurrency**
  - Parallel folder scanning (configurable)
  - Serialized file operations (copy/delete one file at a time)
- 🌐 **Network-friendly**
  - Streaming file copy (low RAM)
  - Retry + backoff for SMB hiccups
  - Optional cooldown between file operations
- 🧹 **Automatic cleanup**
  - Deletes empty directories (bottom-up, safe boundary)
  - Log retention management
- 🪵 **Configurable logging**
  - File logging or console-only (`-no-logs`)
  - Per-level enable/disable via `logging.json`

🗀 Project Structure

```
.
├── cmd/
│   └── main/              # CLI entry point
├── internal/
│   ├── app/               # High-level application orchestration
│   ├── config/            # Reading folders.txt, backup.txt, logging.json
│   ├── logging/           # Thread-safe logger
│   ├── maintenance/       # Core logic (scan, backup, delete, cleanup)
│   ├── types/             # AppConfig definition
│   └── utils/             # Helpers (exe path resolution, etc.)
├── configs/
```

```
│   ├── folders.txt
│   ├── backup.txt
│   └── logging.json
└── build.ps1             # Helpers (exe path resolution, etc.)
```

⚙ Configuration Files (This Files are required in order for the program to run)

configs/folders.txt

List of folders to process (one per line).

Examples

````
```md
# Local temp files
C:\Temp\OldFiles

# Network location
\\server\share\incoming
```
````

- Empty lines and # comments are ignored.

configs/backup.txt

Backup destination root.

```
\\server\share\backups
```

- If empty, defaults to ../backups relative to configs/
- Path is validated and write-tested before any deletion occurs

configs/logging.json

Enable/disable log levels.

```
{
    "DEBUG": false,
    "COUNT": true,
    "INFO": true,
    "WARN": true,
    "ERROR": true,
```

```
    "SUCCESS": true,
    "FATAL": true
}
```

- COUNT is used for summary metrics (ex: deleted files per folder)
- Unknown levels default to enabled (fail-open policy)

📦 Backup Layout (Important)

Backups are written using a date-based folder structure that preserves the original directory hierarchy.

Destination format:

```
<backupRoot>/<DDMmmYY>/<relative folder structure>/<filename>
```

Example:

```
Source file:
C:\Data\Images\2024\Camera\IMG001.jpg

Backup destination:
\\server\share\backups\30Jan26\2024\Camera\IMG001.jpg
```

Why this design:

- Keeps backups grouped per run/day
- Preserves original folder structure for easy restore
- Prevents filename collisions
- Makes auditing and cleanup straightforward
- The backup date folder is determined per run. All files processed in the same run share the same DDMmmYY folder.

🚀 Usage

Basic run

```
fileMaintenance.exe -days 7
```

Deletes files older than 7 days (after backing them up).

Disable backups (⚠ dangerous)

```
fileMaintenance.exe -days 7 -no-backup
```

Deletes files without backup. Use only intentionally.

Resource-controlled run (recommended)

```
fileMaintenance.exe -days 7 -walkers 1 -queue-size 300 -max-files 2500 -max-runtime 30m -cooldown 50ms -retries 2
```

Ideal for:

- busy workstations
- large image sets
- network (SMB) destinations

Console-only logging

```
fileMaintenance.exe -days 0 -no-logs
```

🧠 Concurrency Model (Important)

- Folder scanning Parallel, bounded by `-walkers` (default: 1)
- File operations (copy + delete) **always serialized** (one file at a time)

Why:

- Prevents SMB saturation
- Keeps CPU + disk usage predictable
- Safer for large files (images, media)

🧹 Empty Directory Cleanup

After a file is deleted:

- Parent directories are removed only if empty
- Cleanup proceeds bottom-up
- Deletion never crosses the configured folder root

- Path comparisons are Windows-safe (case-insensitive)

This keeps folder trees tidy without risk

Logging

File mode (default)

- logs/maintenance_YYYY-MM-DD.log (all levels)
- logs/errors_YYYY-MM-DD.log (ERROR only)
- logs/count_YYYY-MM-DD.log (COUNT only — summary totals like “files deleted per folder”)

> [!NOTE] Per-folder delete counts are logged after the run finishes, so counts stay accurate even when walking finishes before processing.

Console mode

- Enabled with -no-logs
- Useful for development and smoke tests

Log retention

```
log-retention 30
```

Deletes log files older than N days (best-effort, non-fatal).

Windows Task Scheduler (Recommended Setup)

Suggested schedule

- Twice daily (e.g., 6:30 AM / 6:30 PM)

Example launch command:

```
powershell.exe -NoProfile -ExecutionPolicy Bypass -Command ^
Start-Process -FilePath "C:\path\fileMaintenance.exe" `
-ArgumentList "-days 7 -walkers 1 -max-runtime 30m -cooldown 50ms" `
-Priority BelowNormal -WindowStyle Hidden -Wait
```

Task options

- ☑ Run whether user is logged on or not
- ☑ Run as soon as possible after a missed start

- ☑ Stop task if running longer than 1 hour

Safety Guarantees

This tool is designed to fail safe:

- ❌ No deletion if backup root is inaccessible or backup copy fails
- ❌ No path traversal outside backup root
- ❌ No directory deletion above configured folder root
- ❌ No unbounded goroutines or memory growth
- ☑ Network hiccups handled with retries + backoff

Development & Testing

Smoke test

```
.\build.ps1 smoke
```

- Builds the binary
- Runs with -no-logs
- Verifies configs exist

License

Internal / private use.