

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

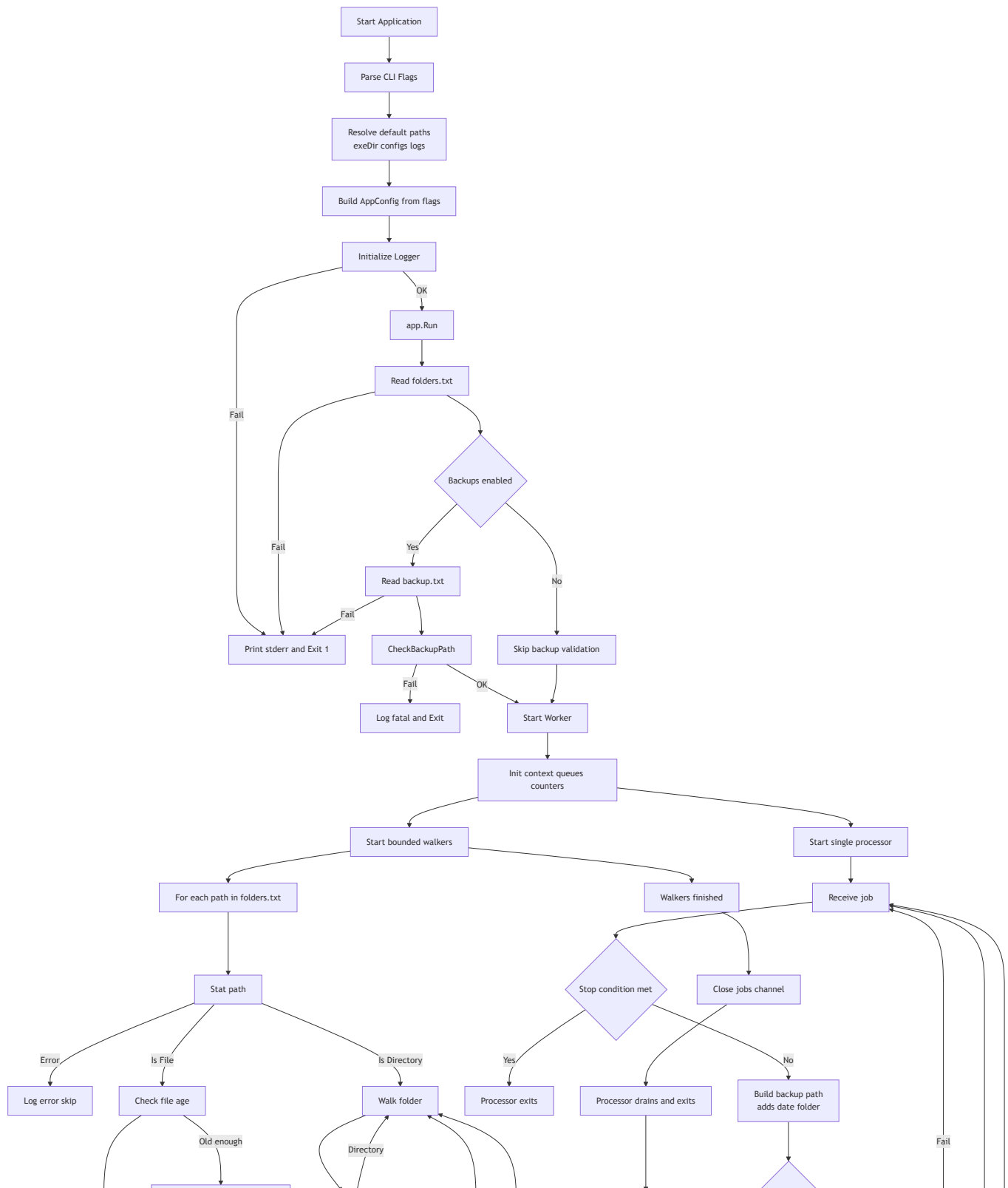
- Eligible files are enqueued for processing
- Backup destination path is built as:

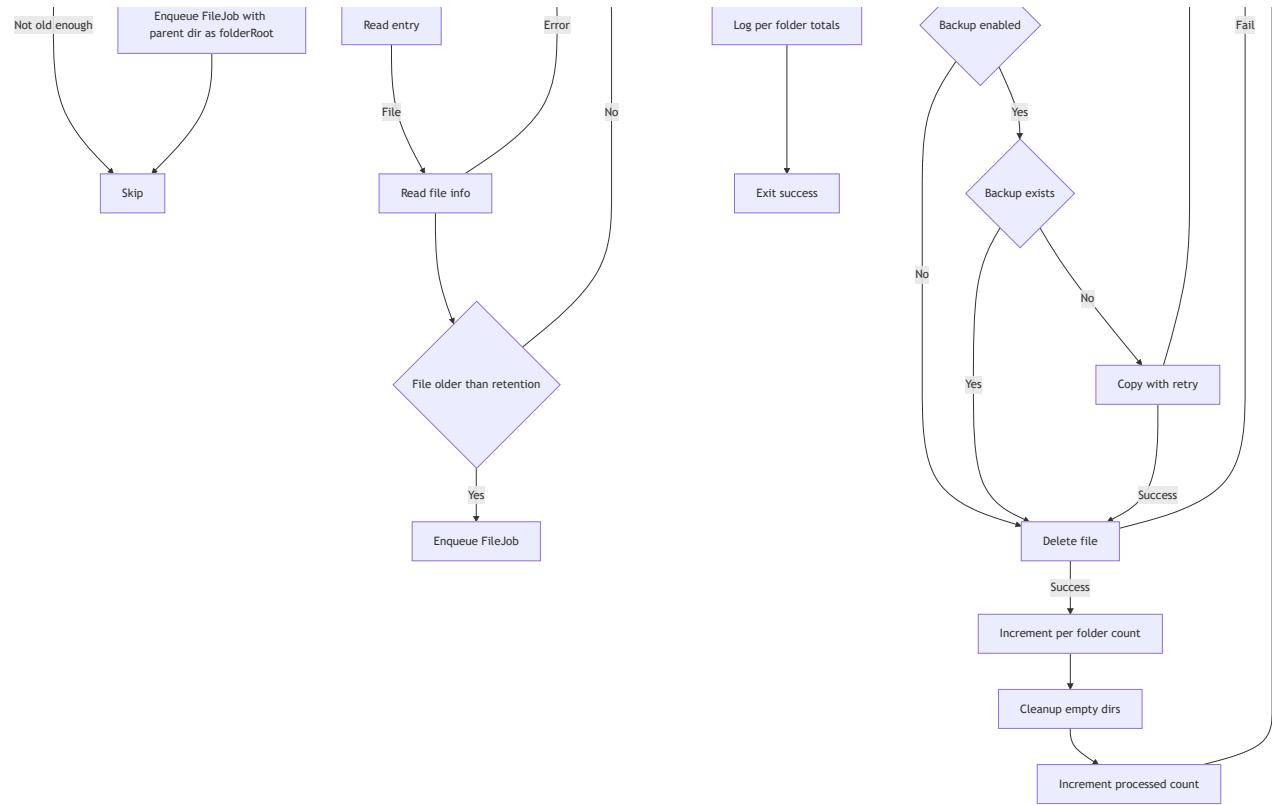
```
backupRoot/DDMmmYY/relative-path
```

- Files are copied using streaming I/O 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 (DDMMYY).

► 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
-walkers	1	Concurrent folder walkers

Flag	Default	Description
-queue-size	300	Job queue size
-max-files	0	Max files per run (0 = unlimited)
-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 (DDMMYY)
 - Preserves full relative directory structure
-  **Path-safe backups**
 - prevents directory traversal
 - Rejects paths escaping the source root
-  **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 (Build, run, smoke, coverage helpers)
```

⚙ Configuration Files

These Files are required for the program to run

configs/folders.txt

List of folders **or individual files** to process (one per line).

Path Types Supported

Type	Description	Example
Folder	All files inside the folder (recursively) are evaluated	C:\Temp\OldFiles
File	The specific file is evaluated directly	C:\Data\Images\old-photo.jpg

Examples

```
# Folders - delete all old files from these locations
C:\Temp\OldFiles
  ``text
  # Local temp files
  C:\Temp\OldFiles

  # Network location
  \\server\share\incoming

# Specific files - delete only these exact files
C:\Data\Images\old-photo.jpg
C:\Logs\debug.log
```

- Empty lines are ignored
- Lines starting with # are treated as comments
- Individual files must meet the age criteria (unless -days 0 is used)

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)

[!NOTE] Per-folder delete counts are logged after the run finishes, so totals remain accurate.

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

- ✗ No deletion if 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.