File Maintenance Tool

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

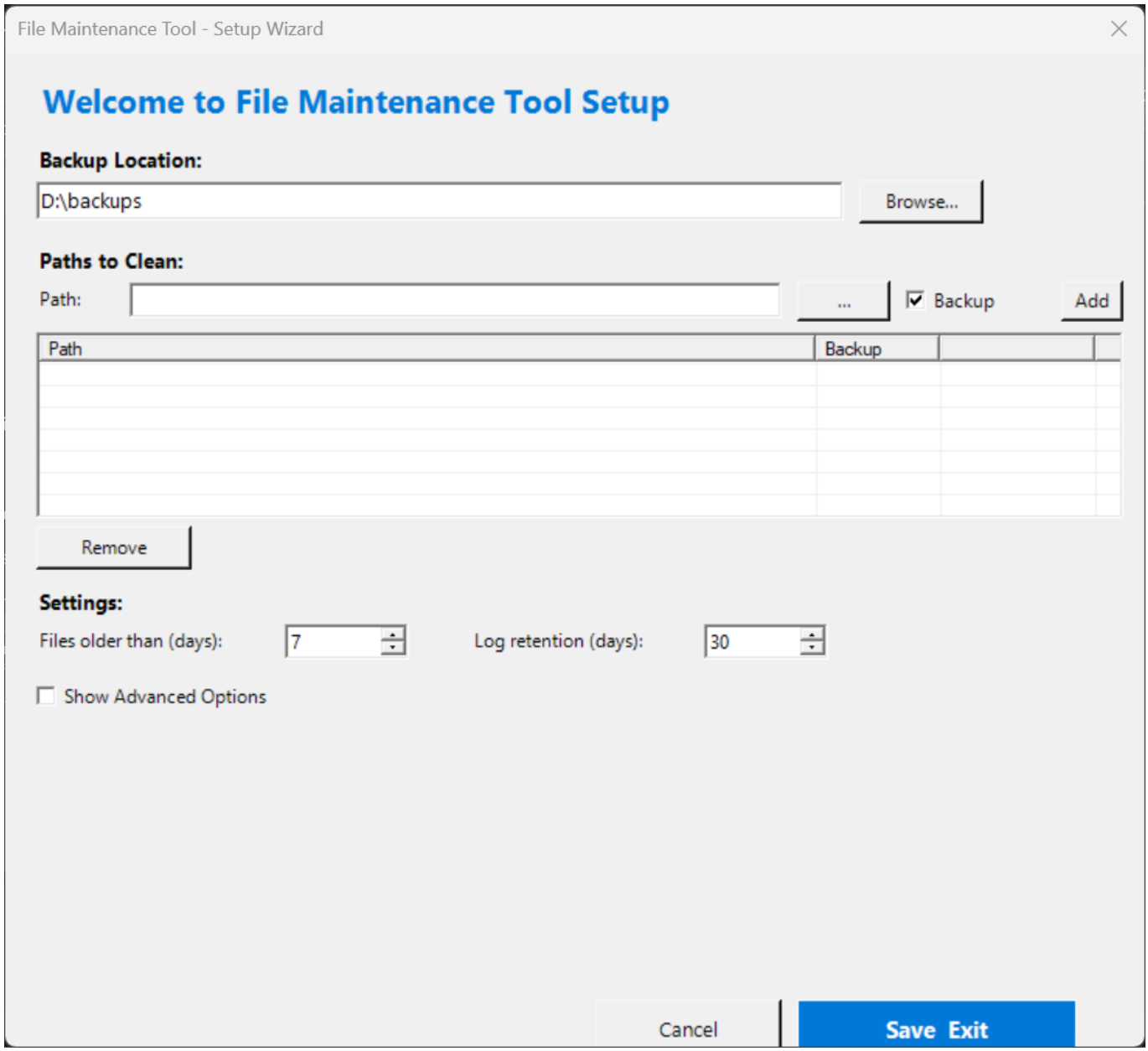
- Scans configured paths
- Identifies files older than a given number of days
- Optionally backs them up to a local or network location (per-path setting)
- Deletes the original files
- Cleans up empty directories
- Manages log retention
- Runs with **bounded resource usage** (safe for busy PCs and SMB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

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

🎯 Getting Started

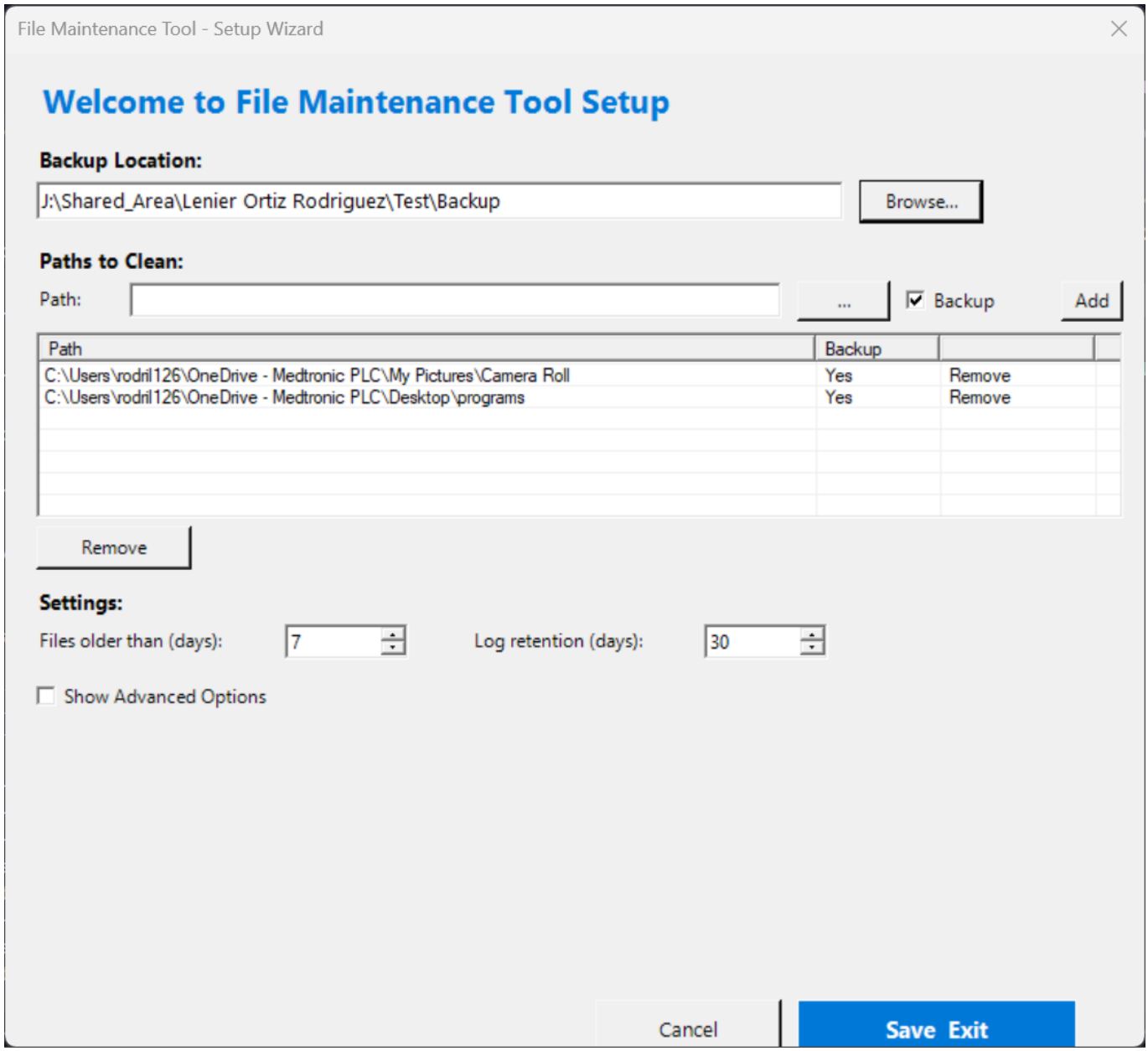
First-Time Setup

When you first run the application, a **Setup Wizard** will launch automatically to help you configure the tool.



The Setup Wizard allows you to:

1. **Set Backup Location** - Choose where to store backups before deletion
    - Click "Browse..." to select a folder
    - Can be a local drive (`D:\backups`) or network share (`\\server\share\backups`)
2. **Add Paths to Clean** - Specify which folders/files to process
    - Enter a path or click "..." to browse
    - Click "Add" to add to the list
    - Use the checkbox to enable/disable backup for each path
3. **Save Configuration** - Click "Save & Exit" to save and run



Running the Application

After initial setup, simply run:

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

This will:

1. Read configuration from `config/config.ini`
2. Scan configured paths for files older than 7 days
3. Backup files (if enabled for that path)
4. Delete original files
5. Clean up empty directories

Modifying Configuration

You can modify settings by:

1. **Editing config.ini directly** - Located in `config/config.ini`
2. **Re-running the Setup Wizard** - Delete `config/config.ini` and launch the application

---

🛠️ How It Works

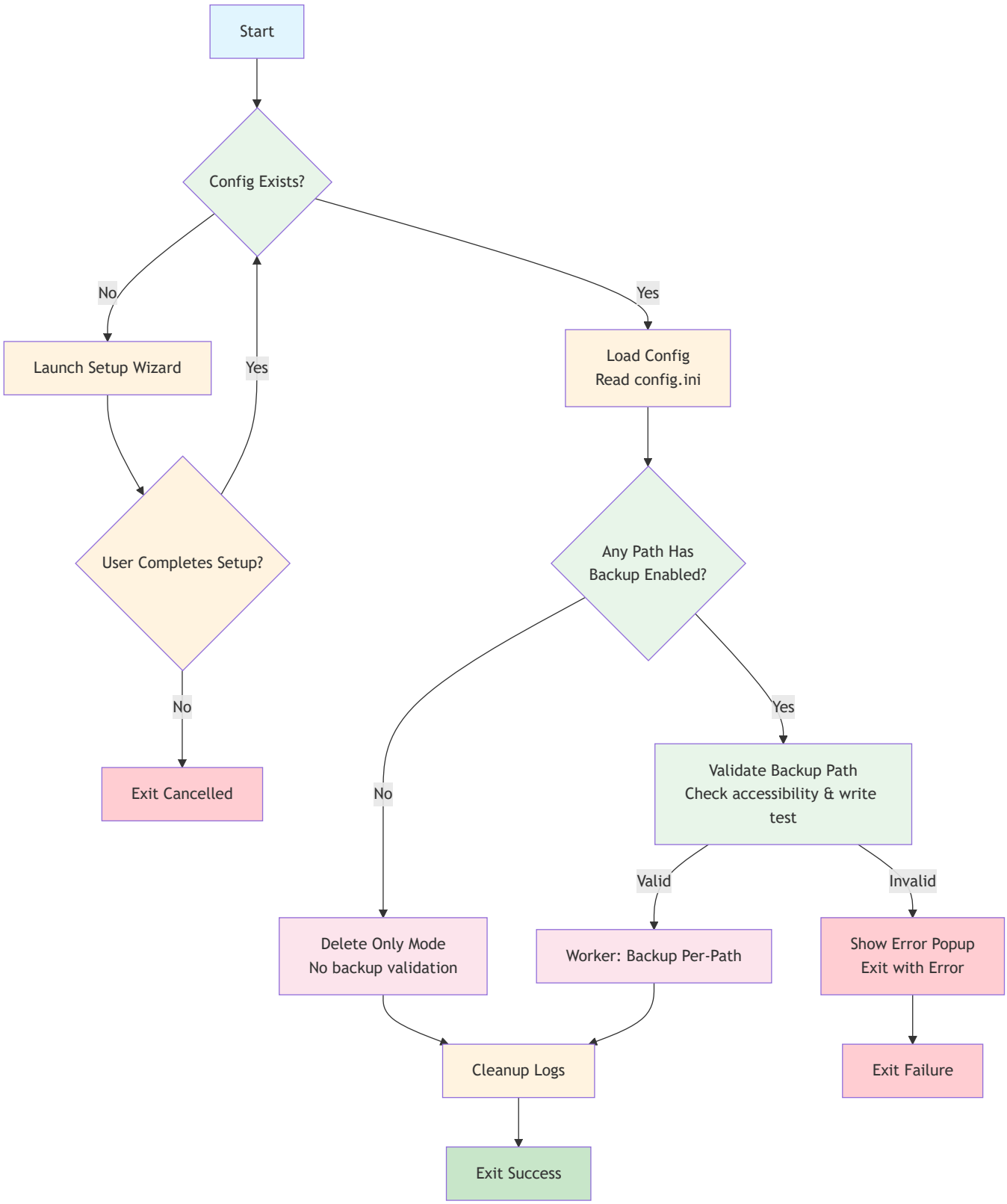
The `file-maintenance` tool performs automated cleanup and optional backups of old files based on configurable rules.

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 paths exist
    - Verifies backup destination is accessible (if any paths have backup enabled)
    - Displays popup notification if backup location is inaccessible
    - Terminates early on fatal misconfiguration
3. **Maintenance Worker**
    - Initializes execution context, queues, and counters
    - Captures a run-specific backup date (DDMmmYY)
    - Starts:
        - Bounded path 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/<folder-name>/relative-path
```

    - Files are copied using streaming I/O with retry + backoff
    - Original files are deleted only after successful backup (unless backup is disabled for that path)
    - 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: path 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

Flag	Default	Description
`-days`	`7`	Only files older than this many days are eligible for deletion
`-log-retention`	`30`	Log retention in days

Paths & Configuration

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

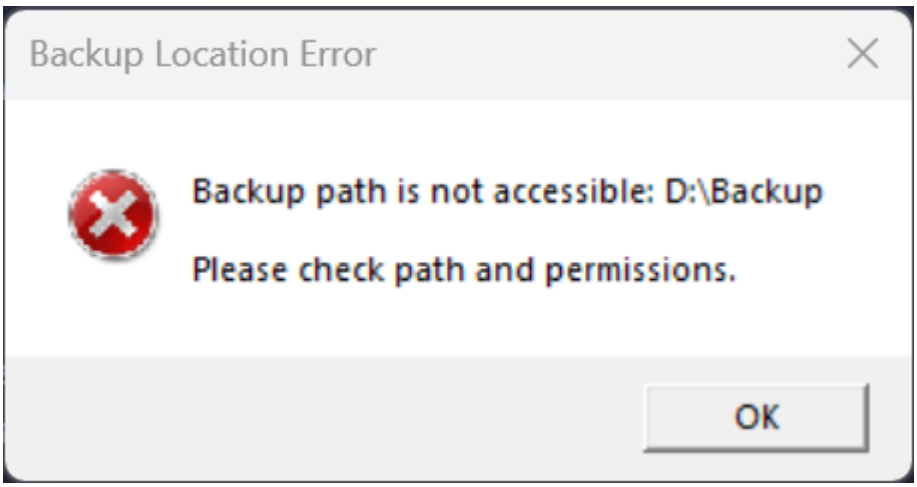
Resource Controls

Flag	Default	Description
`-walkers`	`1`	Concurrent path walkers
`-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** (configurable per-path)
- 🗂 **Date-based backups**
  - One folder per run (`DDMmmYY`)
  - Preserves full relative directory structure
- 🧠 **Path-safe backups**
  - prevents directory traversal
  - Rejects paths escaping the source root
- 🚂 **Bounded concurrency**
  - Parallel path 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`
- **Per-path backup control**
  - Each path can have backup enabled or disabled independently
  - Controlled via `config.ini` with simple `yes/no` syntax
- **User notifications**
  - Popup alerts when backup location is inaccessible
  - Critical errors shown even in unattended runs (Task Scheduler)
  - Error icon indicates issues requiring attention



Project Structure

```
.
├── cmd/
│   └── main/              # CLI entry point
├── internal/
│   ├── app/               # High-level application orchestration
│   ├── config/            # Reading config.ini and logging.json
│   ├── logging/           # Thread-safe logger
│   ├── maintenance/       # Core logic (scan, backup, delete, cleanup)
│   ├── types/             # AppConfig definition
│   └── utils/             # Helpers (exe path resolution, etc.)
├── config/
│   ├── config.ini         # All configuration (backup path + paths list)
│   └── logging.json
└── build.ps1             # Helpers (Build, run, smoke, coverage helpers)
```

Configuration Files

These Files are required for the program to run

`config/config.ini`

Single configuration file containing both backup destination and paths list.

Format

```
[backup]
path=<backup-destination>

[paths]
path1, yes|no
path2, yes|no
```

Sections

Section	Key	Description
`[backup]`	`path`	Backup destination root path
`[paths]`	(standalone lines)	Paths to process with per-path backup control

Paths Format

```
path, yes|no
```

- `path`: the file or folder to process
- `yes`: enable backup before deletion
- `no`: delete without backup

> **Alternative Format**: You can also use the `paths=` key prefix:
>
> ```
> paths=path, yes|no
> ```

Both formats can be mixed in the same config file.

Path Types Supported

Type	Description	Example
Folder	All files inside the folder (recursively) are evaluated	`C:\Temp\OldFiles, yes`
File	The specific file is evaluated directly	`C:\Data\Images\old-photo.jpg, no`

Examples

```
[backup]
path=D:\backups

[paths]
# Folders with backup enabled - delete all old files after backing up
C:\Temp\OldFiles, yes
\\server\share\incoming, yes

# Folders without backup - delete files directly (use with caution)
C:\Temp\ToDelete, no

# Specific files with backup
C:\Data\Images\old-photo.jpg, yes

# Specific files without backup
C:\Logs\debug.log, no

# Alternative format with 'paths=' prefix (can be mixed)
paths=C:\Temp\AltFolder, yes
```

- Empty lines are ignored
- Lines starting with `;` or `#` are treated as comments
- Individual files must meet the age criteria (unless `-days 0` is used)
- Backup is enabled by default if not specified

config/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>/<folder-name>/<relative folder structure>/<filename>
```

Example:

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

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

Why this design: - Keeps backups grouped per run/day - Includes folder name for clear logging and easy restore - 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).

Per-path backup control

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

Configure backup behavior in `config.ini`:

```
[paths]
C:\Temp\OldFiles, yes    # Backup enabled
C:\Temp\ToDelete, no      # Backup disabled
```

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)

- Path 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:

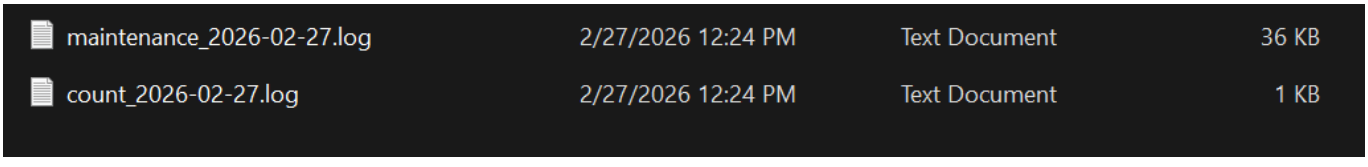
- Parent directories are removed **only if empty**
- Cleanup proceeds bottom-up
- Deletion never crosses the configured path root
- Path comparisons are Windows-safe (case-insensitive)

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-path 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
```

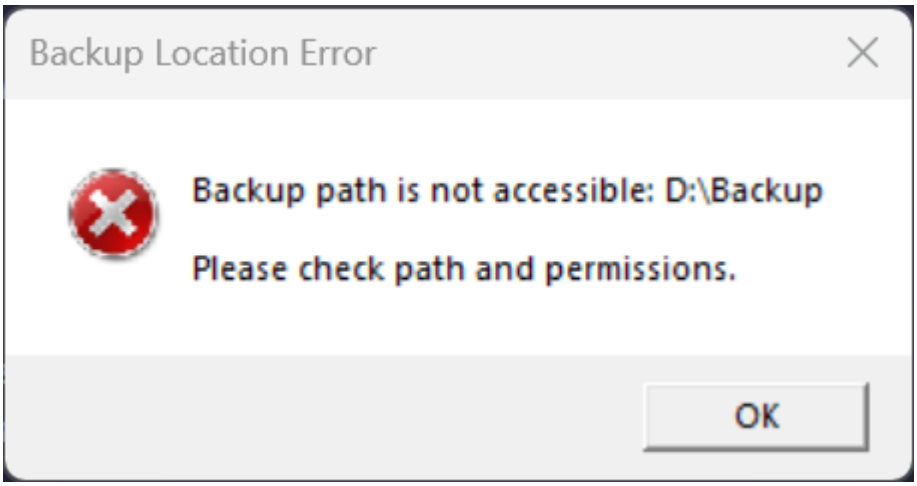
Task options:

- ☑ 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 (when backup is enabled)
- ❌ No deletion if backup copy fails
- ❌ No path traversal outside backup root
- ❌ No directory deletion above configured path root
- ❌ No unbounded goroutines or memory growth
- ☑ Network hiccups handled with retries + backoff
- ☑ Per-path backup control prevents accidental deletion without backup
- ☑ Popup notification alerts user when backup path is inaccessible



How to Capture Error Popup Screenshots

To take a screenshot of the backup location error popup:

Option 1: During Setup Wizard

1. Run the application for the first time (or delete `config/config.ini`)
2. In the Setup Wizard, enter an invalid/inaccessible backup path (e.g., `Z:\nonexistent` or `\\invalid-server\share`)
3. Add a path with backup enabled
4. Click "Save & Exit"
5. The error popup will appear

Option 2: During Regular Run

1. Edit `config/config.ini` and change the backup path to an inaccessible location
2. Run the application
3. The error popup will appear before any files are processed

> **Note**: The backup location is validated every time the application runs (not just during setup). This ensures the backup destination is accessible before any file operations begin.

☑ **Screenshot captured - Error popup during setup wizard**

🧪 Development & Testing

Smoke test

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

- Builds the binary
- Runs with `-no-logs`
- Verifies config exist

License

Internal / private use.