UltraDefrag Handbook

9.0.0

Enterprise Edition

Chapter 1

UltraDefrag Handbook

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Chapter 2

Introduction

UltraDefrag is a powerful disk defragmenter for Windows. It can quickly boost performance of your computer and is easy to use. Also it can defragment your disks automatically so you won't need to take care about that yourself.

UltraDefrag has the following features:

- automatic defragmentation

- fast and efficient defragmentation algorithms

- safe environment preventing files corruption

- detailed file fragmentation reports

- defragmentation of individual files/folders

- defragmentation of locked system files

- defragmentation of NTFS metafiles (including MFT) and streams

- exclusion of files by path, size and number of fragments

- fully configurable disk optimization

- disk processing time limit

- defragmentation of disks having the specified fragmentation level

- automatic hibernation or shutdown after the job completion

- multilingual graphical interface (over 60 languages available)

- one click defragmentation via Windows Explorer's context menu

- powerful command line interface

- easy to use portable edition

- full support of 64-bit editions of Windows

UltraDefrag can defragment both FAT and NTFS disks with just a couple of restrictions:

- It cannot defragment FAT directories, because their first clusters are immovable.

- It cannot defragment master file tables (MFT), because their first 16 clusters are immovable.

However, the program optimizes those files placing their fragments as close to each other as possible.

UltraDefrag can be used on Windows XP/Vista/7/8/10 as well as Windows Server 2003/2008/2012/2016. Older versions of the program (prior to v7) can be used on Windows NT 4.0 and Windows 2000 as well, with some limitations. Additionally `UltraDefrag for Linux` exists which is an independent port of the program based on NTFS-3G capabilities.

Disk processing methods

There are three disk processing methods available: defragmentation, quick optimization and full optimization.

In the initial phase of the disk processing the program analyzes the disk gathering information about files and free space gaps. Then, depending on the selected method, the program either defragments the disk or performs its optimization.

Defragmentation joins fragments together eliminating the fragmentation problem.

Full optimization moves all small files and fragments to the end of the disk to release space in the beginning. Then it moves files back, sorted by a user defined criteria, to speed up access to groups of small files. By default files are sorted by path in ascending order. Additionally FAT directories and NTFS master file tables get optimized as mentioned above.

Quick optimization is the same but it skips already sorted out files.

There are a lot of options available to control the process. Refer to the Graphical Interface chapter of this handbook for detailed information.

Web resources

Everything related to the program can be found at `UltraDefrag Website`.

Chapter 3

Installation

The latest version of the program can be obtained at `UltraDefrag Website`.

Note

    You must be an administrator to install and run UltraDefrag.

The installation process is pretty straightforward, only one thing deserves to be mentioned. During startup the program sends a bit of usage statistics to the `Google Analytics` service. It helps us to understand better your needs. However, you may turn this feature off during the installation.

Also a special portable edition of UltraDefrag is available. It can be copied to a USB stick and then used without installation. However, you have to run the installer once to prepare all the necessary files. Just check **Extract portable edition** on the components selection page and **Show extracted portable edition** on the finish page during the installation. The portable edition includes all the features except a few: it cannot be used to set up automatic defragmentation, it does not include the boot time interface and it cannot be used to defragment individual files/folders from the Windows Explorer's context menu.

Silent mode

UltraDefrag can be installed silently (without graphical dialogs) using additional command line switches:

/S

    Install the program silently.

/NAME={name}

    Your username.

/PASSWORD={password}

    Your password.

/FULL=1

    Install all the components.

/MICRO=1

    Install the console and boot time interfaces only.

/GUI=(1|0)

    Install or remove the graphical interface.

/CONSOLE=(1|0)

Install or remove the console interface.

/BOOT=(1|0)

Install or remove the boot time interface.

/AUTODEFRAG=(1|0)

Enable or disable automatic defragmentation.

/SHELLEXTENSION=(1|0)

Install or remove the Explorer's context menu handler.

/HELP=(1|0)

Install or remove this handbook.

/ICONS=(1|0)

Install or remove all the shortcut icons.

/STARTMENUICON=(1|0)

Install or remove the start menu icon.

/DESKTOPICON=(1|0)

Install or remove the desktop icon.

/QUICKLAUNCHICON=(1|0)

Install or remove the quick launch icon.

/DISABLE_USAGE_TRACKING=(1|0)

Enable or disable the usage tracking mentioned above.

/EXTRACTPE=(1|0)

Extract or remove portable edition of UltraDefrag.

/D={Installation Folder}

Set the installation folder. It must be the last parameter used in the command line and must not contain any quotes, even if the path contains spaces. Only absolute paths are supported. The destination folder must be empty or contain a previous UltraDefrag installation.

Note

- Both name and password switches are mandatory for silent mode unless you upgrade an existing v9 installation.
- The shortcut icons force installation of the graphical interface they depend on.
- The same way automatic defragmentation and the Explorer's context menu handler force installation of the console interface.

The following samples illustrate use of the command line switches:

```
:: install everything except of desktop and quick launch icons
ultradefrag-8.0.0.exe /S /NAME=Joe /PASSWORD=XXX /FULL=1 /ICONS=0 /STARTMENUICON=1

:: install the console and boot time interfaces only along with this handbook
ultradefrag-8.0.0.exe /S /NAME=Joe /PASSWORD=XXX /MICRO=1 /HELP=1

:: remove the boot time interface from the previous installation
ultradefrag-8.0.0.exe /S /NAME=Joe /PASSWORD=XXX /BOOT=0

:: change the installation folder
ultradefrag-8.0.0.exe /S /NAME=Joe /PASSWORD=XXX /D=H:\Software\UltraDefrag

:: uninstall the program silently
%UD_INSTALL_DIR%\uninstall.exe /S
```

For troubleshooting omit the /S switch and check the dialogs to ensure that all the parameters are set properly. In case of errors check the following file as well: **%TMP%\UltraDefrag_Install.log**. Additionally you can use the DebugView program, as shown in the Troubleshooting chapter of this handbook, to collect a bit more debugging information during the installation.

Chapter 4

Graphical Interface

UltraDefrag GUI is pretty straightforward: you select disks and then either analyze, or defragment, or optimize them. If multiple disks are selected they will be processed one by one. After the job completion you may open a file fragmentation report to check which files are still fragmented and why.

If you see locked files in the report it does make sense to perform a boot time defragmentation. Click **Action** > **Boot time defragmentation** and select the action you would like to perform. The program will show a reboot confirmation dialog then. Click **Reboot now** to reboot the computer and start the boot time processing immediately or click **Reboot later** to process selected disks at the next system reboot. Some files cannot be defragmented even at boot time, but most of them can.

To defragment disks automatically click **Settings** > **Preferences**, then open the **Automatic defragmentation** tab, select the disks and click **OK**. The program will defragment the selected disks from time to time automatically when the computer is idle.

Note

> There is no need to keep UltraDefrag GUI open for the automatic defragmentation to run as the job gets done using a special scheduled task.

If the program says some of your disks need to be repaired, select them and click **Action** > **Repair drives**.

Drives list

The top part of the window displays a list of disks available for defragmentation. By default the program skips removable ones (USB sticks and memory cards). Click **Action** > **Skip removable media** to set whether they have to be included to the list or not. To refresh the list click **Action** > **Rescan drives**.

For each disk the program shows the following information: the disk label (if it exists), the disk processing status, the fragmentation level, the total capacity and the amount of free space available on the disk.

The program calculates the fragmentation level using the following formula:

$$fragmentation\ level = \frac{number\ of\ fragments\ requiring\ defragmentation}{total\ number\ of\ fragments}$$

Cluster map

The bottom part of the window shows the cluster map of the selected disk. It represents disk clusters by little colored squares. The top left square represents the first cluster, the bottom right - the last one. All the clusters in between are organized by rows. The colors have the following meaning:

🟥 Fragmented	🟦 Not fragmented	🟨 Compressed
🟨 Directory	🟩 Locked (system)	🟪 MFT
⬜ Free space		⬛ Unused map cell

Initially the program draws a green map, because it has no information about files and free space gaps on the disk. Then, it finds out where the free space is located and shows it on the map. And, finally, the program collects information about all the files on the disk and updates the map respectively. If a file has to be skipped in defragmentation because it's bigger than specified in preferences the program uses a darker color for it, otherwise it uses a lighter color. The master file table gets drawn using the dark magenta color, the space reserved for its `expansion` - using the light magenta color. The map cells which are not in use get painted gray.

Each map cell represents an integer number of clusters. So, for instance, if a disk has 100 clusters, but the map contains a bit more cells those redundand cells will be not used at all. On the other hand, if the map contains exactly 200 cells they will be all in use, reflecting 2 clusters each.

For the free space the program uses white color by default, but it can be easily changed. Just click **Settings** > **Preferences**, then open the **Miscellaneous** tab and choose another color there. Also you can set the grid color, the map block size and the grid line width there.

Menu

Action

🔍	**Analyze (F5; Enter)** Analyze the selected disks.
▦	**Defragment (F6)** Defragment the selected disks.
▤	**Quick optimization (F7)** Perform quick optimization of the selected disks.
▬	**Full optimization (Ctrl+F7)** Perform full optimization of the selected disks.
▤	**Optimize MFT (Shift+F7)** Optimize the master file tables on the selected disks.
⏸	**Pause (Space)** Pause or resume the job. The current file operation will be completed to avoid data corruption.
❌	**Stop (Ctrl+C)** Abort the job. The current file operation will be completed to avoid data corruption.

	Boot time defragmentation Start the boot time defragmentation (disabled in portable edition).
	Show report (F8) Open the file fragmentation report for the selected disks.
	Skip removable media (Ctrl+M) Exclude removable disks from the list.
	Rescan drives (Ctrl+D) Update the list of drives.
	Repair drives Repair the selected disks.
	When done Set the action to be performed after the job completion. The default is **None**, available actions are: **Exit, Standby, Hibernate, Logoff, Reboot** and **Shutdown**. **Note** To shut the computer down successfully both your system and hardware configuration must support shutdown and power off, otherwise Windows might either reboot the computer or simply stay running. The same way neither standby nor hibernation will work when they are not supported by the hardware or are disabled in Windows.
	Exit (Alt+F4) Close UltraDefrag.

Settings

	Preferences (F10) Open the preferences dialog.

Help

	Contents (F1) Open this handbook.
	Best practice (F2) Open the Tips and Tricks chapter of this handbook.
	Frequently asked questions (F3) Open the Frequently Asked Questions chapter of this handbook.
	Cluster map legend Show the Cluster map section of this chapter.

	Debug
	
	    Get access to debugging information:
	      • **Open log (Alt+L)** opens a log file with debugging information if one is enabled.
	      • **Send bug report** opens the Troubleshooting chapter of this handbook.

	About (F4) Show general information about the program.

Preferences

General

On the general preferences tab you can select your language and set whether the program should check for available updates at startup or not.

Defragmentation

On the defragmentation preferences tab you can select which files to defragment and which files to skip. Also it is possible to skip individual fragments.

It does make sense to skip temporary files as well as big files and fragments. For instance, when you watch a movie Windows spends just a few milliseconds to advance from one fragment to another, but the overall watching time is about 2 hours. So, you'll never gain any performance improvement if you will defragment movies. And the same is true for all the other multimedia files.

Also it does make sense to skip archives. Usually they serve for backup purposes and never get accessed otherwise. So, in most cases you'll see no performance improvement if you will defragment them.

Optimization

On the optimization preferences tab you can set the file sorting criteria and order. Also you can exclude big files from the optimization process, which does make sense as sorting of big files does not improve system performace in most cases.

By default the program sorts files by path in ascending order and skips all files bigger than 20 MB.

Automatic defragmentation

On the automatic defragmentation preferences tab you can set the disks to be processed automatically and access the schedule. Also you can disable the automatic defragmentation completely or set a custom script for it.

Note

Automatic defragmentation preferences are not available in the portable edition of UltraDefrag.

Miscellaneous

On the miscellaneous preferences tab you can exclude disks having a certain fragmentation level, adjust cluster map options and set whether the program has to be minimized to the system tray or not.

Advanced

On the advanced preferences tab you can enable advanced features and access the main configuration file.

Check **Deep action** if you would like to process all files on the disk ignoring all the options set on the defragmentation and optimization tabs. Usually that does not make sense, but in some cases it is useful. For instance, if you would like to move everything to the beginning of the disk and pack as tight as possible to prepare the disk for shrinking, just check this option and perform the full optimization then.

If you would like to quickly test disk processing methods check **Quick test mode**. No files will be actually moved on the disk, but everything else will work the same way as in normal operation.

Chapter 5

Console Interface

UltraDefrag command line (console) interface can be used to automate defragmentation via batch scripts and scheduled tasks. Also it can be used instead of the graphical interface by those who prefer command line environment.

Also UltraDefrag uses its command line interface to handle its context menu entries in Windows Explorer. Right click any file / folder and select **Defragment with UltraDefrag** to defragment it. To stop defragmentation hit **Ctrl+C** or close the command prompt.

Note

> The context menu handler is not available in the portable edition of the program.

UltraDefrag puts its command line tool to the **%SystemRoot%\system32** folder, so it can be used without the full path specification. Just make sure you run it from an `elevated command prompt` as it requires administrative rights.

Usage:

```
udefrag [command] [options] [driveletter:] [path(s)]
```

Commands:

-a, --analyze

> Analyze the specified disks.

-o, --optimize

> Perform full optimization of the specified disks.

-q, --quick-optimization

> Perform quick optimization of the specified disks.

--optimize-mft

> Optimize master file tables only.

-l, --list-available-volumes

> List all fixed disks available for defragmentation.

-la, --list-available-volumes=all

> List all available disks, including removable.

-h, -?, --help

> Display a help screen.

Note

The commands are exclusive and can't be combined with each other. If none is specified the program defragments the specified objects.

Options:

--deep

Process all files ignoring all filters.

-b, --use-system-color-scheme

Disable colorization of output.

-p, --suppress-progress-indicator

Hide the progress indicator and the cluster map.

-v, --show-volume-information

Show disk information after the job completion.

-m, --show-cluster-map

Show the cluster map.

--map-border-color=color

Set color of the cluster map border. Available colors: black, white, red, green, blue, yellow, magenta, cyan, darkred, darkgreen, darkblue, darkyellow, darkmagenta, darkcyan, gray. Yellow is used by default.

--map-symbol=x

Set the character to draw the cluster map with. Type it directly or use its hexadecimal number (in range 0x1 ... 0xFF). For instance, use **--map-symbol=0x1** to draw the map with a smile character. The % symbol is used by default.

--map-rows=n

Set height of the cluster map. The default value is 10.

--map-symbols-per-line=n

Set width of the cluster map. The default value is 68.

--use-entire-window

Expand the cluster map to use the entire console window.

--wait

Wait for completion of other UltraDefrag instances before the job startup (useful for scheduled tasks).

--shellex

List selected objects and display a prompt to hit any key after the job completion. This switch is intended to handle the context menu entries in Windows Explorer, so the program interprets the main UltraDefrag configuration file and ignores all the environment variables listed below.

Drive letters:

List of space separated drive letters or one of the following switches:

--all

> Process all available drives.

--all-fixed

> Process all non-removable drives.

Paths:

List of space separated paths which need to be defragmented. Both absolute and relative paths are supported, as well as wildcards: the question mark (?) matches any one character, while the asterisk (∗) - any zero or more characters. Thus ∗.∗ matches any file with an extension while a single asterisk (∗) matches anything (with or without an extension). All paths including spaces must be enclosed by double quotes:

```
:: defragment drives d: and e:
udefrag d: e:

:: defragment USERPROFILE folder contents
udefrag "%USERPROFILE%\*"

:: defragment everything inside of the '..\Test Files' folder
udefrag "..\Test Files\*"

:: defragment an individual file
udefrag C:\WINDOWS\WindowsUpdate.log

:: defragment them all at once
udefrag d: e: "%USERPROFILE%\*" "..\Test Files\*" C:\WINDOWS\WindowsUpdate.log

:: defragment the WINDOWS folder itself
:: (its contents will be left untouched)
udefrag C:\WINDOWS
```

If command line is empty the program displays the help screen.

Environment variables

Filter variables

UD_IN_FILTER

> List of semicolon separated paths which need to be defragmented.
> Empty list means that everything needs to be defragmented.

UD_EX_FILTER

> List of semicolon separated paths which need to be skipped, i.e. left untouched.

UD_FRAGMENT_SIZE_THRESHOLD

> Skip fragments bigger than specified.
> The following size suffixes are accepted: KB, MB, GB, TB, PB, EB.

UD_FILE_SIZE_THRESHOLD

> Skip files bigger than specified.
> The following size suffixes are accepted: KB, MB, GB, TB, PB, EB.

UD_OPTIMIZER_FILE_SIZE_THRESHOLD

> For optimization only, skip files bigger than specified.
> The following size suffixes are accepted: KB, MB, GB, TB, PB, EB.
> The default value is 20MB.

UD_FRAGMENTS_THRESHOLD

Skip files having less fragments than specified.

UD_SORTING

Set sorting criteria for the disk optimization. PATH is used by default, it forces to sort files by their paths. Four more options are available: SIZE (sort by size), C_TIME (sort by creation time), M_TIME (sort by last modification time) and A_TIME (sort by last access time).

UD_SORTING_ORDER

Set sorting order for the disk optimization. ASC (ascending) is used by default. DESC (descending) forces to sort files in reverse order.

UD_FRAGMENTATION_THRESHOLD

Cancel all tasks except of the MFT optimization when the disk fragmentation level is below than specified.

Process variables

UD_TIME_LIMIT

Terminate the job automatically when the specified time interval elapses. The following time format is accepted: Ay Bd Ch Dm Es. Here A,B,C,D,E represent integer numbers while y,d,h,m,s represent years, days, hours, minutes and seconds.

UD_REFRESH_INTERVAL

The progress refresh interval, in milliseconds. The default value is 100.

UD_DISABLE_REPORTS

Set it to 1 (one) to disable generation of the file fragmentation reports.

Debugging variables

UD_DBGPRINT_LEVEL

Set amount of debugging output. NORMAL is used by default, DETAILED can be used to collect information for a bug report, PARANOID turns on really huge amount of debugging output.

UD_LOG_FILE_PATH

Set log file path (including file name) to redirect debugging output to a file.

UD_DRY_RUN

Set it to 1 (one) to perform all the operations in a quick test mode. No files will be actually moved on the disk, but everything else will work the same way as in normal operation, so you'll be able to quickly test the disk processing methods.

Samples

Batch scripts can be used to automate complex defragmentation tasks:

```
@echo off

:: save debugging information for troubleshooting
set UD_LOG_FILE_PATH=C:\Windows\Temp\udefrag.log

:: terminate the processing after 6 hours and 30 minutes
set UD_TIME_LIMIT=6h 30m
```

```
:: exclude temporary stuff
set UD_EX_FILTER=*system volume information*;*temp*;*tmp*;*recycle*

:: exclude archives as well
set UD_EX_FILTER=%UD_EX_FILTER%;*.zip;*.7z;*.rar

:: skip fragments bigger than 20 MB
set UD_FRAGMENT_SIZE_THRESHOLD=20MB

:: list all drives available for defragmentation
udefrag -la

:: check all available drives for errors
for /F "tokens=1 skip=8" %%D in ('udefrag -la') do chkdsk %%D

:: analyze all fixed drives
udefrag -a --all-fixed

:: defragment everything on drive c:
udefrag c:

:: defragment small audio files on drive d:
set UD_IN_FILTER=*.mp3
set UD_FILE_SIZE_THRESHOLD=20MB
udefrag "D:\My Docs\Music\*"

:: defragment large video files having at least 10 fragments
set UD_IN_FILTER=*.avi;*.mkv
set UD_FILE_SIZE_THRESHOLD=
set UD_FRAGMENTS_THRESHOLD=10
udefrag "D:\My Docs\Movies\*"

:: optimize master file tables on drives c: and d:
udefrag --optimize-mft c: d:

:: reset filters used above
set UD_IN_FILTER=
set UD_FRAGMENTS_THRESHOLD=

:: sort files on drive g: by creation time in descending order
set UD_SORTING=C_TIME
set UD_SORTING_ORDER=DESC
udefrag -o g:

:: sort everything on drive h: ignoring all filters
udefrag -o --deep h:

:: defragment everything on drive k: ignoring all filters
udefrag --deep k:

:: defragment drive n: only if its fragmentation level is above 10%
set UD_FRAGMENTATION_THRESHOLD=10
udefrag n:

:: defragment all fixed drives except of c:, d:, g:, h:, k: and n:
set UD_EX_FILTER=%UD_EX_FILTER%;C:\*;D:\*;G:\*;H:\*;K:\*;N:\*
udefrag --all-fixed

:: defragment a disk with no drive letter assigned,
:: mounted to C:\Games, using the diskpart utility

:: first of all, assign a drive letter to the disk
echo select volume c:\games > script
```

```
echo assign letter=t >> script
diskpart /s script

:: then, defragment the disk
udefrag t:

:: after all, remove the assigned letter
echo select volume c:\games > script
echo remove letter=t >> script
diskpart /s script

:: hibernate the computer using a special
:: command line tool shipped with UltraDefrag
hibernate4win now

:: shut the computer down if hibernation failed
if errorlevel 1 shutdown -s -t 00
```

Chapter 6

Boot Time Defragmentation

To defragment files locked most of the time UltraDefrag can be launched inside of the Windows boot process. Being executed there UltraDefrag can defragment almost everything including paging and hibernation files.

To process selected disks at Windows boot click **Action** > **Boot time defragmentation** and select the action you would like to perform. The program will show a reboot confirmation dialog then. Click **Reboot now** to reboot the computer and perform the selected action at Windows boot immediately or click **Reboot later** to perform the action at the next system reboot.

Also it is possible to execute a custom script at Windows boot. Just click **Action** > **Boot time defragmentation** > **Execute custom script**. To adjust the script click **Action** > **Boot time defragmentation** > **Edit custom script** or open the following file manually in a text editor: **%SystemRoot%\system32\ud-boot-time.cmd**.

The following command line tools can also be used to control the boot time defragmentation: **boot-on**, **boot-off** and **boot-config**. The first one enables the boot time defragmentation, the second one disables it and the last one opens the custom script in Notepad.

The boot time interface is pretty straightforward. First of all it shows a prompt to hit any key to exit and then performs the selected action. The process can be easily aborted at any time using the **Pause/Break** key. Also it is possible to use the boot time interface interactively. Just hit the **Escape** key at any time and the program will show you the following prompt and wait for your input:

```
Interactive mode:
Type 'help' to list available commands.
#
```

The same interactive console will be shown on the screen after the custom script execution if the script does not include the **exit** command.

Available commands

:: or ; or #

Lines starting with one of these characters are treated as comments.

@

Lines starting with this character will be not shown on the screen.

boot-on

Turns the boot time defragmenter on for the next boots.

boot-off

Turns the boot time defragmenter off for the next boots.

call

> Similar to the DOS command. Executes a script; if none is specified the main boot time script will be executed.

echo

> Similar to the DOS command. Displays a message, an empty line, sets whether the commands will be shown on the screen or not or displays the current setting.

exit

> Similar to the DOS command. Terminates UltraDefrag.

help

> Lists all available commands.

hexview

> Displays a file in a HEX viewer layout:

```
000000C0: 0a 00 3b 00 20 00 46 00 |   ;   F
000000C8: 72 00 61 00 67 00 6d 00 | r a g m
000000D0: 65 00 6e 00 74 00 65 00 | e n t e
```

history

> Lists all manually entered commands. To cycle through them use the up/down arrow/cursor keys.

man

> Lists or displays available manual pages.

pause

> Pauses the script execution for the specified time interval (in milliseconds) or till a key is pressed if no duration is specified. For example, the command **pause 1000** will pause execution for one second.

reboot

> Reboots the computer.

set

> Similar to the DOS command. Lists, sets and clears environment variables.

shutdown

> Shuts the computer down.

type

> Similar to the DOS command. Displays a file; if none is specified the main boot time script will be shown.

udefrag

> The boot time equivalent of the [Console Interface](#). Accepts the following command line switches: **-l, -la, -a, -o, -q, --optimize-mft, --all, --all-fixed, --deep**. To process single files or directories specify their absolute paths. If they include spaces enclose them by double quotes:
>
> ```
> udefrag "C:\Documents and Settings\*" C:\WINDOWS\WindowsUpdate.log
> ```

All commands displaying long lists (help, hexview, history, man, set, type) are splitting them into pages in the interactive mode.

Environment variables

Environment variables can be used the same way as in Windows batch files.

Two special variables are supported: **DATE** for the current date in the format **YYYY-MM-DD** and **TIME** for the current time in the format **HH-MM**:

```
2012-02-14
12-48
```

Restrictions

Encrypted disks cannot be defragmented at boot time because the `local security service` is inactive on early stages of Windows boot.

UltraDefrag terminates immediately in `Windows safe mode` because it cannot display text on the screen there.

Custom scripts

By default the program uses the following custom script:

```
@echo off
::
:: UltraDefrag - a powerful disk defragmenter for Windows.
::
:: ud-boot-time-custom.cmd - custom script for boot time defragmentation.
::
:: Visit https://en.wikibooks.org/wiki/Windows_Batch_Scripting
:: for general information about the script syntax.
::
:: Refer to the Boot time defragmentation chapter of the UltraDefrag
:: Handbook for detailed information about the supported commands
:: and environment variables controlling their behaviour. You should
:: have received the handbook along with this program, if not, you can
:: find it at the official UltraDefrag website (https://ultradefrag.net/)
::
:: Please note that you have to save this file in Unicode
:: (UTF-16 / UCS-2 LE BOM) encoding.
::
:: For syntax highlighting the Notepad++ editor can be used.
:: The latest version of it can be downloaded for free from
:: http://www.notepad-plus-plus.org/
::

:: Below is a sample script. It defragments system files, including
:: registry, paging and hibernation files. Feel free to adjust it
:: to make it more suitable for your needs, replace it entirely
:: or keep as is.

:: turn the boot time defragmentation off for subsequent boots
boot-off

set UD_IN_FILTER=*windows*;*winnt*;*ntuser*;*pagefile.sys;*hiberfil.sys
set UD_EX_FILTER=*temp*;*tmp*;*dllcache*;*ServicePackFiles*;*.log;*Windows.old*

; exclude big fragments which rarely benefit from defragmentation
set UD_FRAGMENT_SIZE_THRESHOLD=20MB

; if your system drive is an SSD uncomment the following
```

```
; line to exclude slightly fragmented content as well
; set UD_FRAGMENTS_THRESHOLD=20

; uncomment the following line to increase amount of debugging output
; set UD_DBGPRINT_LEVEL=DETAILED

; uncomment the following line to save debugging information to a log file
; set UD_LOG_FILE_PATH=%UD_INSTALL_DIR%\logs\ud-boot-time.log

udefrag %SystemDrive%

exit
```

Chapter 7

Automatic Defragmentation

Defragmentation can be easily fully automated. Just click **Settings** > **Preferences**, open the **Automatic defragmentation** tab, select the disks you would like to defragment automatically and click **OK**.

By default the program performs automatic defragmentation once a day when the computer is idle. To adjust defragmentation schedule click **Settings** > **Preferences**, open the **Automatic defragmentation** tab and click **Schedule**. Alternatively, you can adjust the schedule directly in `Windows Task Scheduler`.

Note

- By default the automatic defragmentation will not be performed when the computer runs on batteries.
- To prevent waste of time the program disables the following built-in task on Windows Vista and more recent Windows editions:

  Task Scheduler Library\Microsoft\Windows\Defrag\ScheduledDefrag.

Also it is possible to execute a custom script during the automatic defragmentation. Just click **Settings** > **Preferences**, open the **Automatic defragmentation** tab, select the **Execute custom script** option there and click **OK**. To adjust the script click **Edit custom script** or open the following file manually in a text editor: **{installation folder}\tasks\auto-defrag-custom.cmd**.

By default the program uses the following custom script:

```
@echo off
::
:: UltraDefrag - a powerful disk defragmenter for Windows.
::
:: auto-defrag-custom.cmd - custom script for automatic defragmentation.
::
:: Visit https://en.wikibooks.org/wiki/Windows_Batch_Scripting
:: for general information about the script syntax.
::
:: Refer to the Console chapter of the UltraDefrag Handbook for detailed
:: information about the 'udefrag' command and environment variables
:: controlling its behaviour. You should have received the handbook
:: along with this program, if not, you can find it at the official
:: UltraDefrag website (https://ultradefrag.net/)
::
:: To use Unicode characters in filters edit this file in the Notepad++
:: editor and then save it in UTF-8 (without BOM) encoding.
::
:: Also Notepad++ features syntax highlighting which makes it much easier
:: to edit the file. The latest version of Notepad++ can be downloaded
:: for free from http://www.notepad-plus-plus.org/
::

:: Below is a sample script. It defragments system drive and heavily
```

```
:: fragmented content on all the connected non-removable drives.
:: Feel free to adjust it to make it more suitable for your needs,
:: replace it entirely or keep as is.

:: first of all, let's set UD_EX_FILTER to exclude all
:: the stuff which rarely benefits from defragmentation

:: exclude temporary content
set UD_EX_FILTER=*system volume information*;*temp*;*tmp*;*recycle*
set UD_EX_FILTER=%UD_EX_FILTER%;*dllcache*;*ServicePackFiles*;*.log
set UD_EX_FILTER=%UD_EX_FILTER%;*Windows.old*

:: exclude archives
set ARCHIVE_PATTERNS=*.7z;*.7z.*;*.arj;*.bkf;*.bz2;*.bzip2;*.cab;*.cpio;*.deb
set ARCHIVE_PATTERNS=%ARCHIVE_PATTERNS%;*.dmg;*.gz;*.gzip;*.lha;*.lzh;*.lzma
set ARCHIVE_PATTERNS=%ARCHIVE_PATTERNS%;*.rar;*.rpm;*.swm;*.tar;*.taz;*.tbz
set ARCHIVE_PATTERNS=%ARCHIVE_PATTERNS%;*.tbz2;*.tgz;*.tpz;*.txz;*.xar;*.xz
set ARCHIVE_PATTERNS=%ARCHIVE_PATTERNS%;*.z;*.zip
set UD_EX_FILTER=%UD_EX_FILTER%;%ARCHIVE_PATTERNS%

:: exclude multimedia content
set AUDIO_PATTERNS=*.aif;*.cda;*.flac;*.iff;*.kpl;*.m3u;*.m4a;*.mid
set AUDIO_PATTERNS=%AUDIO_PATTERNS%;*.mp3;*.mpa;*.ra;*.wav;*.wma
set VIDEO_PATTERNS=*.3g2;*.3gp;*.asf;*.asx;*.avi;*.flv;*.mov;*.mp4
set VIDEO_PATTERNS=%VIDEO_PATTERNS%;*.mpg;*.rm;*.srt;*.swf;*.vob;*.wmv
set UD_EX_FILTER=%UD_EX_FILTER%;%AUDIO_PATTERNS%;%VIDEO_PATTERNS%

:: exclude virtual machines
set DISK_IMAGE_PATTERNS=*.fat;*.hdd;*.hfs;*.img;*.iso;*.ntfs;*.squashfs
set DISK_IMAGE_PATTERNS=%DISK_IMAGE_PATTERNS%;*.vdi;*.vhd;*.vmdk;*.wim
set UD_EX_FILTER=%UD_EX_FILTER%;%DISK_IMAGE_PATTERNS%

:: exclude big fragments which rarely benefit from defragmentation
set UD_FRAGMENT_SIZE_THRESHOLD=20MB

:: if your system drive is an SSD uncomment the following
:: line to exclude slightly fragmented content as well
:: set UD_FRAGMENTS_THRESHOLD=20

:: uncomment the following line to increase amount of debugging output
:: set UD_DBGPRINT_LEVEL=DETAILED

:: defragment system drive
set UD_LOG_FILE_PATH=%UD_INSTALL_DIR%\logs\autodefrag-system.log
udefrag --wait %SystemDrive%

:: defragment heavily fragmented content
:: on all the connected non-removable drives
set UD_LOG_FILE_PATH=%UD_INSTALL_DIR%\logs\autodefrag-fixed.log
set UD_FRAGMENTS_THRESHOLD=20
udefrag --wait --all-fixed
```

Chapter 8

File Fragmentation Reports

After the job completion the program creates a file fragmentation report. It contains the following information about fragmented files:

Fragments

> Number of fragments.

Filesize

> Size of the file.

Comment

> **[DIR]** for directories and **[CMP]** for NTFS compressed files.

Status

> The reason the file is still fragmented: either **locked** or **move failed** or **invalid**. In the last case the disk needs to be checked for errors (run *CHKDSK {Driveletter} /F /R* to fix it). If no reason is specified the file simply requires more continuous free space for defragmentation.

Filename

> The full path of the file.

To open the report click **Action** > **Show report** in UltraDefrag GUI or click the following file in Windows Explorer: **{installation folder}\reports\fraglist_{drive}.luar**. Depending on configuration the program will generate either a web page or a plain text report and show it then.

To configure the reports click **Settings** > **Preferences** in UltraDefrag GUI. Then open the **Advanced** tab and click **UltraDefrag configuration file** > **Edit**. The program will open the following file in a text editor: **{installation folder}\conf\options.lua**. Adjust the file fragmentation reports options there and then save the file. The next time you open a report the adjusted options will take effect.

By default files are sorted by number of fragments in descending order. To change the order click the appropriate column heading. The sorting is pretty slow: it may take a few seconds.

Chapter 9

Tips and Tricks

Performance

How to improve system performance

First of all, we do recommend to disable the `Windows paging file`. It expands RAM, but works much slower. If you need more memory than physically installed, buy more for the best performance.

Then, it's a good idea to keep system files as close as possible to the beginning of the disk because of higher speed of that area. The best way to do it is to `repartition` the disk once and use the first partition for system files and the second one for backups, videos, music and other stuff more tolerant for slower access.

How frequently to defragment

Defragment files whenever you believe their fragmentation slows down your system. It really does make sense to defragment the system drive every day and optimize it after massive updates. On the other hand, data drives rarely benefit from defragmentation, especially when they are filled by music and videos.

In case of highly fragmented drives, no matter what is fragmented, files or free space, we do recommend to run the full optimization instead of regular defragmentation as it usually leads to better results. If neither defragmentation nor optimization are able to reduce fragmentation significantly in most cases it simply means you haven't enough free space on the disk, so it's time for a cleanup.

The best environment for UltraDefrag

The program shows the best performance being launched at Windows boot where no concurrent processes are running. Nothing interrupts its flow and no applications are locking files preventing their movements.

On the other hand, when your system is in use, some files, being locked by running applications, drop down Ultra-Defrag performance. Due to this reason we do recommend to optimize entire disks at Windows boot rather than on a fully running system. Slightly better results can be achieved in Windows safe mode, but at boot they're always the best.

Note

> You should disable your virus detection software before defragmentation, because otherwise it will be extremely slow. If your antivirus program allows to exclude processes from being monitored, you might exclude Ultra-Defrag instead of disabling it completely.

Regardless of environment remove temporary contents from disks before their optimization. This will shorten optimization time and lead to better results.

Hardware

Flash and SSD drives

Defragmentation of `flash memory` and `solid state drives` (SSD) is usually not necessary as those drives don't rely on physical movements of mechanical parts anyway. However, in case of heavily fragmented files defragmentation still does make sense as it improves performance of the file system itself. Also defragmentation can help to make files `more recoverable`.

Floppy drives

Floppy drives defragmentation is not recommended, because it always reduces lifespan of the floppies.

Checking the file system

Freshly used drives can be defragmented immediately; any drive, which has been in use for a long time without maintenance, should be checked for consistency first. Open a command prompt and type one of the following commands there:

```
:: check drive c: and repair it when needed
chkdsk C: /F /V

:: check drive c:, repair it and collect lost clusters
:: when needed (takes quite long, but is the safest)
chkdsk C: /R /F /V
```

Parallel processing

Simultaneous defragmentation of multiple hard disks can save time.

For instance:

- Hard disk 1 contains partitions C: and D:

- Hard disk 2 contains partitions G: and H:

Start two UltraDefrag sessions simultaneously - one for partitions C: and D: and another one for G: and H: to save up to 50% of time (compared to the case when all four partitions are processed one by one). On the other hand, don't try to defragment partitions C: and D: simultaneously - they belong to the same physical disk, so their parallel processing will be pretty slow.

Caveats

How to prevent endless boot processing

We are trying to keep the program as reliable as possible, but some little chance still exists that its boot time interface will crash making it impossible to boot into Windows. So, for extra safety we do recommend to automatically turn the program off for subsequent boots by inclusion of the **boot-off** command to the beginning of the boot time script.

USN journal cleanup

Sometimes a fragmented `USN journal` prevents free space consolidation. Open an `elevated command prompt` and type the following commands there to clean it up:

```
:: query the journal parameters,
:: write them down to use later
fsutil usn queryjournal c:

:: delete the journal
fsutil usn deletejournal /n c:

:: now it's time to optimize the disk...

:: recreate the journal afterwards
fsutil usn createjournal m=33554432 a=4194304 c:
```

A reasonable value for the maximum size is 85MB for each 100GB of the disk space. The allocation delta should be between $^1/_8$ and $^1/_4$ of the maximum size. The default values are usually 32MB and 4MB respectively.

Chapter 10

Frequently Asked Questions

Installation

Can I up- or downgrade over an existing installation?

Yes. There's no need to remove old files, the installer will take care about everything automatically.

My antivirus software says UltraDefrag is infected by a virus. Is it true?

No, it isn't. To ensure that none of the files have been accidentally infected by a virus, we test everything carefully on `virustotal.com`. Only when all the files pass most of the virus scanners we make an official release. So, if you see a message saying UltraDefrag is infected by a virus, actually that's nothing but a `false positive`. We do recommend you to report the case to your antivirus software vendor. As a result your antivirus software will get fixed and you won't see the false positives anymore.

General usage

I need to defragment a large file but have no sufficient free space gap on the disk, what should I do?

To consolidate free space you can try the full optimization. If it fails to achieve the desired result try one of the following:

- Move all files to another disk, reformat the original disk and move files back. Everything will be perfectly settled in the beginning of the disk.

- Use `GParted` or `Partition Magic` software to shrink the disk. Then expand it back to the original size to get a continuous free space gap at the end.

After defragmentation I see my restore points disappeared, what happens?

The system restore service sometimes tracks file movements. When it exhausts all the disk space reserved for restore points it eliminates elder stuff to release some space for further tracking. Due to this reason we recommend to use `backup` software instead to keep valuable data backed up.

How to move everything to the beginning of the disk?

Usually it doesn't make sense to move big fragments, but if you'd like to get all files perfectly sorted or just want to pack everything as tight as possible before partition shrinking you can easily do it. Just click **Settings** > **Pref-**

erences, open the **Advanced** tab, check **Deep action**, click **OK** and perform full optimization then. This way UltraDefrag will move all files, regardless of their fragments size, to the beginning of the disk.

I have a volume with no drive letter assigned, how can I defragment it?

Go to **Start** > **Control Panel** > **Administrative Tools** > **Computer Management** > **Storage** > **Disk Management** and assign a drive letter to the volume. Then defragment it and, if you wish, remove the assigned letter afterwards. To automate the process the `diskpart` utility can be used as shown in the Console Interface chapter of this handbook. The only drawback is that in some cases a reboot may be required to release the assigned drive letter, especially on older systems like Windows XP.

Graphical interface

When will the cluster map become interactive, so I'll be able to know where individual files are located on disk?

When defragmentation algorithms are quite efficient, it's definitely not necessary to know locations of individual files - anyway you'll get your drive optimized quite well. Maybe we'll implement the discussed feature later, but now it's time for more significant improvements.

Why the progress percentage updates irregularly?

The progress percentage measures disk space, not number of files. So it advances pretty quickly when the program deals with big files, and slows down significantly when thousands of small files are in the queue.

Why the progress sometimes exceeds 100% for FAT disks?

On FAT disks space gets immediately released after file movements, so it might happen that more files get fully defragmented than initially calculated.

Why is the disk name not displayed?

Windows Explorer replaces empty disk names by **Local Disk** or similar, but UltraDefrag doesn't.

Why is only the last report displayed, if I choose to display multiple reports?

Browsers which do not support tabbed browsing are reusing the same window. This is a limitation of the way a web page is opened from within Explorer.

Why are multiple windows opened, if I choose to display multiple reports?

If your browser supports tabbed browsing open one instance of it before you display the reports. This will open each report in a new tab depending on your browser configuration.

When I click Settings > **Preferences** > **Advanced** > **UltraDefrag configuration file** > **Edit the program fails to open the file, what's going on?**

Usually it happens on 64-bit systems when a 32-bit text editior is associated with the .lua file extension. To fix the problem just install a 64-bit edition of the editor or associate the .lua extension with the built-in Windows Notepad.

Boot time interface

Why some files are still fragmented?

Inspect the file fragmentation reports to find out the reason. Some system configurations are locking files even at boot, which can't be prevented. In some cases free space regions aren't big enough to hold the entire file. You might fix that using the quick optimization which consolidates free space a bit.

How can I disable the boot time defragmenter manually?

Remove the **defrag_native** entry from the following system registry parameter:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\BootExecute
```

Automatic defragmentation

The built-in disk defragmenter refuses to run showing the message: "Disk defragmenter was scheduled using another program". What's going on?

Usually this happens on Windows 7 when automatic defragmentation is enabled. To prevent waste of time Ultra-Defrag disables the built-in scheduled defragmentation task during the installation, as described in the Automatic Defragmentation chapter. On Windows 8 and more recent Windows editions everything works fine, but on Windows 7 the built-in disk defragmenter may complain about that and refuse to run. It's completely safe to reenable the task (just click **Remove settings** in the message dialog), but afterwards we do recommend to disable it again, to prevent waste of time.

Why Windows refused to launch the task at idle, but queued it instead?

Usually this happens on Windows Vista and 7 which do check whether the computer is idle or not pretty infrequently, every 15 minutes or so. Thus, the computer needs to stay idle for up to 15 minutes on these systems to launch the task. Till then the task will stay queued.

Why Windows shows the following last run result for the task: "The process terminated unexpectedly (0x8007042B)"?

Usually this happens on Windows 8 and 10. It simply indicates that the task has been stopped because the computer ceased to be idle before the task completion. There's nothing special about it - the task will be launched again to finish the job when the idle state will resume.

I'd like to check what's been done during the last run of the task, but I found log files empty. What's going on?

Usually this happens on Windows 7 when the computer ceases to be idle before the task completion. In this case Windows 7 terminates all the processes involved in the task immediately giving them no chance to save debugging output to log files. There's no easy way to overcome this. The program could save debugging output bit by bit during its execution but this would affect its performance, in some cases pretty drastically.

Miscellaneous

How many differences are between the disk processing algorithms of UltraDefrag and well known MyDefrag (previously JkDefrag)?

Both programs have similar disk analysis algorithms, but defragmentation is done in different ways. While MyDefrag gives more control over files placement, UltraDefrag uses much simpler algorithms which are much faster and much easier to use.

Chapter 11

Troubleshooting

If something is not working properly don't hesitate to investigate the case and report it to support@ultradefrag.-net.

To help us find out what's going on please attach UltraDefrag log file to your report. To open it click **Help** > **Debug** > **Open log** in UltraDefrag GUI.

To configure logging click **Settings** > **Preferences**, open the **Advanced** tab and click **UltraDefrag configuration file** > **Edit**. The program will open the following file in a text editor: **{installation folder}\conf\options.lua**. Adjust logging options there and then save the file. The next time you run UltraDefrag the adjusted options will take effect.

To enable logging for console and boot time interfaces use the **UD_DBGPRINT_LEVEL** and **UD_LOG_FILE_PATH** environment variables. Refer to the Console Interface chapter of this handbook for detailed information.

Alternatively, you can use the Debug View program for logging. Just make sure the **Capture Win32** option is checked there.

Note

> If logging to the specified file fails the program tries to log into the **%SystemDrive%\UltraDefrag_Logs** folder.

For automatic defragmentation issues please attach also the following file: **{installation folder}\logs\task-launcher.log**.

For graphical interface issues please attach a screenshot.

To speed up files submission compress logs by 7-zip and save screenshots in png format.

Chapter 12

Translation

UltraDefrag uses `Transifex` to manage translations online. Register there for free to join our translation team. You are welcome!

If you'd like to translate the program offline use the `PoEdit` software.

To configure PoEdit enter your name and email address under **File** > **Preferences** > **Personalise** > **Identity**.

To edit an existing translation find your language in the `ISO 639-2` list and edit then the appropriate **{installation folder}\po\{language code}.po** file.

To create a new translation click **File** > **New catalogue from POT file** and select **{installation folder}\po\Ultra-Defrag.pot** as the translation template.

Enter the following information into the catalog properties dialog:

- Project name and version: **ultradefrag**

- Language: the language code mentioned above

- Charset: **UTF-8**

- Plural forms: fill it if you know how

Translate strings paying attention to the **Notes for translators** and then send the updated stuff to us.

Your changes will be applied to the next release of UltraDefrag.

Chapter 13

Development

If you'd like to know what's under the hood you are welcome to inspect UltraDefrag 7 sources which are licensed under `GPL`. They are outdated but still good for educational purposes. You can either use an `online svn browser` or download sources from `SourceForge`. Alternatively you can setup an SVN client (for instance `TortoiseSVN`) and check sources out from their `base address`.

Essential parts of UltraDefrag are written in four programming languages:
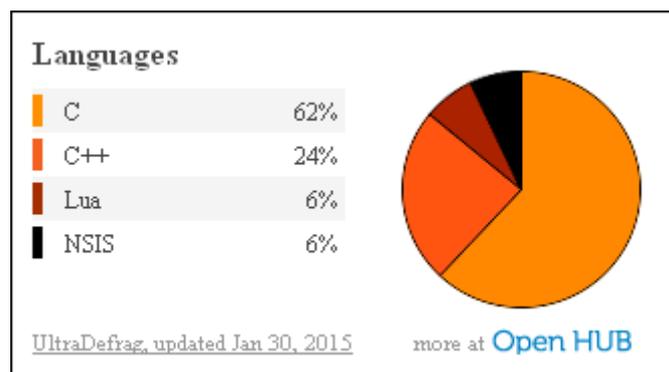
UltraDefrag `core libraries` are written in pure C for compatibility with Windows boot environment where only primitive ntdll interfaces are available. Both graphical and command line tools are written in C++ on top of `wxWidgets` library which helps to keep things simple. For configuration purposes and reports generation the program uses the `Lua` scripting language. UltraDefrag installers are written in `NSIS`.

Compilation

First of all, to build the program download and unpack its sources somewhere. Make sure the path doesn't contain spaces (`GNU make doesn't like them`). Then install the following software:

- `MinGW` or `Microsoft Windows SDK v7.1`

- `wxWidgets 3.1.0`, `Doxygen 1.8.4`, `NSIS 3.xx`, `7-zip`

- `Lua 5.1.x`, `UPX` (extract them somewhere on your **%path%**)

- `Transifex client` (put it to **\src\tools\transifex** folder)

- `GNU gettext` (optional; for translations management)

- `MiKTeX` (optional; for pdf documentation; use basic installer)

To configure build environment follow these steps:

```
:: edit the main configuration file
edit setvars.cmd

:: patch the installed software
patch-tools

:: build wxWidgets using all the compilers
:: involved in development
wxbuild --use-mingw
wxbuild --use-winsdk
```

To build UltraDefrag use the following commands:

```
:: build the program using defaults
build

:: show all available options
build --help

:: use predefined build actions
build-menu
```

If you need an IDE for development install `Code::Blocks` as well. To launch it in correct environment type:

```
start-CodeBlocks
```

If you'd like to know how the build process works inspect .cmd files - they contain the complete information.

Web resources

Follow these links to understand better UltraDefrag design and internals.

Batch scripting

Hidden features of Windows batch files

Windows command line syntax

Rob van der Woude's scripting pages

Binary trees

The Art of Computer Programming

Boot time interface

Windows native API reference

Windows x86 system call table

Defragmentation

Inside Windows NT disk defragmenting

Improvements in Windows 7

Improvements in Windows XP

Defragmenting Files (Windows)

Master File Table (Windows)

File systems

NTFS on-disk structure

Graphical interface

Design apps for the Windows desktop

Writing High-DPI Win32 Applications

Software design

The Art of Unix Programming

GNU coding standards

Information for maintainers of GNU software

Threads

Writing reentrant and threadsafe code

A short guide to mastering thread-safety

Chapter 14

Credits and License

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