DiskBoss
DATA MANAGEMENT

User Manual

Version 14.4

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1   Product Overview

DiskBoss is an automated, policy-based data management solution allowing one to analyze disks, directories and network shares, classify and categorize files, search and cleanup duplicate files, perform automated file management operations according to user-defined rules and policies, synchronize disks, directories and network shares, compare directories and files, perform bulk file delete and secure data wiping operations, detect unauthorized changes in files and directories, etc.
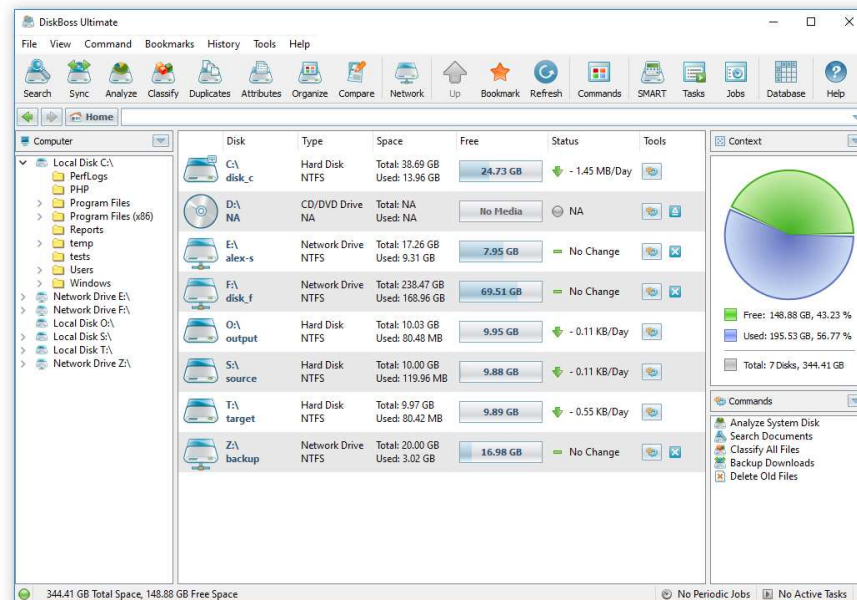
All disk space analysis and file management operations are integrated into a centralized and easy-to-use GUI application allowing one pre-configure analysis and file management operations as user-defined commands and execute any required command in a single mouse click using the DiskBoss GUI application or direct desktop shortcuts.

- Disk Space Analysis
- File Classification and Organizing
- Duplicate Files Search and Cleanup
- Bulk File Delete and Secure Data Wiping
- Automated, Policy-Based File Management
- Real-Time Disk Change Monitoring
- High-Speed File Synchronization
- Secure File Transfer Operations
- File Integrity Monitoring

DiskBoss allows one to generate various types of pie charts and save HTML, PDF, Excel, text, CSV and XML reports for all types of disk space analysis, file classification and file search operations. The user is provided with the ability to categorize and filter analysis and file classification results and perform file management operations on categories of files.

IT administrators are provided with extensive SQL database integration capabilities allowing one to submit disk space analysis, file classification, duplicate files search and disk change monitoring reports into an SQL database. Reports from multiple servers and NAS storage devices may be submitted to a centralized SQL database allowing one to display charts showing the used disk space, file categories and duplicate files per user or per server and providing an in-depth visibility into how the disk space is used, what types of files are stored and how much space is wasted on duplicate files across the entire enterprise.

In addition to the DiskBoss GUI application, IT and storage administrators are provided with the DiskBoss command line utility, which can be used to execute all types of analysis and file management operations from batch files and shell scripts. The command line utility provides an extensive set of command line options allowing one to execute various types of disk space analysis, file synchronization, data migration and bulk file delete operations pre-configured for user-custom needs and hardware configurations.

Finally, IT professionals and enterprise customers are provided with DiskBoss Server – a server-based product version, which runs in the background as a service and is capable of performing all type of disk space analysis and file management operations in a fully automatic and unattended mode according to a user-specified schedule.
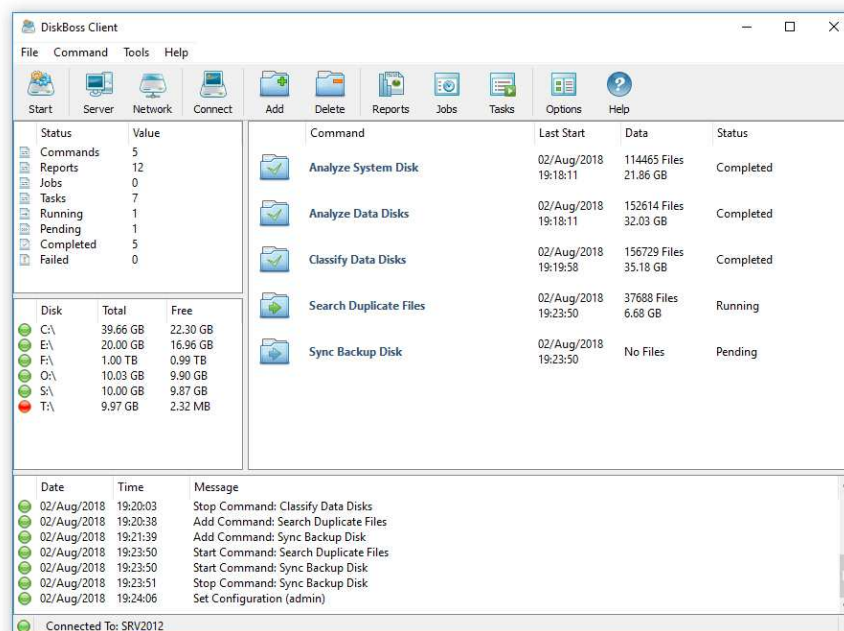
DiskBoss Server can be controlled locally or through the network using the DiskBoss client GUI application or the command line utility. DiskBoss Server provides the ability to pre-configure various types of disk space analysis and/or policy-based file management operations, schedule periodic jobs, save analysis reports into a number of different formats, export analysis results to an SQL database, periodically synchronize disks, directories and network shares and monitor critical disks and directories for unauthorized changes.

1.1   Disk Space Usage Analysis

DiskBoss provides advanced disk space usage analysis capabilities allowing one to analyze one or more local disks, network shares or NAS storage devices and easily identify directories and files holding significant amounts of the disk space, generate various types of pie charts and save disk space analysis reports.
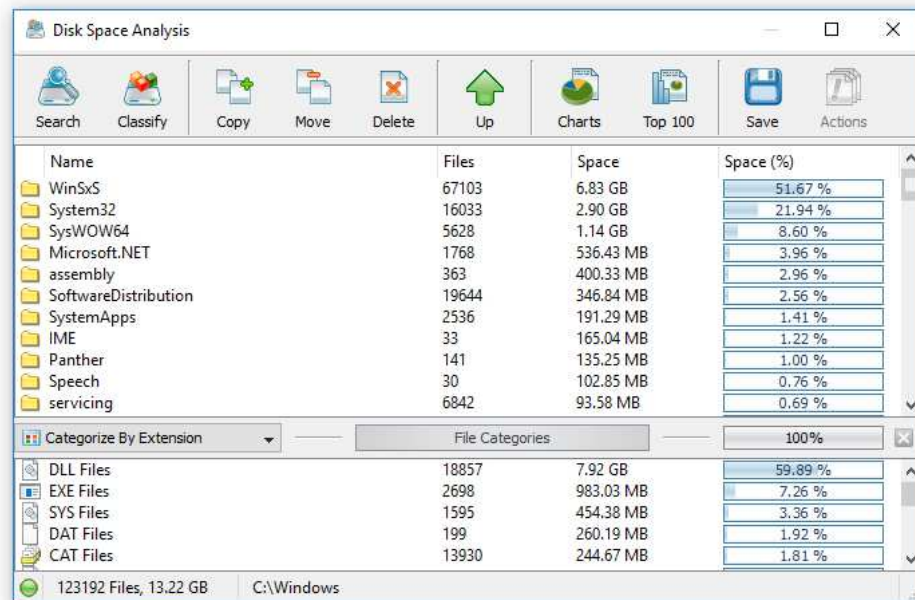
The user is provided with the ability to browse files and directories sorted by the used disk space, categorize and filter analysis results by the file extension, file type, file size, creation, modification and last access date, user name, etc. and easily identify disk space usage hotspots. In addition, DiskBoss allows one to perform file management operations on analysis results, generate pie charts and export disk space usage reports into a number of standard formats such as HTML, PDF, Excel, XML, CSV and ASCII text.
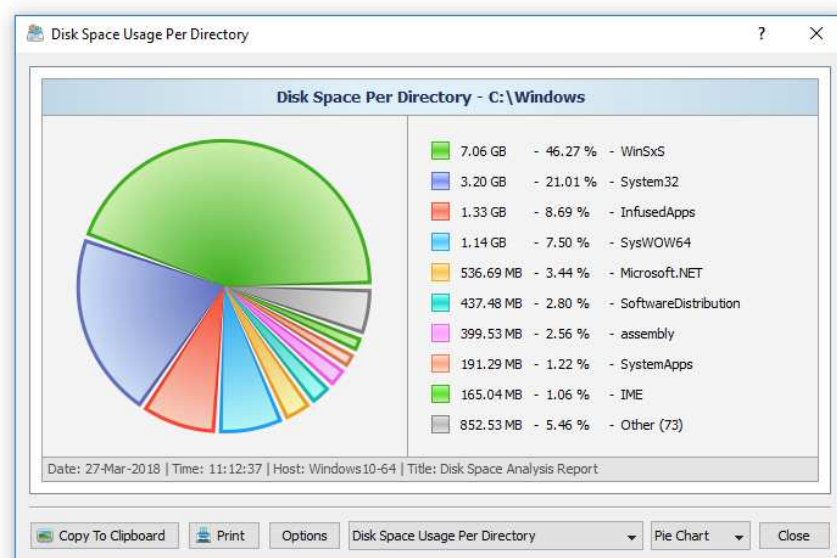
Finally, IT and storage administrators are provided with extensive SQL database integration capabilities allowing one to submit disk space analysis reports from a number of servers and NAS storage devices to a centralized SQL database and perform advanced disk space usage history trend analysis operations, analyze disk space usage per server and/or per user.

1.2   File Classification and Categorization

DiskBoss is capable of scanning disks, network shares and NAS storage devices and classifying files using a number of different types of file classification plug-ins. DiskBoss automatically recognizes more than 3,500 types of files and allows one to browse the categorized file hierarchy, generate various type of pie charts, save file classification reports, perform file management operations on categories of files and physically reorganize files according to user-defined rules and policies.
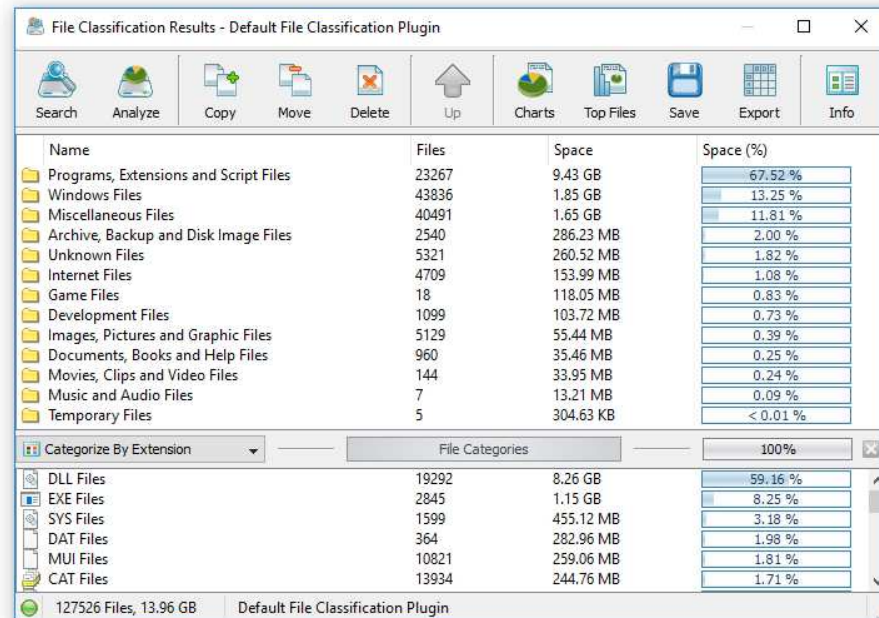
The user is provided with the ability to categorize and filter file classification results allowing one to precisely focus on specific types of files or file groups. In addition, DiskBoss allows one to generate pie charts and export file classification results into a number of standard formats such as HTML, PDF, Excel, XML, text and CSV.
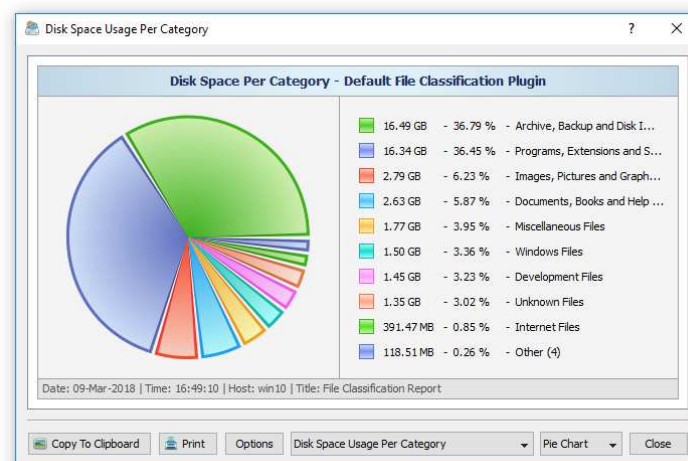
DiskBoss provides a number of file classification plugins allowing one to classify files by the file type, extension, user name, file size, last access, modification and creation times, etc. In addition, IT and storage administrators are provided with the ability to design custom file classification plugins using an open and easy-to-use XML-based format. Finally, DiskBoss provides the ability to submit file classification reports from multiple servers and NAS storage devices to a centralized SQL database allowing one perform history trend analysis operations, analyze disk space usage trends per server and per user.

1.3   Duplicate Files Search and Cleanup

DiskBoss includes a built-in duplicate files finder, which provides a large number of advanced features and capabilities allowing one to search and cleanup duplicate files in servers, NAS storage devices and enterprise storage systems. The DiskBoss duplicate files finder allows one to search duplicate files, generate various types of pie charts, save reports, delete duplicate files, replace duplicate files with links and move compressed duplicate files to another location.
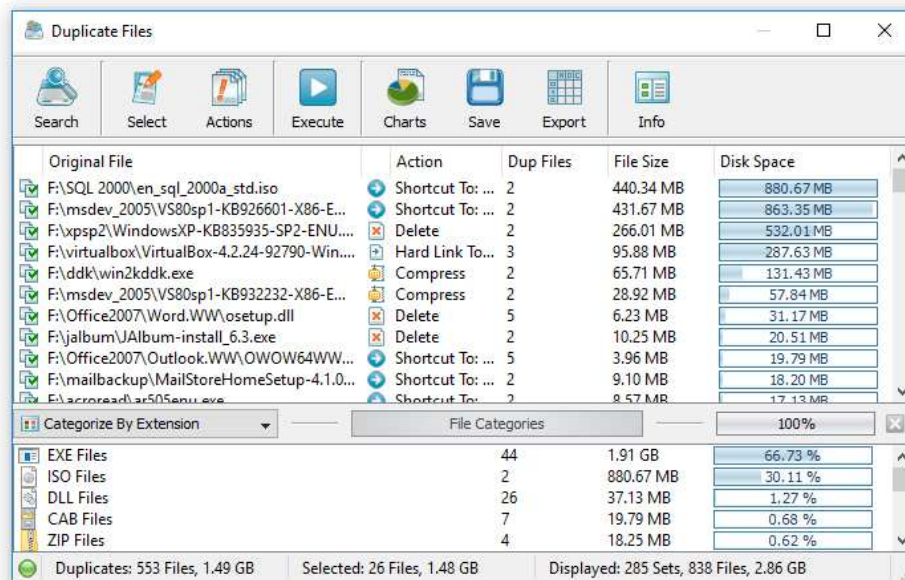
The user is provided with the ability to categorize and filter duplicate files by the file type, extension, category, file size, user name, creation, modification and last access date, etc. allowing one to precisely focus on specific types of duplicate files or groups of duplicate files. Moreover, DiskBoss allows one to generate pie charts and save reports to a number of standard formats including HTML, PDF, Excel, XML, text and CSV.
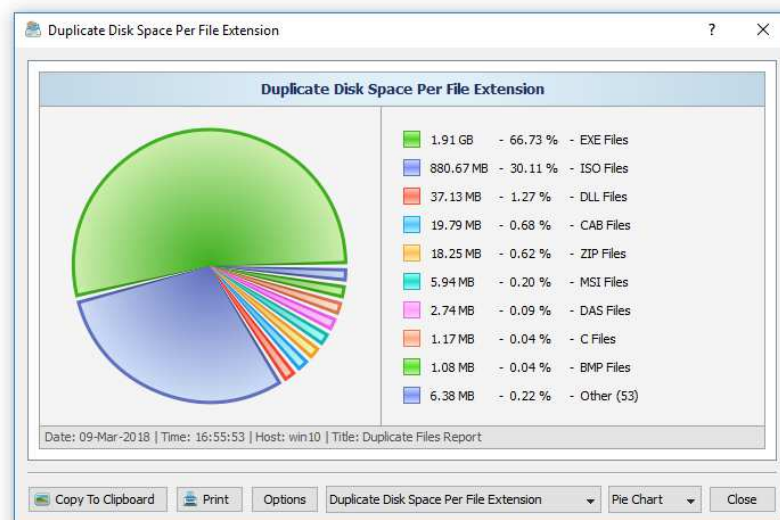
IT and storage administrators are provided with policy-based duplicate files search and removal capabilities allowing one to define automatic duplicate files search and cleanup policies, which can be executed in a fully automatic mode using DiskBoss Server or the command line utility. Finally, enterprise customers are provided with the ability to submit reports from multiple servers and NAS storage devices to a centralized SQL database allowing one to analyze duplicate files per server and per user across the entire enterprise.

1.4   Rule-Based File Search

DiskBoss provides powerful and flexible file search capabilities allowing one to search files using multiple file search criteria including the file name, file extension, file type, file size, last access, modification and creation dates, text or binary patterns, file attributes, user name, JPEG EXIF tags, etc. The user is provided with the ability to define composite file search command using multiple types of search rules combined with the AND/OR logical operators.
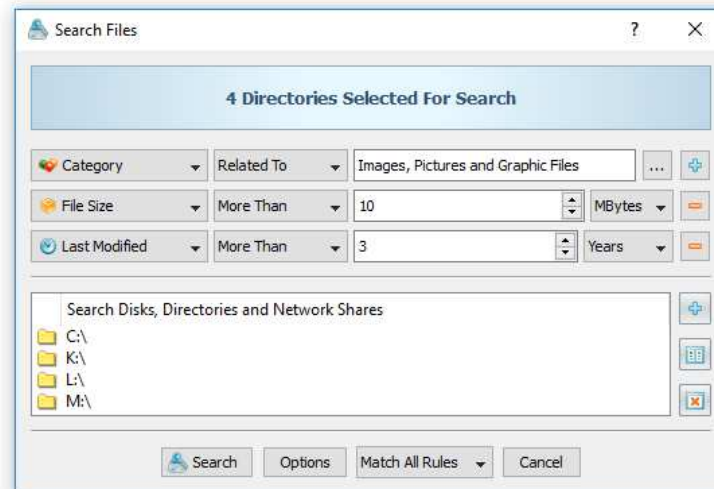
One of the most powerful capabilities of DiskBoss is the integration of the rule-based search features in almost all types of analysis and file management operations. For example, disk space analysis, duplicate files detection, file classification, file copy and file delete operations may be performed on files matching one or more user-specified rules and policies.
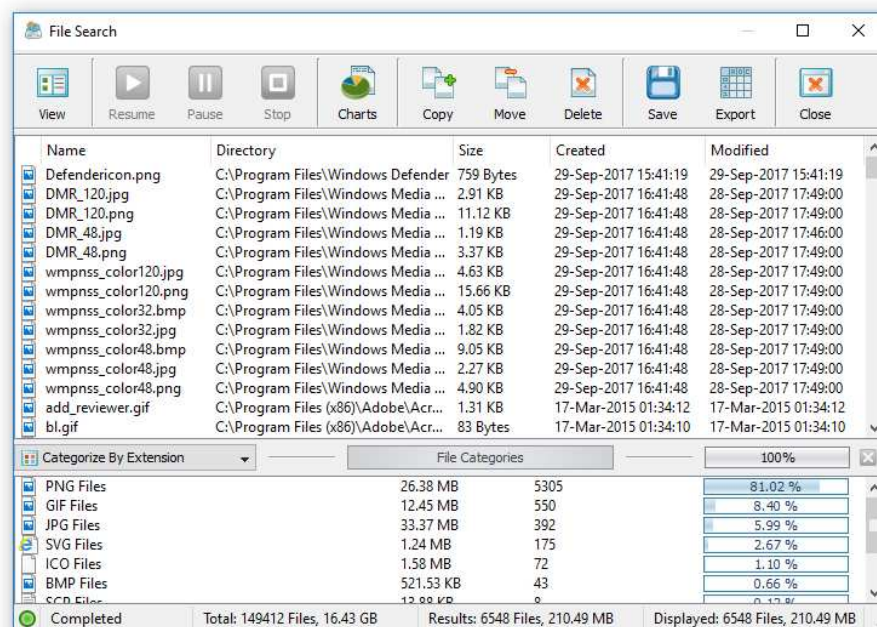
Users are provided with the ability to display file search results, save HTML, Excel, PDF, XML, text and CSV reports and perform file management operations on file search results. In addition, DiskBoss allows one to send e-mail notifications and/or execute custom actions when a search operation reaches a user-specified number of search results. Finally, IT and storage administrators are provided with advanced SQL database integration capabilities allowing one to submit file search reports into a centralized SQL database.

1.5   High-Speed File Synchronization

DiskBoss provides advanced file synchronization capabilities allowing one to synchronize files between disk, directories, network shares and NAS storage devices. The DiskBoss' built-in file synchronization engine offers a number of one-way and two-way file synchronization modes, the ability to synchronize specific types of files, file compression capabilities and advanced performance tuning options.
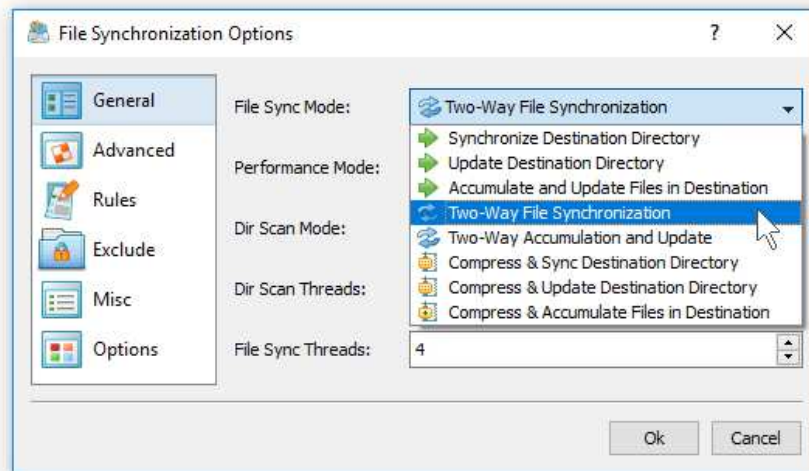
By default, file synchronization commands are executed in the preview mode, which provides the user with the ability to review and manually confirm each specific file synchronization action. Once a file sync command is tested and verified, the user can configure the command to run in a fully automatic, unattended stream file synchronization mode. The stream file synchronization mode performs all file synchronization actions on-the-fly, without showing the preview dialog and therefore it is much faster and optimized to synchronize huge file systems containing millions of files.
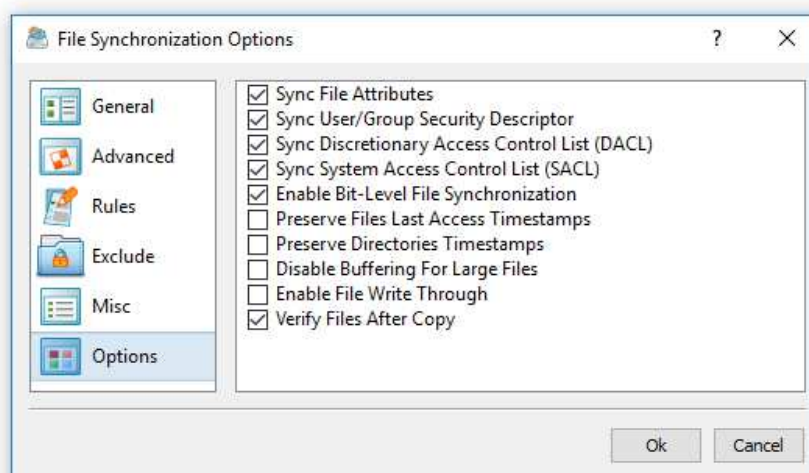
Frequently used file synchronization operations may be pre-configured as user-defined file synchronization commands, optimized for custom hardware and storage configurations and executed in a single mouse click. In addition, the DiskBoss command line utility may be used to execute DiskBoss file synchronization commands from shell scripts and batch files. Finally, DiskBoss Server allows one to schedule periodic file sync operations or trigger file sync operations in real-time after a user-specified number of file system changes.

1.6   File Copy and Data Migration Operations

DiskBoss provides a large number of advanced file copy and data migration capabilities allowing one to copy vast numbers of files fast, efficiently and reliably. DiskBoss allows one to copy files including access control lists (ACLs), security attributes, user/group ownership information, timestamps and file attributes. In addition, the user is provided with the ability to copy files to a number of destination disks, directories or network shares allowing one to easily distribute files to a large number of servers or virtual machines through the network.
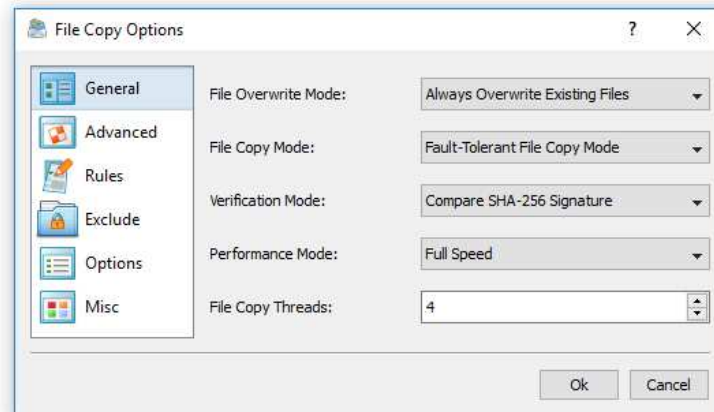
Users are provided with a large number of flexible file copy performance optimization options and fault tolerance capabilities allowing one to copy data at various speeds, recover failed file copy operations and minimize the potential impact on running production systems. The DiskBoss file copy engine is especially optimized for modern hardware platforms and is capable of copying file using multiple parallel file copy threads effectively utilizing powerful RAID controllers, multi-CPU/multi-core servers and Gigabit Ethernet networks.
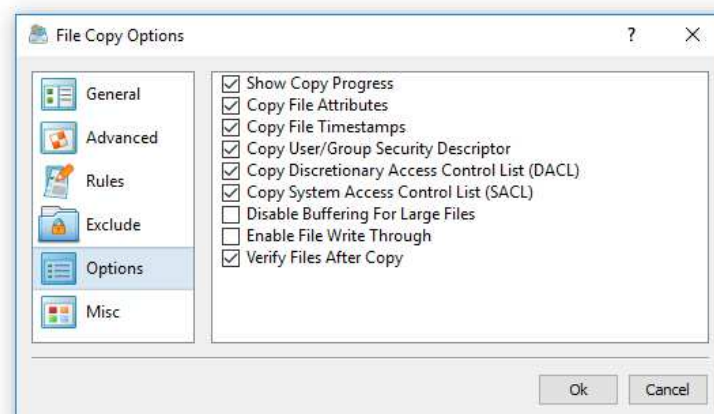
One of the most powerful capabilities of the DiskBoss file copy engine is the integration with file matching rules allowing one to copy specific types of files by the file name, type, size, location, creation, last modification or last access dates, file attributes, user name, etc. For example, the user is provided with the ability to copy a category of files with the file size larger that a specific value that were last modified during a specific period of time.

In addition, DiskBoss Server provides the user with the ability to perform file copy operations periodically at specific time intervals or trigger pre-configured file copy commands when a user-specified number of changes are detected in a disk or directory. Finally, IT and storage administrators are provided with the DiskBoss command line utility, which is capable of executing pre-configured file copy commands from shell scripts and batch files and allowing one to integrate the DiskBoss file copy and data migration capabilities into 3rd party products and custom solutions.

1.7   File Delete and Data Wiping Operations

DiskBoss provides bulk file delete and secure data wiping operations allowing one to effectively delete huge numbers of files, securely wipe confidential information, schedule periodic file delete operations and perform policy-based file delete operations according to user-specified rules while saving file delete logs or exporting lists of deleted files to an SQL database.

Users required to securely wipe confidential information are provided with a large number of different data wiping algorithms ranging from a simple, single-pass wipe to a powerful 7-pass, DOD 5220.22-M compliant data wiping algorithm. In addition, DiskBoss provides the ability to apply different types of delete operations for different types of files. For example, all types of documents and image files may be securely wiped while all other types of files just deleted.

IT and storage administrators are provided with the ability to implement fully automated file retention policies using rule-based periodic file delete operations preconfigured to delete files based on file creation, last modification and/or last access dates. Finally, DiskBoss Server can be used to automatically enforce PCI and HIPPA compliance policies and perform file management operations on specific types of files and directories matching user-specified rules.

1.8   Files and Directories Compare Operations

DiskBoss provides the ability compare directories and detect changes in the directory structure, file contents, file size, file attributes, file ownership, creation and last modification dates. The user is provided with the ability to detect all changes between two directories and save reports into a number of various report formats including HTML, PDF, text, CSV and XML.

In addition, DiskBoss allows one to select which types of changes to detect, compare specific types of files using flexible file matching rules, exclude special subdirectories from the directories comparison process, customize various performance optimization options and export detected changes to an SQL database.

IT professionals and storage administrators are provided with the ability to schedule periodic execution of directory comparison operations and configure conditional actions allowing one to automatically save various types of reports, send E-Mail notifications and/or execute file synchronization or custom file management operations when a directory comparison operation detects a user-specified number of changes.

1.9   Rule-Based File Management Operations

DiskBoss Ultimate and DiskBoss Server provide the ability to automatically organize and manage files according to user-specified rules and policies. DiskBoss allows one to configure one or more conditional file management operations such as the file copy, move, delete, link, compress or a user-custom command and execute these file management operations on files matching user-specified rules based on the file name, extension, type, category, size, user name, creation, last access or last modification date, text or binary patterns, etc.

For each file organizing command, the user is provided with the ability to specify a number of disks, directories and network shares to process, configure an unlimited number of conditional file management actions with each one performing a specific file management operation on files matching one or more user-specified rules. During runtime, DiskBoss will scan the specified disks, directories and network shares, evaluate all files using the user-specified rules and execute configured actions on files matching the rules.

By default, DiskBoss organizes files with a preview display allowing one to review and manually confirm each specific file organizing action before execution. Once a file organizing operation is fully tested and verified, the file organizing command may be configured to be executed without the preview display in a fully automatic mode. In addition to the ability to execute file organizing operations manually, DiskBoss Server provides the ability to schedule periodic file organizing operations and/or real-time file organizing operations triggered automatically after each X disk changes according to user-specific needs and requirements.

1.10   Real-Time Disk Change Monitor

DiskBoss Ultimate and DiskBoss Server include a real-time disk change monitor capable of detecting newly created, modified and deleted files. The real-time disk change monitor provides the user with the ability to monitor one or more disks or directories, detect all changes made in the monitored file systems, send E-Mail notifications, save HTML, PDF, Excel, XML, text and CSV reports, export disk changes to an SQL database, automatically trigger DiskBoss file management operations and/or execute user-custom commands or batch files.

The real-time disk change monitor allows one to monitor specific types of files or file groups using flexible file matching rules. In addition, the user is provided with the ability to execute pre-configured file management commands as actions triggered by a disk change monitoring operation. For example, a user-defined file synchronization command may be automatically triggered after each X changes in a disk or directory effectively providing real-time file synchronization capabilities.

Finally, IT and storage administrators are provided with the ability to trigger file integrity monitoring operations based on real-time disk activities, automatically validate authenticity of critical system files, prevent malicious software from making any changes in the operating system files and ensure security of critical production servers.

1.11   File Integrity Monitor

DiskBoss Ultimate and DiskBoss Server provide a file integrity monitor allowing one to save digital signatures of critical system files and then periodically monitor the integrity of critical system files, detect unauthorized changes, save HTML, PDF, text, Excel CSV and XML reports and send E-Mail notifications.

The user is provided with the ability to specify one or more disks or directories to be monitored, select which types of files should be monitored, types of changes that should be detected and optionally save reports, send E-Mail notifications or execute custom commands when a user-specified number of changes is detected.
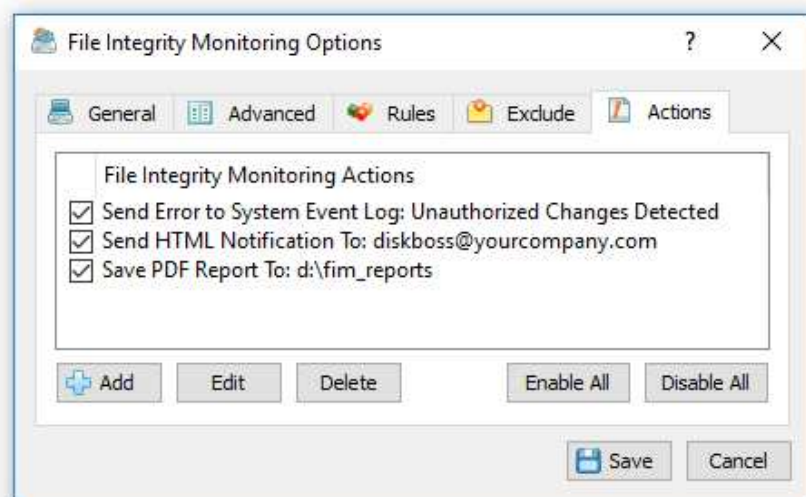
In addition to the file integrity monitoring capabilities available in the DiskBoss GUI application, DiskBoss provides a command line utility allowing one to verify the integrity of critical system files, save reports and send E-Mail notifications from shell scripts and batch files. Finally, DiskBoss Server, which runs in the background as a service, allows one to periodically monitor the integrity of system files in critical servers and NAS storage devices.

1.12   Bulk File Attribute Changer

DiskBoss includes a bulk file attribute changer allowing one to process one or more disks or directories and change file attributes, creation dates, last modification dates and last access dates. The bulk file attributes changes provides a large number of advanced options allowing one to process specific types of files, perform multiple operations during a single scan through the file system, exclude directories from the scanning process, etc.

DiskBoss allows one to change file attributes and/or file timestamps for files matching user-specified rules. For example, the user is provided with the ability to change file attributes for all types of images with the file size more than X MB. Multiple different types of file matching rules may be used to precisely select files to be processed.

The bulk file attribute changer is optimized for modern multi-core and multi-CPU servers and can scan directories and process files using a number of CPU or CPU cores according to user-specific needs and requirements. In addition, the user is provided with advanced parallel directory scanning capabilities allowing one to process files and change file attributes and/or file timestamps for millions of files very effectively.

1.13   Periodic Analysis and File Management Operations

DiskBoss provides the ability to execute disk space analysis and file management operations periodically at specific time intervals, weekly or monthly schedules, etc. The user is provided with the ability to define an unlimited number of periodic jobs with each one configured to execute one or more disk space analysis or file management commands.

Each periodic job can be started by multiple hourly, daily, weekly and/or monthly triggers with different schedules for each trigger allowing one to execute disk space analysis and file management operations at different times depending on the week day, month day, etc. In addition, the user is provided with the ability to execute multiple disk space analysis and/or file management operations in each periodic job.

By default, DiskBoss executes multiple commands specified in a periodic job sequentially one after one. In some situations, when processing or analyzing files located on multiple physical disks or multiple severs or NAS storage devices, it may be more effective to execute multiple disk space analysis or file management operations in parallel.

1.14   Pre-Configured Analysis and File Management Commands

DiskBoss is a powerful and flexible product providing a large number of features, capabilities and configuration options allowing one to perform many types of different disk space analysis and file management operations. In order to simplify management and execution of frequently used operations, DiskBoss provides the user with the ability to add user-defined disk space analysis and file management commands pre-configured for user-specific hardware and storage configurations.
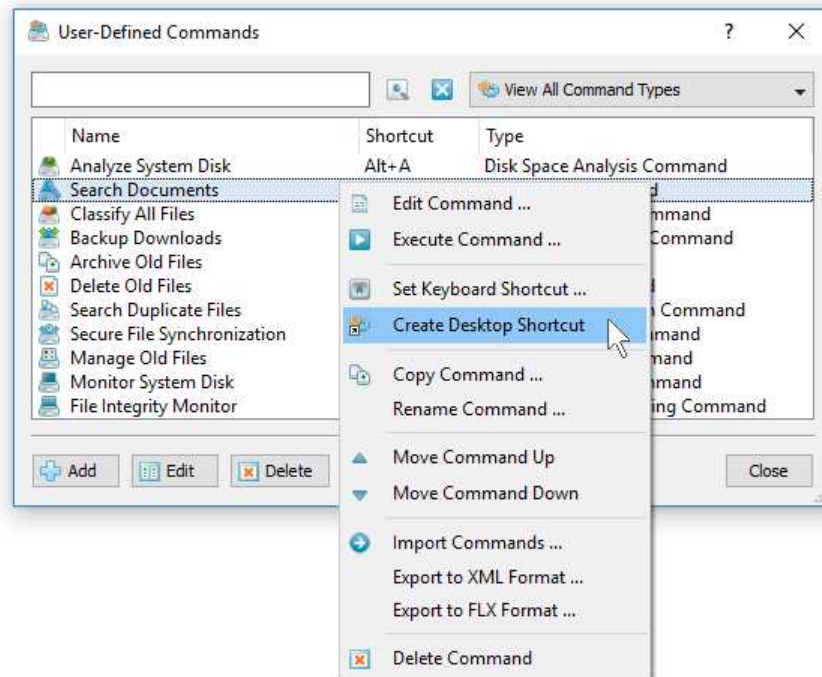
All types of disk analysis and file management operations such as disk space analysis, file classification, duplicate files detection, file organizing, file search, file synchronization, copy, move, delete and disk change monitoring may be saved as user-defined commands, pre-configured for user-specific needs and custom hardware configurations and executed in a single click using the main GUI application or the DiskBoss command line utility.

The user is provided with the ability to create direct desktop shortcuts for user-defined file management commands and execute any command directly from the Windows desktop without starting the DiskBoss main GUI application.

Moreover, DiskBoss allows one to design user-defined disk analysis and file management commands using an open and easy-to-use XML-Based format, which may be imported into the DiskBoss GUI application or executed by the command line utility. Pre-configured and tested disk analysis and file management commands may be easily and safely executed on multiple servers and desktop computers minimizing risks or potential operator-related errors.

One of the most powerful capabilities of DiskBoss is the integration of different types of user-defined disk space analysis and file management commands, which provides the user with the ability to combine multiple operations in order to fully automate frequently performed and time consuming operations. For example, a disk space analysis operation configured to detect large amounts of old, unused files may automatically trigger a rule-based file management operation, which will archive, move or delete these specific files.

1.15   SQL Database Integration

DiskBoss Ultimate and DiskBoss Server provide the ability to submit disk space analysis, file classification, duplicate files, disk change monitoring and file search results into a centralized SQL database through the ODBC interface.
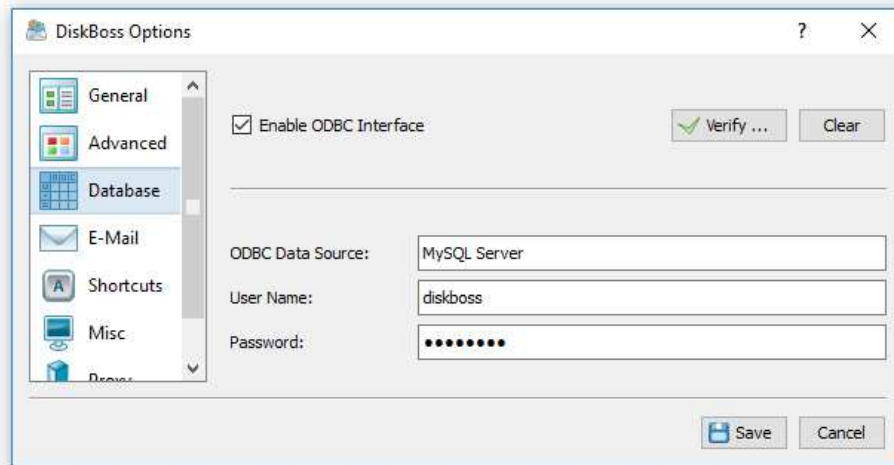
In order to connect DiskBoss to an SQL database, open the options dialog, select the 'Database' tab and specify an ODBC data source, user name and password. Once finished specifying the required information, press the 'Verify' button to check the database connection.
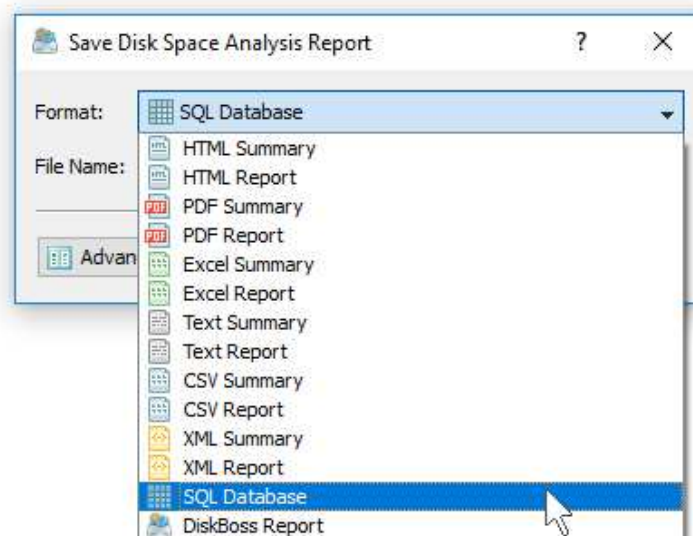
Disk space analysis, file classification, duplicate files detection, disk change monitoring and file search results may be saved into an SQL database in a very similar way. Just press the 'Save' button on the results dialog and select the 'SQL Database' report format.

1.16   DiskBoss Command Line Utility

In addition to the DiskBoss GUI application, DiskBoss Ultimate and DiskBoss Server provide a command line utility allowing one to perform all types of disk space analysis, file classification and data management operations from scripts and batch files. The command line utility provides the ability to automate execution of multiple operations and execute per-configured disk space analysis, file classification, file search and data management commands.

1.17   DiskBoss Server and DiskBoss Enterprise

IT professionals and storage administrators are provided with two server-based product version, named DiskBoss Server and DiskBoss Enterprise, which run in the background as a service and allow one to perform automated, scheduled disk analysis, file synchronization, disk monitoring and data management operations according to user-defined rules and policies.
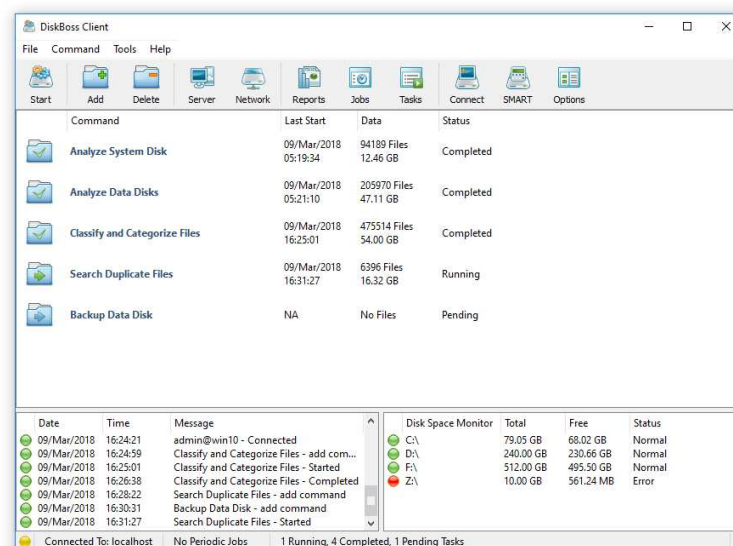
The user is provided with a client GUI application and a command line utility, which can manage and control one or more DiskBoss Servers locally or through the network. The DiskBoss client GUI application allows one to configure various types of disk space analysis, file search, disk change monitoring and data management operations, review analysis results, save HTML, PDF, Excel, text, CSV and XML reports, generate various types of charts and schedule periodic disk space analysis and data management operations.

1.18   DiskBoss Product Versions

Feature	Pro	Ultimate	Server	Enterprise
Maximum Number of Files	25 M	50 M	100 M	Unlimited
Maximum Storage Capacity	25 TB	50 TB	100 TB	Unlimited
Maximum Number of Network Shares	25	50	100	Unlimited
Maximum Number of Parallel Tasks	25	50	100	Unlimited
Maximum Predefined Commands	25	50	100	Unlimited
Support for Unicode File Names	**Yes**	**Yes**	**Yes**	**Yes**
Support for Long File Names	**Yes**	**Yes**	**Yes**	**Yes**
File Classification Operations	**Yes**	**Yes**	**Yes**	**Yes**
Disk Space Analysis Operations	**Yes**	**Yes**	**Yes**	**Yes**
Duplicate Files Search and Cleanup	**Yes**	**Yes**	**Yes**	**Yes**
Recoverable File Copy Operations	**Yes**	**Yes**	**Yes**	**Yes**
File Synchronization Operations	**Yes**	**Yes**	**Yes**	**Yes**
Copy ACLs and Security Attributes	**Yes**	**Yes**	**Yes**	**Yes**
Compressed File Synchronization	No	**Yes**	**Yes**	**Yes**
DiskBoss Command Line Utility	No	**Yes**	**Yes**	**Yes**
Scheduled Periodic Operations	No	**Yes**	**Yes**	**Yes**
File Integrity Monitor	No	**Yes**	**Yes**	**Yes**
Real-Time Disk Change Monitor	No	**Yes**	**Yes**	**Yes**
Policy-Based File Management	No	**Yes**	**Yes**	**Yes**
Copy Files to Multiple Destinations	No	**Yes**	**Yes**	**Yes**
SQL Database Integration	No	**Yes**	**Yes**	**Yes**
Runs in the Background as a Service	No	No	**Yes**	**Yes**
Manageable Through the Network	No	No	**Yes**	**Yes**
DiskBoss Client GUI Application	No	No	**Yes**	**Yes**
Built-In Disk Space Monitor	No	No	**Yes**	**Yes**
Secure File Copy Operations	No	No	**Yes**	**Yes**
Secure File Sync Operations	No	No	**Yes**	**Yes**
Real-Time File Sync Operations	No	No	**Yes**	**Yes**
Programming API and SDK	No	No	**Yes**	**Yes**
Batch Analysis and Search Operations	No	No	No	**Yes**
Support For Multi-User Configurations	No	No	No	**Yes**
Web-Based Management Interface	No	No	No	**Yes**
License	$125 Free Trial	$250 Free Trial	$625 Free Trial	$1250 Free Trial

* Product features, prices and license terms are subject to change without notice.
** A license allows one to use the product on a single physical or virtual host computer.

2   Product Installation

2.1   Downloading DiskBoss

DiskBoss is available as a free download on our web site (www.diskboss.com) and from a large number of software directories from around the world. To be sure you are getting the latest product version, check here: http://www.diskboss.com/downloads.html
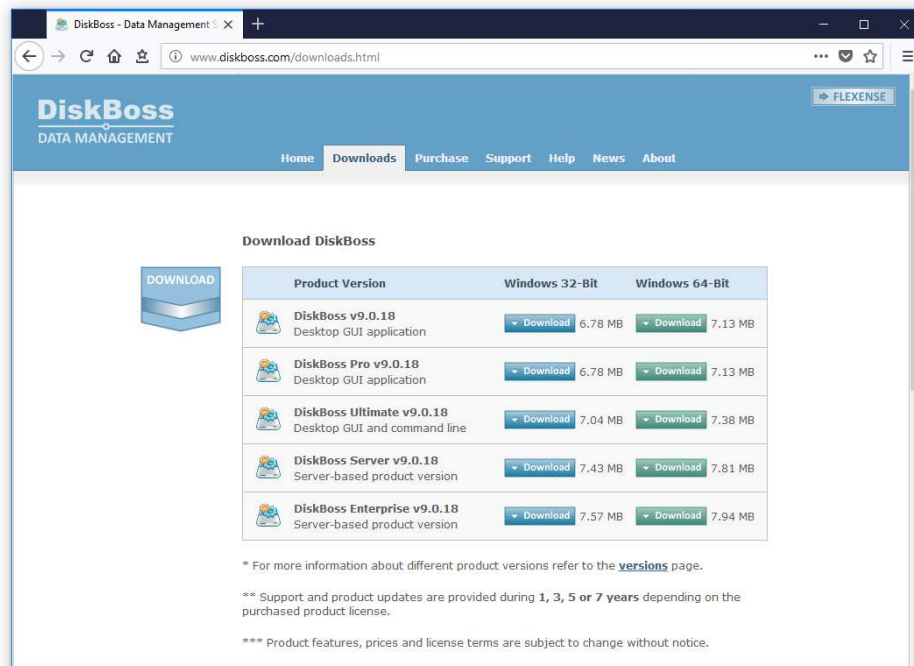
2.2   Product Installation Procedure

DiskBoss is especially designed to be as simple as possible. The installation procedure is very simple, requires no special knowledge and may be completed in less than 10 seconds. There is no need for any additional software. Just download the DiskBoss installation package, run the setup program and you are done.
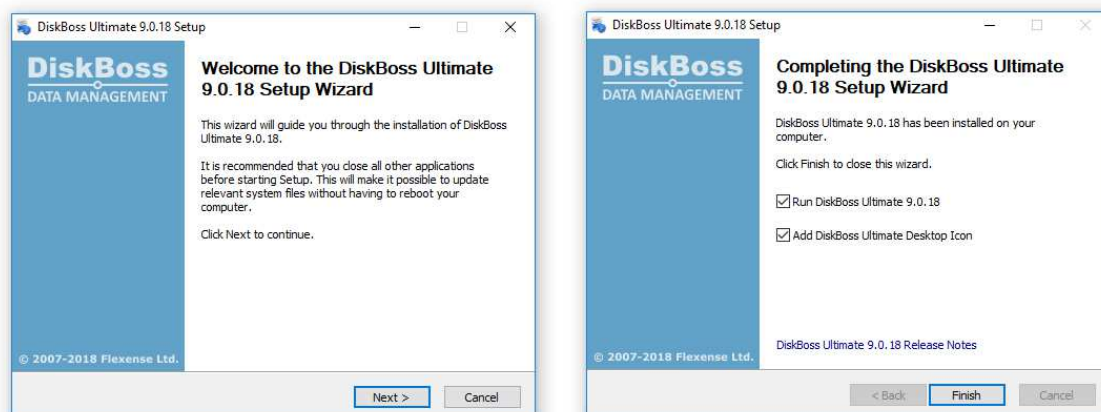
On the 'Welcome' screen press the 'Next' button. Read the end-user license agreement and press the 'I Agree' button if you accept the license terms or the 'Cancel' button to stop the installation process. Select the destination directory, press the 'Install' button and wait for the installation process to complete. That's all you need to install DiskBoss on your computer.

2.3   Product Update Procedure

Almost every month, Flexense releases a new version of DiskBoss, which typically includes new features and bug-fixes. These product updates are uploaded to our web site and may be applied to any installed product version. Each time DiskBoss is started, the DiskBoss update manager checks if there is a new product update available. If there is a new product update available, an 'Update' link will be displayed in the bottom-right corner of the status bar.

Click on the link to open the update dialog and see more information about the available product update. The update dialog shows the version of the new product update and the following two buttons: the 'Release Notes' button and the 'Install' button.
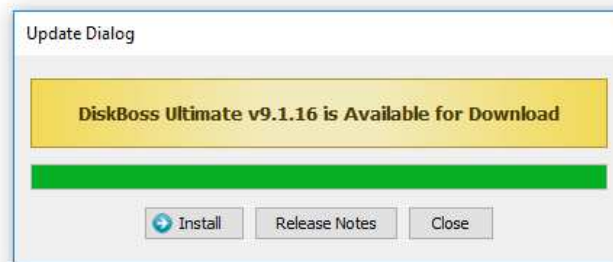
Press the 'Release Notes' button to see more information about the new product version. Press the 'Install' button to download and install the new product version. After pressing the 'Install' button, please wait while the Flexense update manager will download the new product version to the local disk. The update package will be downloaded to a temporary directory on the system drive and automatically deleted after the Flexense update manager will finish updating the product.
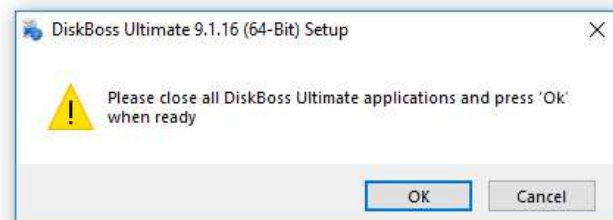
After download is completed, close all DiskBoss application windows and press the 'Ok' button when ready. If one or more DiskBoss application windows will be open during the update, the operation will fail and the whole update process will need to be restarted from the beginning.
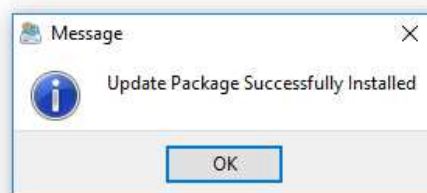
After finishing the update process, DiskBoss will show a message box informing about the successfully completed operation. In order to manually verify that the currently installed product version is up-to-date, select menu 'Help – Check For Updates ...' on the menu bar.

3   Disk Space Usage Analysis

3.1   Analyzing One or More Disks or Directories

In order to analyze one or more disks or directories, select the directories in the DiskBoss file navigator and press the 'Analyze' button located on the main toolbar. DiskBoss will scan the selected disks and directories and display the analysis results dialog showing disks, directories and files sorted by the amount of the used disk space.
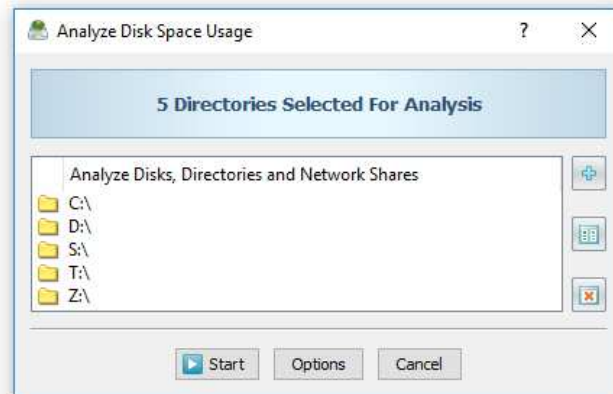
The disk space analysis results dialog allows one to browse analysis results, perform file management operations, categorize and filter results, generate various types of charts, save analysis reports into the HTML, PDF, Excel, XML, text and CSV formats, submit reports to an SQL database, etc.
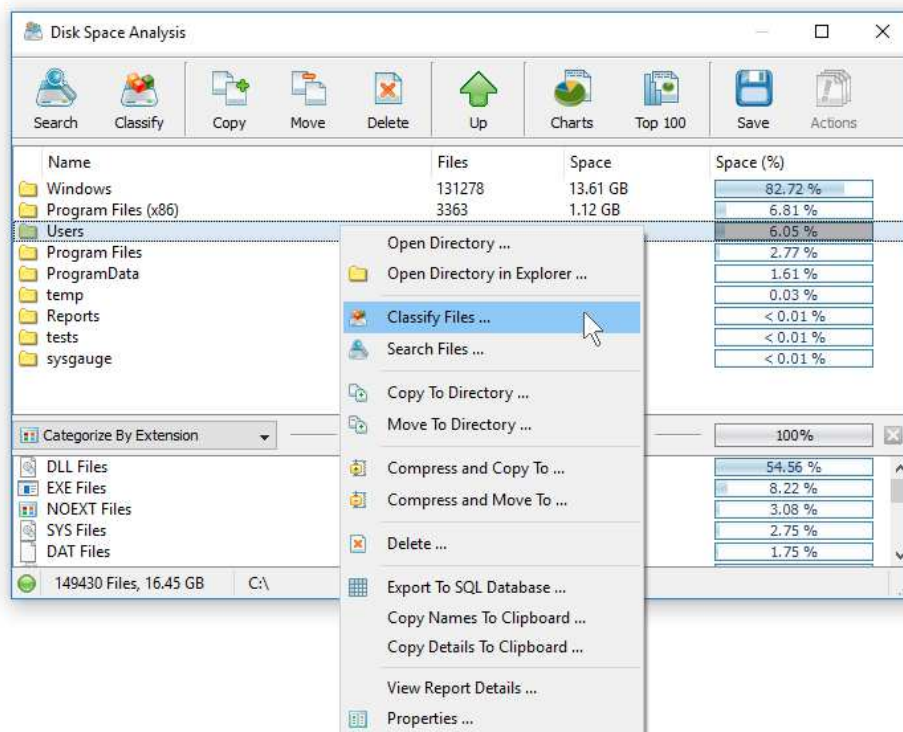
In order to perform an operation on one or more files or directories, select the required files and press an appropriate button on the dialog's toolbar. Alternatively, use the dialog's context menu, which provides access to additional options and features.

3.2   File Categories and File Filters

The top view of the analysis results dialog shows directories and files sorted by the amount of the used disk space and the bottom view shows the currently selected file categories, which are allowing one to categorize and filter files and directories displayed in the top view. DiskBoss provides the ability to categorize disk space analysis results by the file extension, file type, file size, user name, creation, last modification and last access dates.
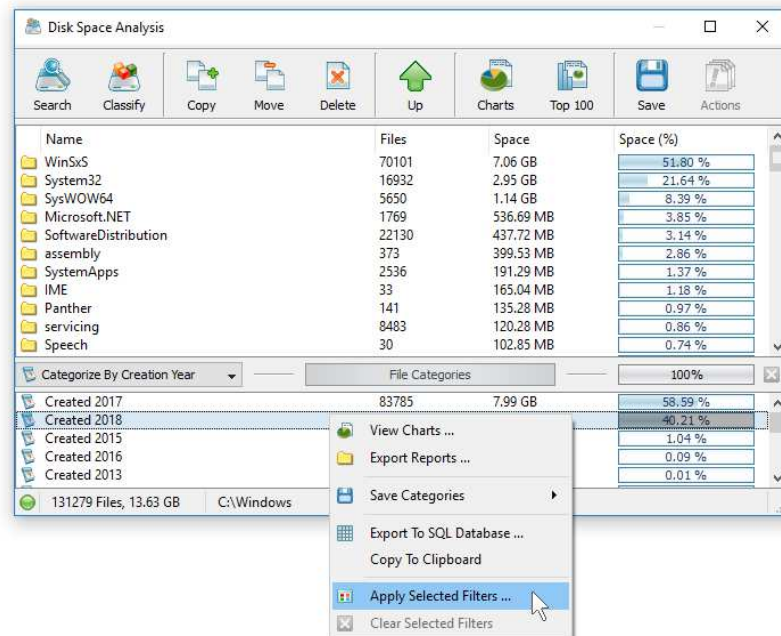
In order to change the file categorization mode, click on the 'Categories' combo box located in the top-left corner of the categories view and select an appropriate file categories mode. In order to apply one or more file categories as a filter, select the required file categories in the bottom view, press the right mouse button and select the 'Apply Selected Filters' menu item. DiskBoss will filter the disk space analysis results and display in the top view files matching the selected file filters and directories containing these files.
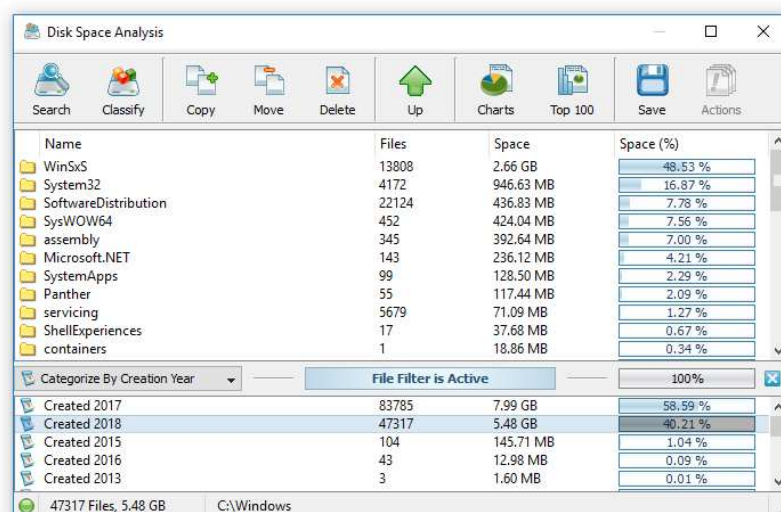
With an active file filter, all operations such as browsing, file copy, move and delete, reports generation, charts, etc. will be performed on filtered results only. In order to reset the currently active file filter, press the right mouse button over the filters view and select the 'Clear Selected Filters' menu item.

28

In addition to the built-in file filters, DiskBoss provides the ability to pre-configure one or more custom file filters according to user-specific needs and requirements and then categorize and filter the disk space analysis results using to the user-custom file filters. In order to add a custom file filter, select the custom file filters view, press the right mouse button over the filters view and select the 'Edit Custom Rules' menu item.

In order to add a new custom file filter, press the 'Add' button, enter a unique filter name and configure one or more file matching rules specifying which types or groups of files to display. In order to edit a custom file filter, select the filter in the custom file filters dialog and press the 'Edit' button.

Once finished configuring custom file filters, close the filters dialog and DiskBoss will categorize the currently displayed disk space usage results and show the list of user-specified custom file filters sorted by the amount of data and the number of files matching the specified file filters. In order to filter the currently displayed disk space usage results by one or more custom file filters, select the required custom file filters in the filters view, press the right mouse button and select the 'Apply Selected Filters' menu item. DiskBoss will filter the disk space analysis results according to the selected custom file filters and display the amount of data and the number of files matching the selected file filters.

3.3   Disk Space Usage Pie Charts

The DiskBoss disk space analyzer provides multiple types of statistical pie charts and timeline charts capable of showing the amount of disk space usage and the number of files per directory, file extension, file type, file size, file owner, creation, modification and last access time. In order to open the charts dialog, press the 'Charts' button located on the main toolbar and select an appropriate chart type.
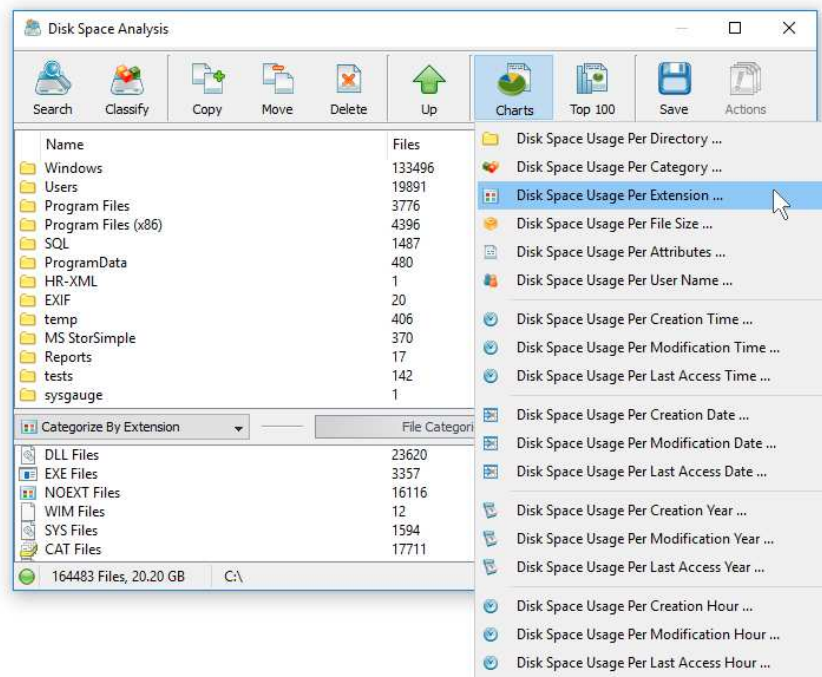
By default, the charts dialog shows the amount of disk space usage and the number of files for the current file system location. For example, in order to open a chart showing the disk space usage and the number of files per file category in the current directory, press the 'Charts' button located on the main toolbar and select the 'Disk Space Usage Per Category' chart type.
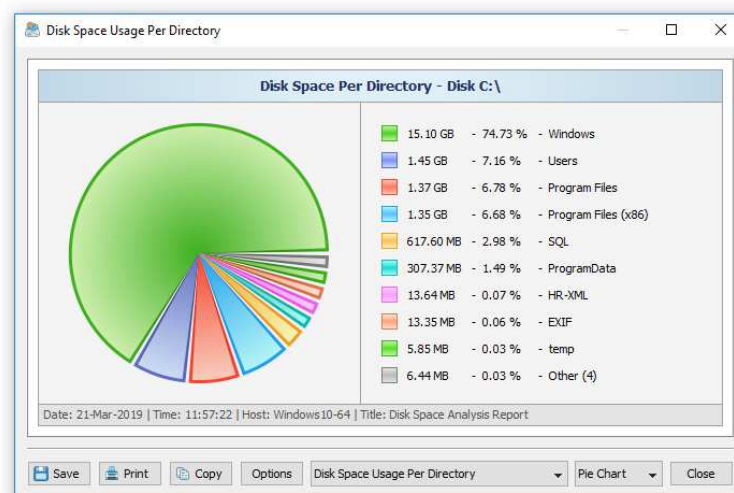
In addition, the charts dialog provides the user with the ability to export the chart data to a number of different formats and copy the displayed chart image to the clipboard allowing one to easily integrate DiskBoss charts into user's documents and presentations. In order to customize the chart's description, press the 'Options' button and specify a custom chart title, host name, date or time.

One of the most powerful features of the DiskBoss disk space analyzer is the ability to filter disk space analysis results using one or more user-specified filters and then categorize filtered results and display statistical pie charts. For example, in order to display a pie chart showing the amount of disk space per file extension for files that were modified during the last two years, set the file categorization mode to 'Categorize By Modification Year', select one or more years to show the information for, press the right mouse button over the file filters view and select the 'Apply Selected Filters' menu item.
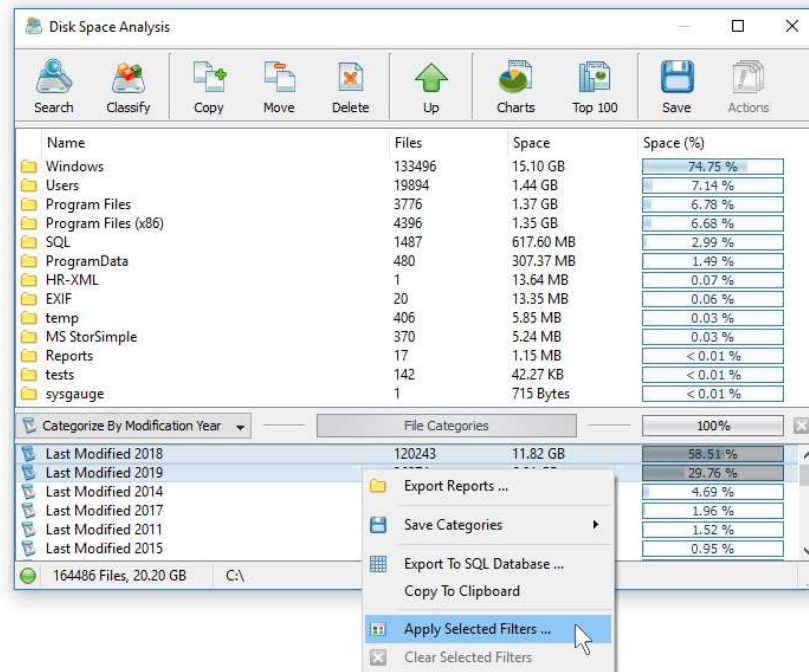
DiskBoss will filter the disk space analysis results and display files that were modified during the selected years. Now, press the 'Charts' button located on the main toolbar and select the 'Disk Space Usage Per Extension' menu item. DiskBoss will categorize the filtered disk space analysis results and display a pie chart showing the amount of disk space usage per file extension for files that were modified during the selected years.
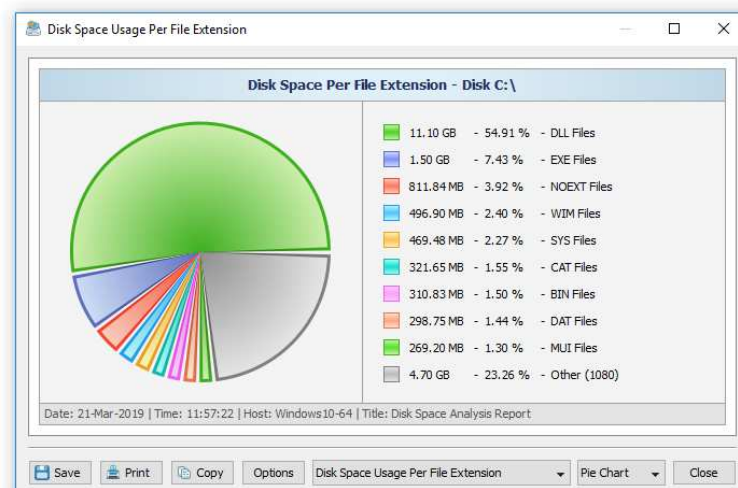
In a similar way, the user can filter disk space analysis results by file type, size, user name, file attributes, creation, modification and last access dates and then display various types of charts showing the disk space usage or the number of files according to user-specific needs.

Another powerful capability is the ability to display the disk space usage timeline charts for all or filtered disk space analysis results. In the simplest case, press the 'Charts' button located on the main toolbar and select the 'Disk Space Usage Per Modification Year' menu item.
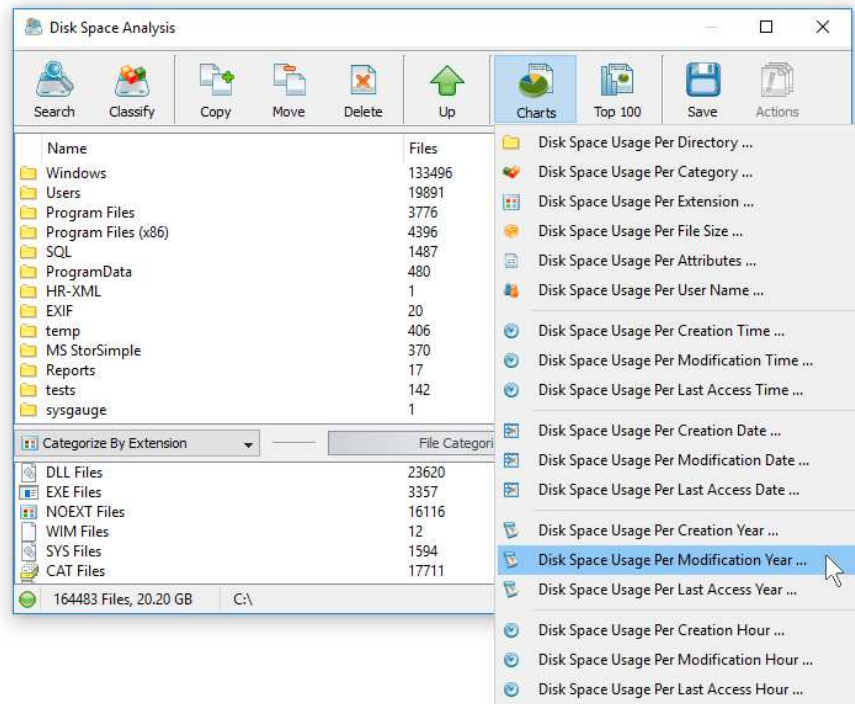
DiskBoss will display a time line chart showing how much data was modified per year. In order to display how many files were modified per year, set the chart mode to 'Number Of Files Per Modification Year'.
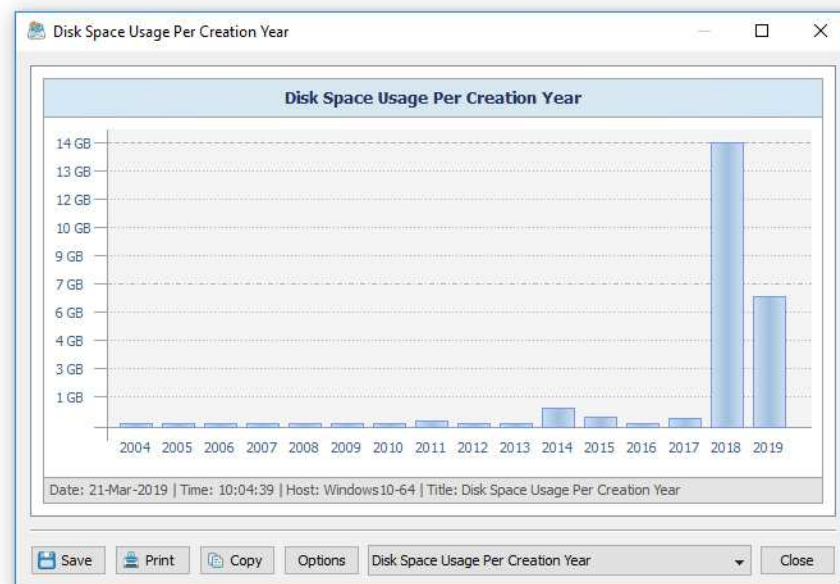
In addition, the user is provided with the ability to display timeline charts for filtered disk space analysis results. For example, in order to display how many documents were created per year, set the file categorization mode to 'Categorize By File Type', select the 'Documents, Books and Help Files' file category, press the right mouse button and select the 'Apply Selected Filters' menu item. Now, press the 'Charts' button located on the main toolbar, and select the 'Disk Space Usage Per Creation Year' menu item.

3.4   File Management Operations

DiskBoss allows one to copy, move and delete files and directories displayed in the disk space analysis results dialog. In order to perform a file operation on one or more files or directories, select the required items in the directory view, press the right mouse button and select an appropriate file management operation.

For copy and move operations, enter the destination directory and optionally press the 'Advanced Options' button to open the file copy options dialog. The copy options dialog allows one to control the file overwrite mode, file copy rules, performance tuning options and error handling options.

When copying files with an active file filter, DiskBoss automatically adds one or more file matching rules to the 'Rules' tab ensuring that only filtered files are copied to the destination directory. In order to delete one or more files or directories, select the required files or directories in the analysis results view, press the right mouse button and select the 'Delete' menu item.

3.5   Classify Disk Space Analysis Results

DiskBoss provides the ability to classify and categorize disk space analysis results allowing one to understand what types of files are stored in directories holding most of the used disk space. In order to classify files in one or more directories displayed in the disk space analysis results dialog, select the required directories in the directory view, press the right mouse button and select the 'Classify Files' menu item.
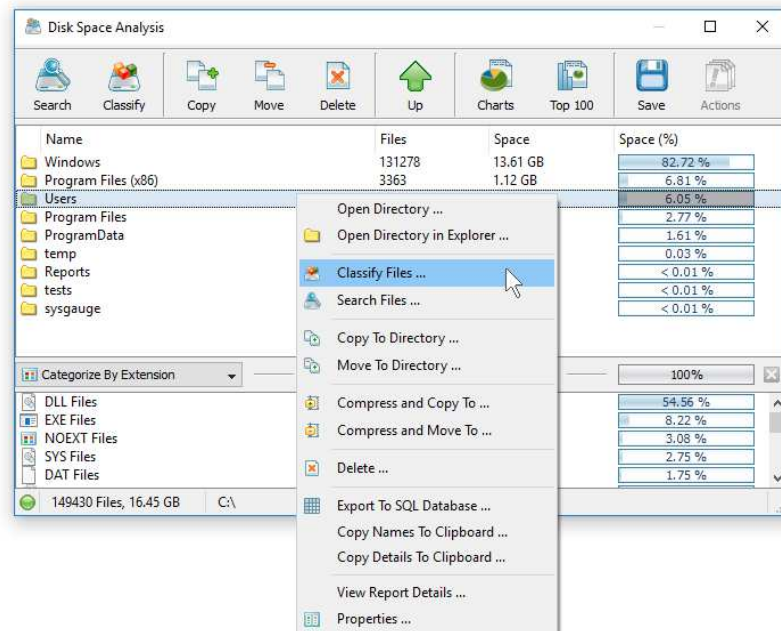
On the file classification plug-ins dialog, select an appropriate file classification plug-in and press the 'Classify' button. DiskBoss will classify files in the selected directories and display a list of file categories sorted by the amount of the used disk space.
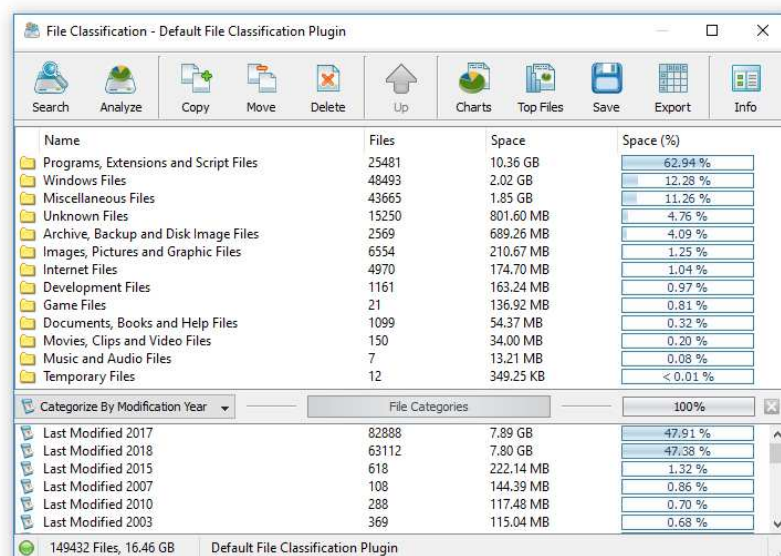
The file classification results dialog shows file categories and classes according to the selected file classification plug-in and provides the user with the ability to export charts, save reports, submit results to an SQL database and perform file management operations on specific types of files. Moreover, the user is provided with the ability to apply second-level file categories and filters by the file size, extension, last access, creation and modification dates, etc. to further focus on specific files or file groups.

3.6   Searching Files in Disk Space Analysis Results

DiskBoss provides the ability to search files in disk space analysis results by the file name, extension, full path, file category, file size, file attributes, creation, last modification and last access dates. In order to start a file search operation, analyze one or more disks or directories and press the 'Search' button located on the main toolbar.
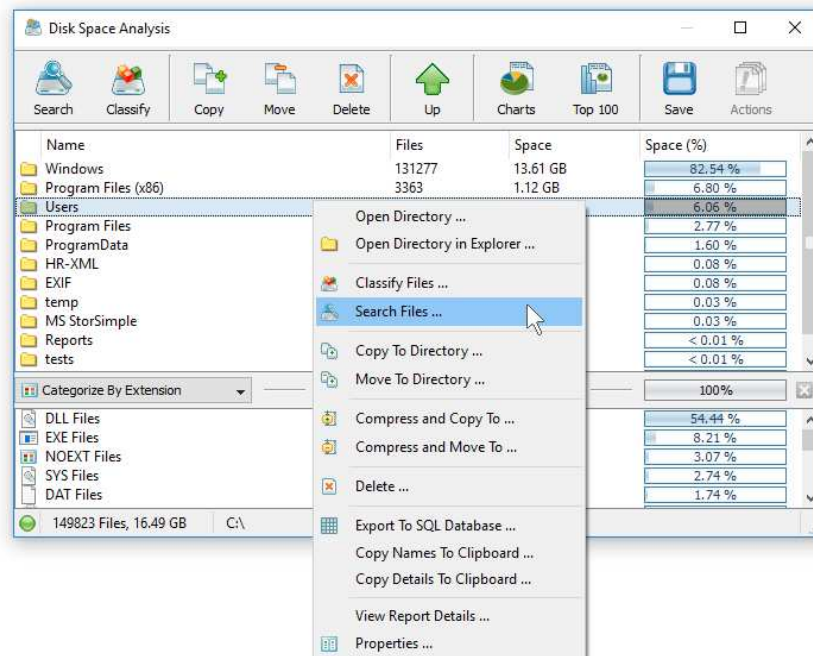
By default, the search operation will be performed on all disk space analysis results. In order to search files in a specific disk, directory or network share, select one or more directories in the disk space analysis results view, press the right mouse button and select the 'Search Files' menu item. DiskBoss will search in the selected directories and display the file search results dialog showing a list of files matching the user specified criteria.
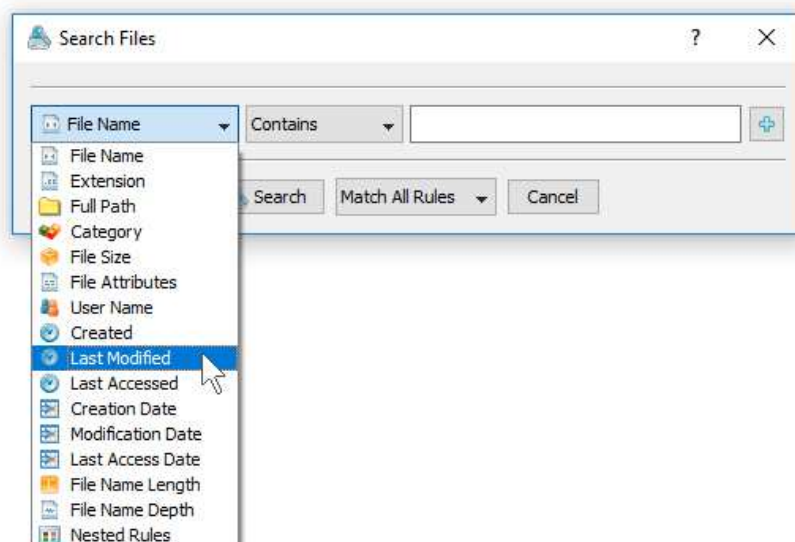
The search results dialog allows one to filter and categorize file search results, display various types of pie charts, copy, move and/or delete files, export file search results to a number of standard report formats including PDF, HTML, text, Excel CSV and XML. In addition, advanced users are provided with the ability to export file search results to an SQL database.

3.7   Disk Space Analysis Reports

DiskBoss allows one to save disk space analysis reports into a number of standard formats including HTML, PDF, Excel, XML, text and CSV. In the simplest case, perform a disk space analysis operation and press the 'Save' button located on the disk space analysis results dialog. On the save report dialog, select an appropriate report format, enter a report file name and press the 'Save' button.
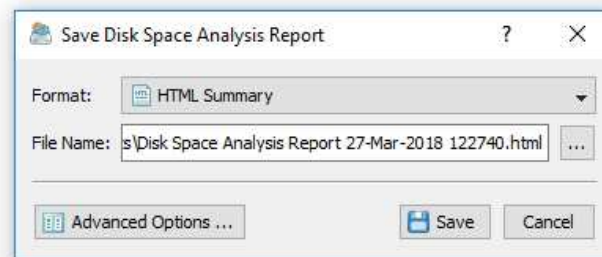
For the HTML, PDF, Excel, text, CSV and XML report formats, the user is provided with the ability to save a short summary report or a longer detailed report, which may be very long for large file systems containing millions of files. By default, DiskBoss will save a short, summary disk space analysis report in the HTML report format, which will include a top-level view of analyzed disks or directories and a list of tables showing the disk space usage and the number of files per file extension, file type, user name, etc.

In addition, the user is provided with the ability to save disk space analysis results to the DiskBoss native report format, which preserves all information related to each specific disk space analysis operation and may be loaded at any time just by clicking on a report file in the DiskBoss file navigator.

Sometimes, it may be required to perform additional analysis of disk space usage results using external tools such as Microsoft Excel. In order to export disk space analysis results to the Excel report format, perform a disk space analysis operation, press the 'Save' button located on the disk space analysis results dialog, select the 'Excel Summary' report format for a short summary report or the 'Excel Report' format for a detailed disk space analysis report.
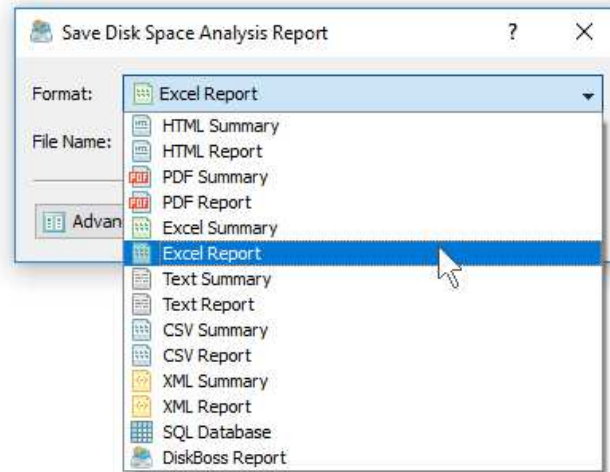
A summary Excel report will include a top-level list of analyzed disks and directories and a number of tables showing the used disk space and the number of files per file extension, file category, file creation time, last modification time, user name, etc.
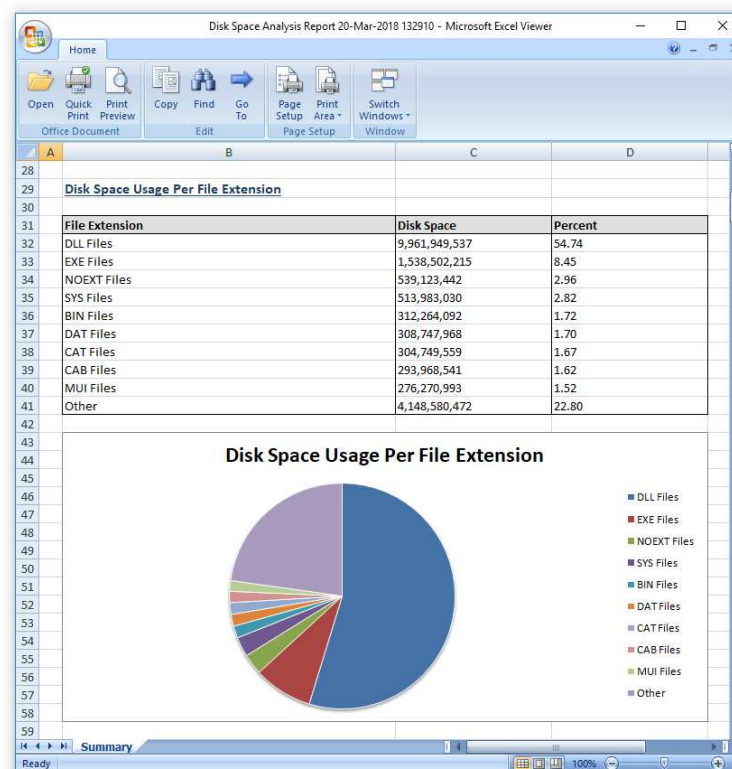
A detailed Excel report will include a list of file categories according to the currently selected file categorization mode and an hierarchy of directories and files sorted by the amount of the used disk space, which may be very long for large file systems containing millions of files. In order to control how many directory levels and how many files per directory are exported in the detailed report, press the 'Advanced Options' button located on the 'Save Report' dialog and customize the disk space analysis report for your specific needs.

One of the most useful ways to export disk space analysis results is to use the PDF summary or the PDF report formats. Both of these report formats include various types of graphical pie charts showing disk space usage and the number of files per file extension, file category, creation time, last modification time, user name, etc. In order to save disk space analysis results to a PDF report file, press the 'Save' button located on the disk space analysis results dialog and select the 'PDF Summary' report format for a short, summary report or the 'PDF Report' format for a detailed disk space analysis report.
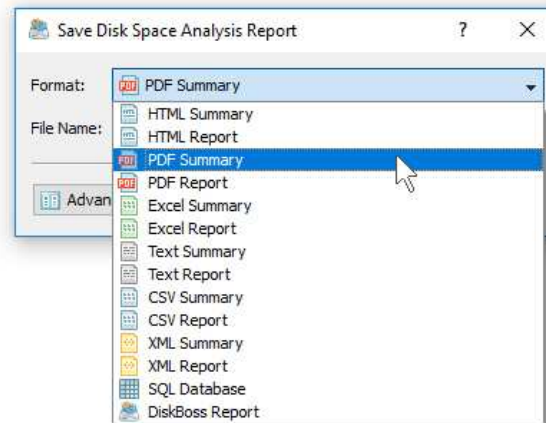
A summary PDF report will include a top-level list of analyzed disks, directories or network shares sorted by the amount of the used disk space followed by a number of pie charts showing the disk space usage and the number of files per file extension, file category, file creation time, last modification time, user name, etc. A detailed PDF report will include an hierarchy of directories and files sorted according to the used disk space, which may be very long for large file systems containing millions of files.
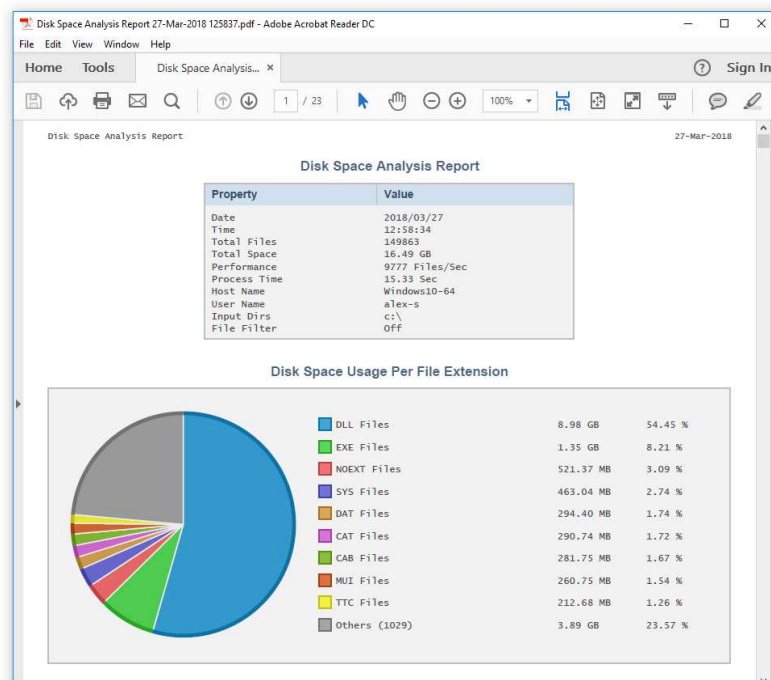
In addition to the directory tree sorted by the used disk space, detailed PDF reports include pie charts showing the disk space usage per file category and the number of files per file category according to the currently selected file categorization mode. For example, if the second-level file categories mode is set to categorize disk space analysis results by the file extension, the PDF report will display pie charts showing the used disk space and the number of files per file extension.

3.8   Batch Disk Space Analysis Reports

DiskBoss allows one to save batches of disk space analysis reports according to the currently selected categories of files with each report showing the number of files per directory and the disk space usage for a corresponding category of files. For example, let's assume that we need to save disk space analysis reports for the last 10 years with each report showing the number of files per directory and the disk space usage for all files that were created during each year.

In order to generate such reports, set the file categorization mode to 'Categorize By Creation Year', select all years for which you need to generate analysis reports in the file categories view, press the right mouse button and select the 'Export Reports' menu item. On the 'Export Reports' dialog, select an appropriate report format and report mode, specify a destination directory to export reports to and press the 'Save' button.
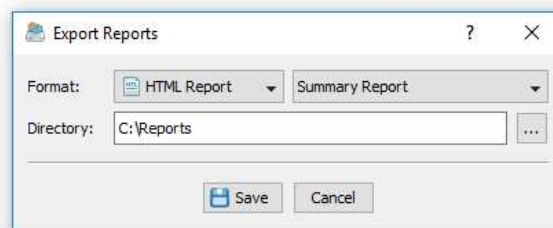
For each selected year, DiskBoss will filter disk space analysis results by the file creation year and save an individual disk space analysis report in the specified destination directory with each report file name and report title containing the corresponding file creation year.

In the same way, the user can generate batches of analysis reports showing the number of files per directory and the disk space usage per user, last modification date, last access date, file attributes, file size, top directory or user-custom categories pre-configured using flexible file matching rules.

For example, in order to export individual disk space analysis reports for all users, set the file categorization mode to 'Categorize By User Name', select all the required users, press the right mouse button and select the 'Export Reports' menu item. Now, the destination directory will contain a series of disk space analysis reports with each report showing the number of files per directory and the disk space usage for the corresponding user.

The batch reports dialog provides the ability to export reports to a number of standard report formats including: HTML, PDF, Excel, text, CSV and XML. Depending on the selected report format and report mode, each report will include a summary table showing statistics about the report and a list of tables showing disks, directories and files sorted by the amount of used disk space.
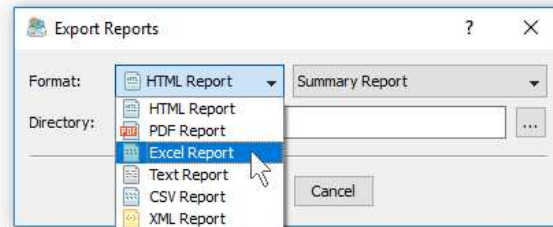
In addition, the batch reports dialog allows one to select one of the following report modes: summary report, compact report or full report. When the summary report mode is selected, each report will include a summary table and up to 3 levels of directories sorted by the amount of used disk space. When the compact report mode is selected, each report will include a summary table and up to 5 levels of directories with up to 20 files per directory sorted by the amount of used disk space. When the full report mode is selected, each report will include a summary table and a complete list of directories and files sorted by the amount of used disk space.
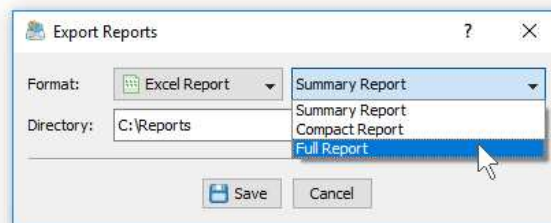
Once the export operation will be completed, the specified destination directory will contain a number of disk space analysis reports according to the selected file categorization mode, selected categories of files and the selected report format.
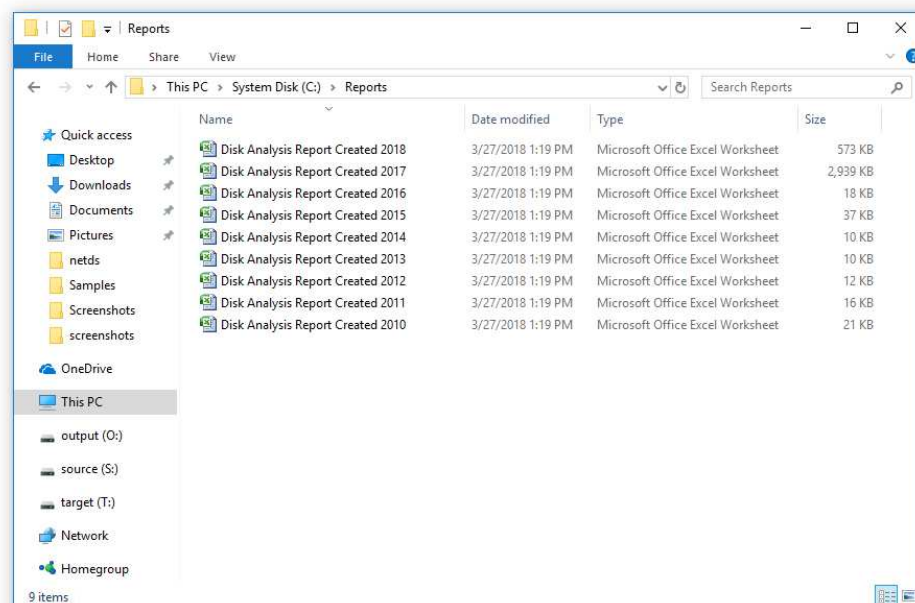
3.9   Exporting Reports to an SQL Database

DiskBoss Ultimate and DiskBoss Server allow one to save disk space analysis reports into an SQL database. A long-term history of disk space analysis reports from multiple servers and desktop computers may be submitted to a centralized SQL database and used to analyze disk usage trends across the entire enterprise.
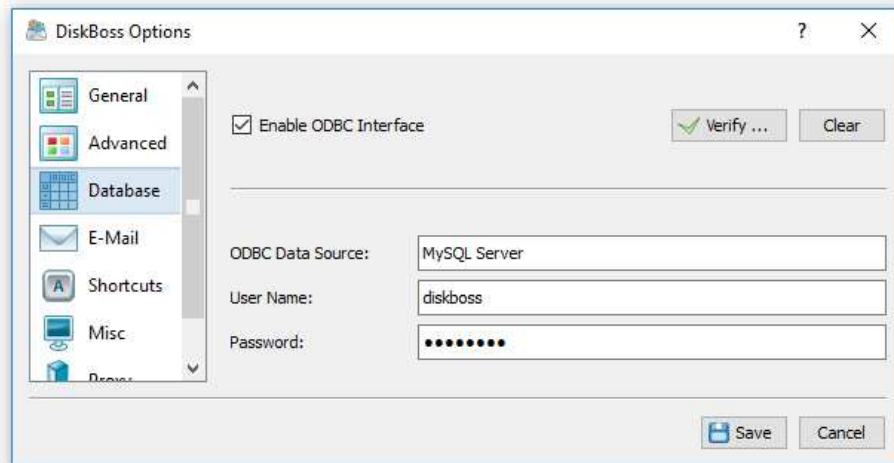
In order to be able to export reports to an SQL database, open the 'Options' dialog, enable the ODBC interface and specify the name of the data source, database user name and password to use to connect to the database.
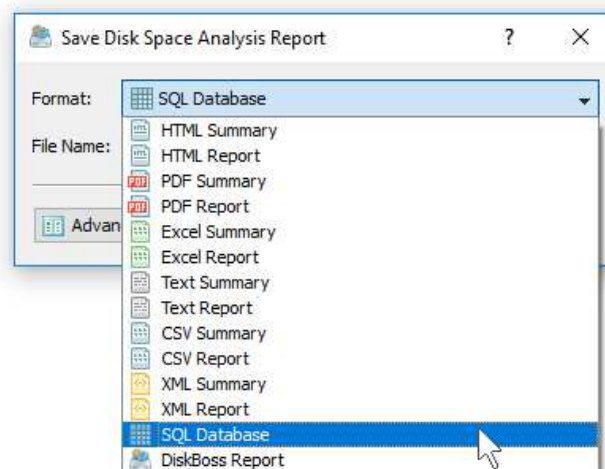
In order to export a disk space analysis to an SQL database, press the 'Save' button located on the results dialog's toolbar and select the 'SQL Database' report format. Optionally, press the 'More Options' button and specify the number of file system levels and the number of items per file system level to be exported to the database. For each report in the database, DiskBoss displays the report date and time, the host name, the input directories, the total number of files and disk space and the report title. To open a previously saved report, just click on the report item in the database reports dialog.

3.10   Analyzing Disk Space Usage Per Host

DiskBoss Server and DiskBoss Enterprise provide the ability to automatically detect all servers and NAS storage devices on the network, analyze hundreds of servers and/or NAS storage devices via the network, submit reports to a centralized reports database and display charts showing the disk space usage per server or NAS storage device across the entire enterprise.
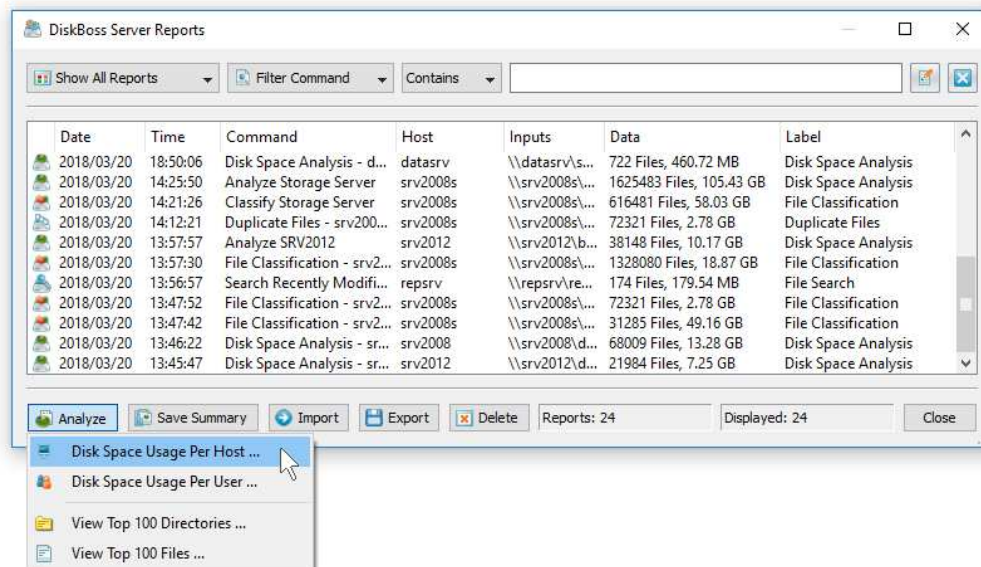
In order to analyze disk space usage per server, perform one or more disk space analysis operations on multiple servers and/or NAS storage devices, open the 'Reports' dialog, press the 'Analyze' button and select the 'Analyze Disk Space Usage Per Host' menu item. DiskBoss will analyze all reports saved in the reports database and display the hosts analysis dialog showing the disk space usage per host.
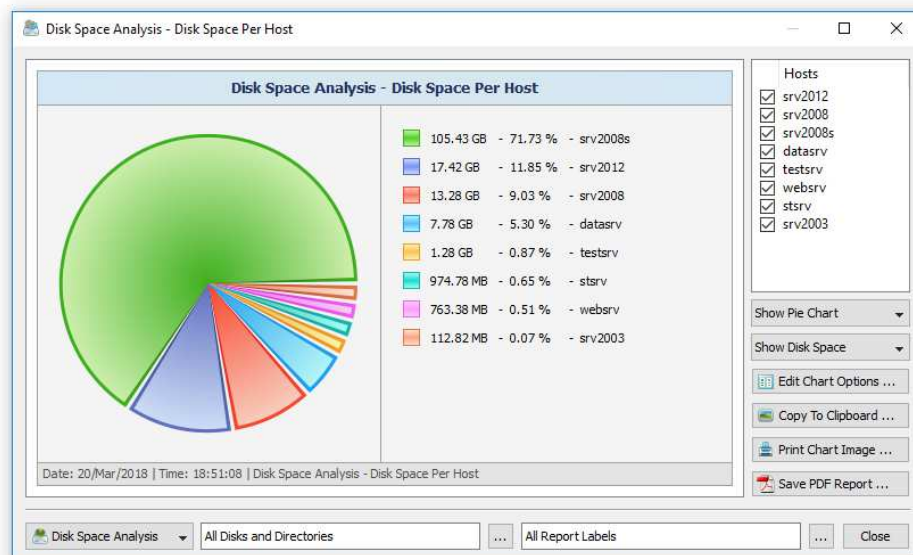
The hosts analysis dialog provides the ability to display pie charts and bars charts showing the disk space usage per server or NAS storage device according to analysis reports saved in the reports database. The user is provided with the ability to select types of disk space analysis operations and file system locations to analyze, edit the chart header and footer, copy the chart image to the clipboard and export graphical PDF reports including pie charts.

3.11   Analyzing Disk Space Usage Per User

DiskBoss Server and DiskBoss Enterprise provide the ability to automatically detect all servers and NAS storage devices on the network, analyze hundreds of servers and/or NAS storage devices via the network, submit analysis reports to a centralized report database and display charts showing the used disk space per user across the entire enterprise.
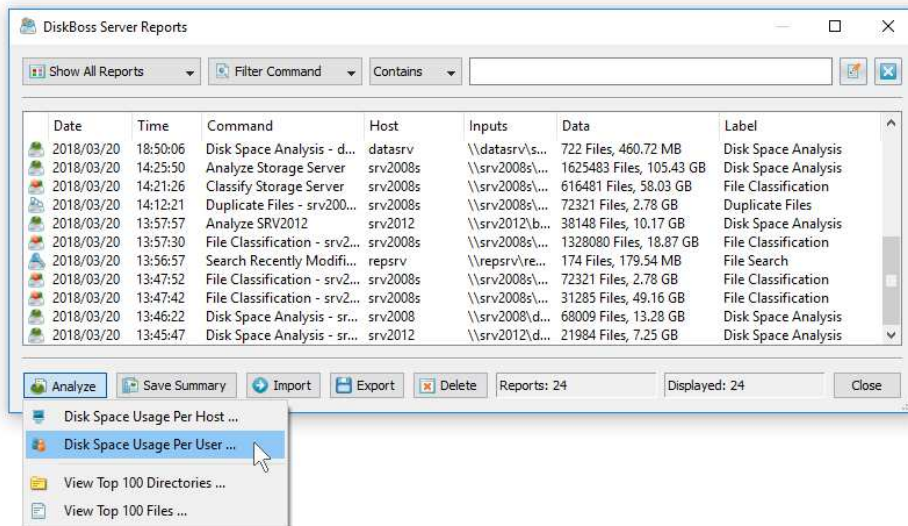
In order to analyze disk space usage per user, perform one or more disk space analysis, file classification and/or duplicate files search operations on multiple servers and/or NAS storage devices, open the 'Reports' dialog, press the 'Analyze' button and select the 'Analyze Disk Space Usage Per User' menu item. DiskBoss will analyze all reports saved in the reports database and display the users analysis dialog showing the disk space usage per user.
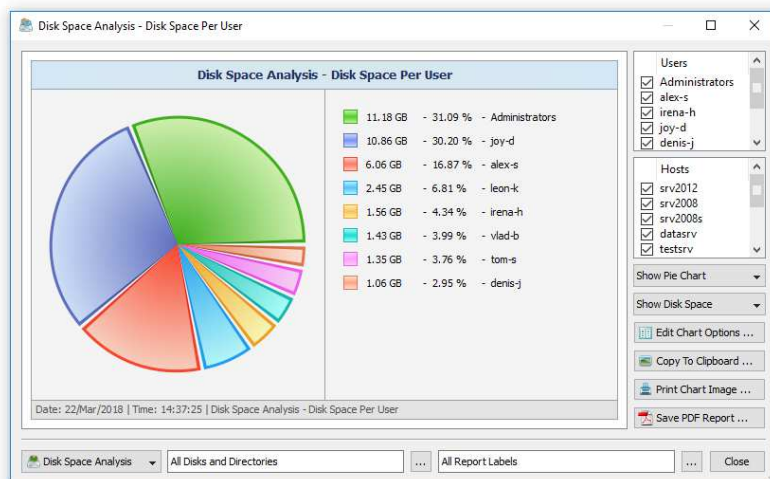
The users analysis dialog provides the ability to display pie charts and bars charts showing the disk space usage, file categories, the number of duplicate files and the amount of duplicate disk space per user according to analysis reports saved in the reports database. The user is provided with the ability to select types of disk analysis operations, file categories and file system locations to analyze, edit the chart header and footer, copy the chart image to the clipboard and export graphical PDF reports including pie charts.

IMPORTANT: In order to be able to display the disk space usage per user, the disk space analysis operation should be configured to process and display files user names.

3.12 Analyzing Network Servers and NAS Storage Devices

DiskBoss allows one to scan the network, discover network servers and NAS storage devices, automatically detect all accessible network shares and analyze disk space usage in hundreds of network servers and NAS storage devices. In addition, the user is provided with the ability to export the list of detected servers and NAS storage devices (including lists of network shares for each server) into HTML, PDF, text and Excel CSV reports.
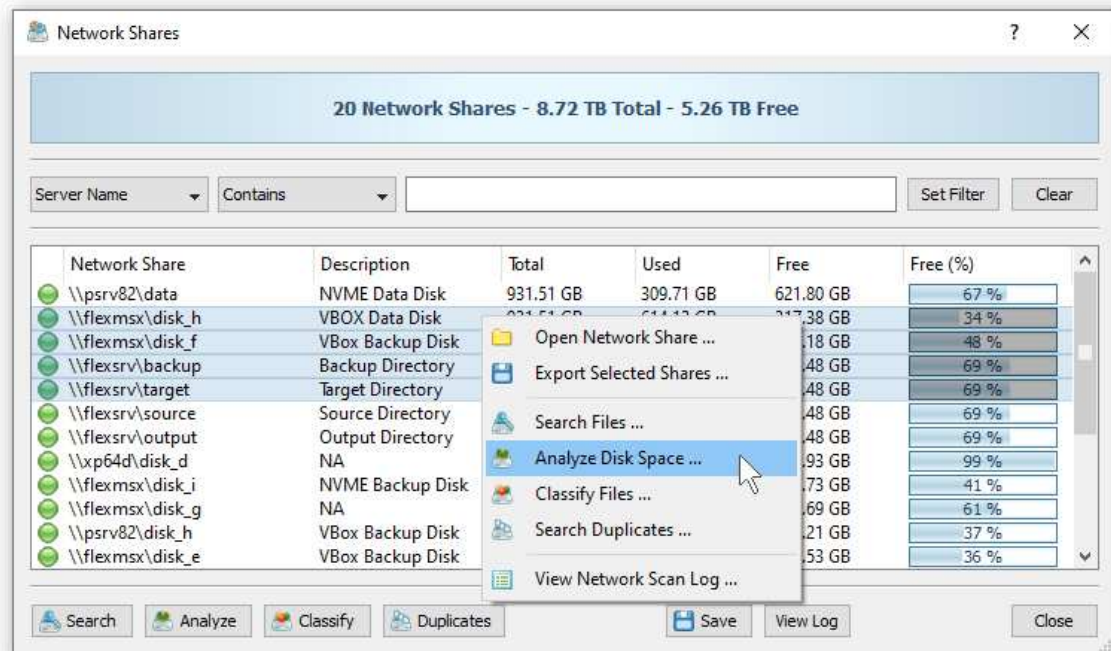
In order to discover all network servers and NAS storage devices on the network, press the 'Network' button located on the main toolbar and wait while DiskBoss will scan the network and show a list of detected network servers and NAS storage devices. In order to analyze disk space usage in one or more servers or NAS storage devices, select the required servers and NAS storage devices and press the 'Analyze' button.
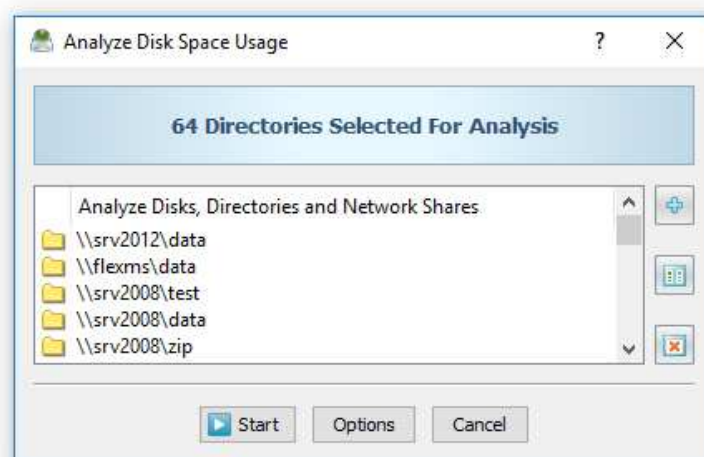
DiskBoss will show all accessible network shares hosted on the selected servers and NAS storage devices allowing one to analyze disk space usage and save various types of disk space analysis charts and reports. In addition, the user is provided with the ability to customize a large number of advanced disk space analysis options allowing one to tune disk space analysis operations for user specific needs and hardware configurations.

3.13   Batch Disk Space Analysis Operations

DiskBoss Server and DiskBoss Enterprise provide the ability to execute one or more pre-configured disk space analysis operations on all network servers and NAS storage devices on the network and generate an individual disk space analysis report for each server and NAS storage device. In order to be able to use batch disk space analysis operations, the user needs to pre-configure one or more disk space analysis commands customized to generate disk space analysis reports according to user-specific needs and requirements.
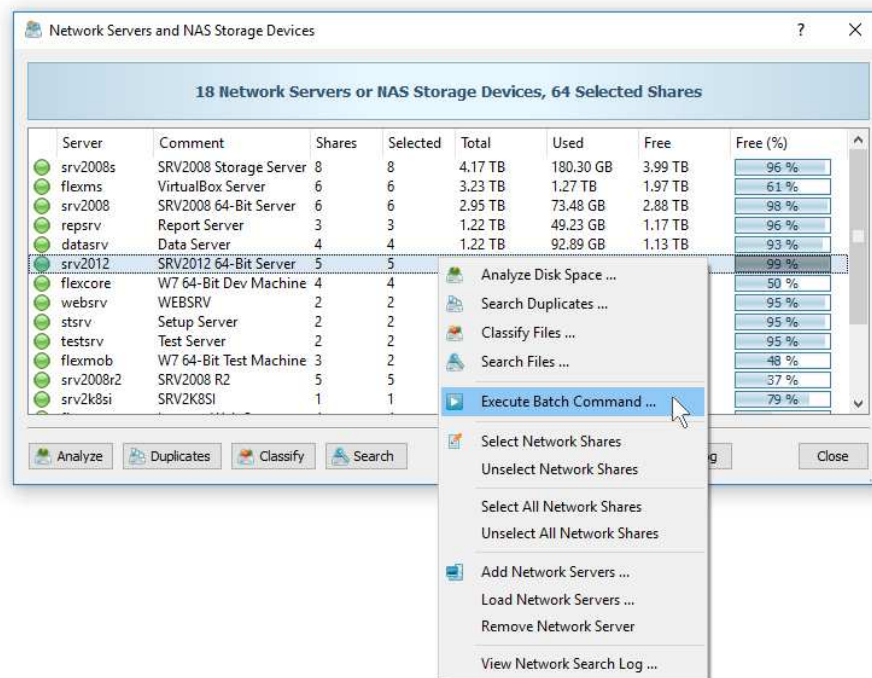
In order to start a batch disk space analysis operation, press the 'Network' button located on the main toolbar, search all servers and NAS storage devices on the network, select one or more servers and NAS storage devices, press the right mouse button and select the 'Execute Batch Command' menu item.
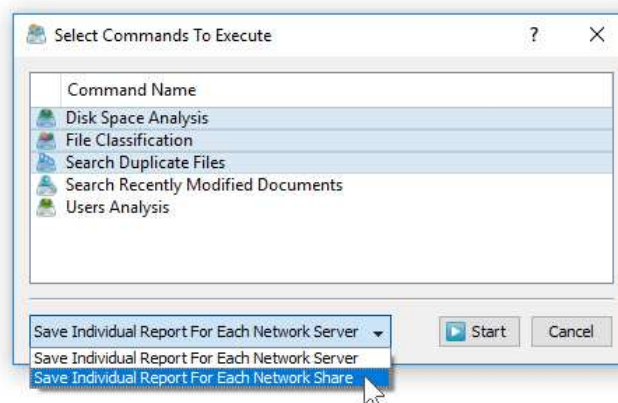
DiskBoss will display a list of pre-configured disk space analysis commands allowing one to select one or more commands to be executed on all selected servers and NAS storage devices. In addition, the user is provided with the ability to select how to save disk space analysis reports - for each analyzed server or for each analyzed network share. By default, all disk space analysis reports will be saved in the DiskBoss internal reports database allowing one to

open each report, review results, generate various types of pie charts and export reports into a number of standard formats including HTML, PDF, Excel, text, CSV and XML.

3.14   Analyzing Specific File Types or Categories

One of the most powerful capabilities provided by DiskBoss is the integration between disk space analysis and file search features allowing one to perform disk space analysis on files matching one or more user-specified rules. For example, the user is provided with the ability to analyze files related to a specific file category, with a specific file size that were modified or created during a specific time period or any other combination of user-specific rules.
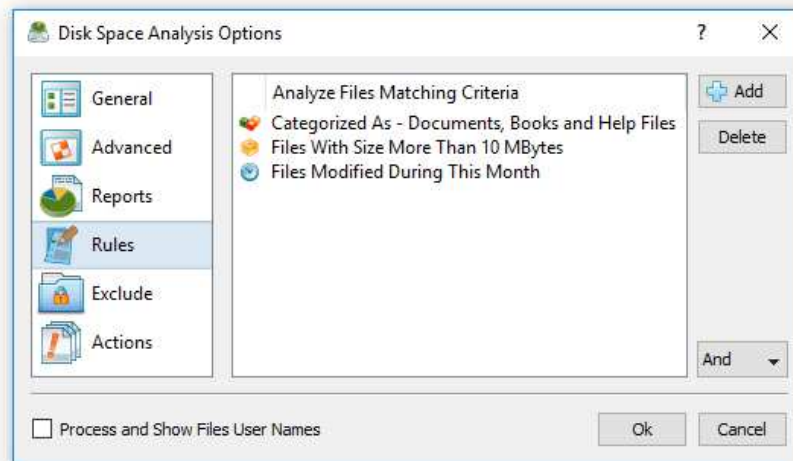
In order to add one or more file matching rules to a disk space analysis operation, press the 'Advanced Options' button on the disk space analysis command dialog, select the 'Rules' tab and press the 'Add' button. Once finished to add file matching rules, select an appropriate rules logic mode (AND/OR) and press the 'Save' button. For a rule-based disk space analysis operation, the results dialog will show files matching the specified rules and directories containing these files. All types of charts and reports will include information about filtered files only making it very easy to focus on specific types or categories of files.
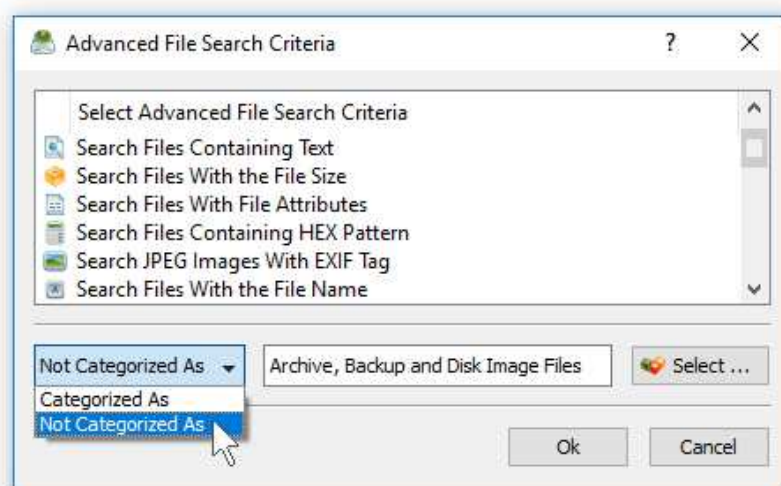
In addition to positive file matching rules allowing one to analyze disk space usage for files matching user-specified rules, DiskBoss provides the ability to add negative file matching rules, which will exclude specific type or categories of files from the disk space analysis process. For example, in order to exclude all types of backup and archive files from disk space

analysis results, add a file category rule, select the 'Not Categorized As' rule operator and select the 'Archive and Backup Files' file category.

Another very useful analysis rule provides the ability to analyze the disk space usage by the creation, last modification or the last access date. For example, in order to analyze files modified during the last year, select the rule named 'Search Files Last Modified' and set the rule operator to 'During This Year'.
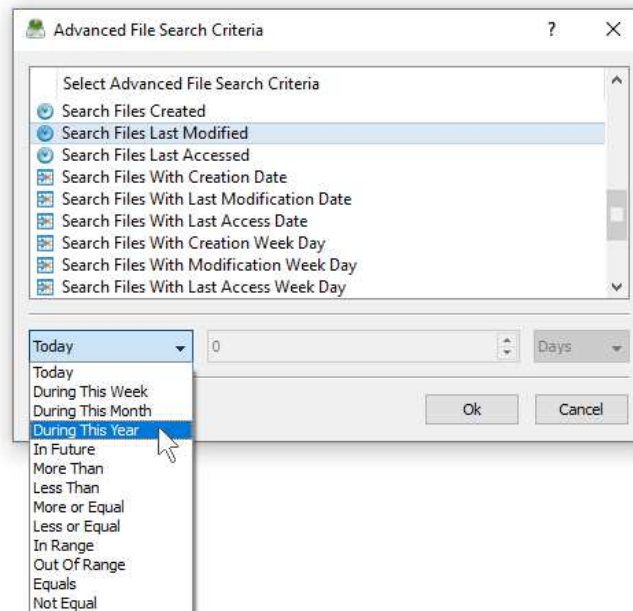
In addition, there are analysis rules to match files by the number of days, months, years, hours, minutes or seconds since the creation, last modification or the last access time allowing one to precisely select which files to analyze. Finally, the user is provided with the ability to analyze files created, last modified or last accessed before or after a specific date or a date range. For example, in order to analyze files by a modification date range, select the rule named 'Search Files With Last Modification Date', set the rule operator to 'In Range' and then select the start date and the end date.
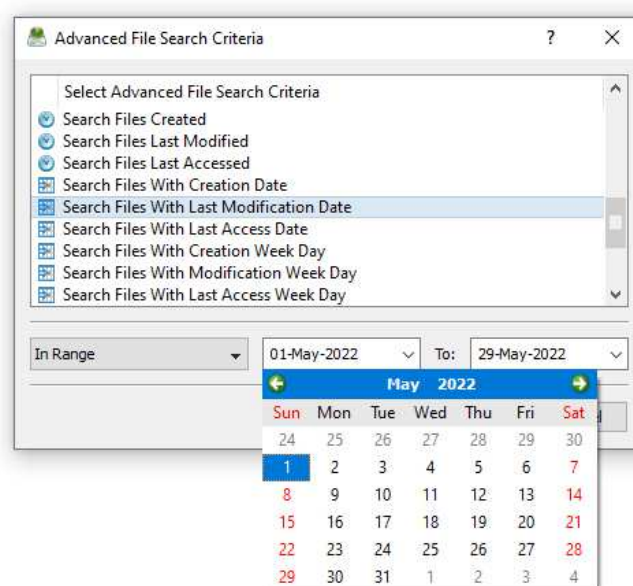
In advanced analysis operations the date and time rules may be combined with other types of file matching rules allowing one to view the disk space analysis results according to the user-

specific needs. For example, in order to free the disk space, the user may display analysis results showing the disk space usage for all types of backup files with the file size more than 100 MB which were created more than a year ago.

3.15 Excluding Subdirectories from Disk Space Analysis Process

Sometimes, it may be required to exclude one or more subdirectories from the disk space analysis process. For example, if you need to analyze a disk excluding one or two special directories, you may specify the whole disk as an input directory and add the directories that should be skipped to the exclude list.
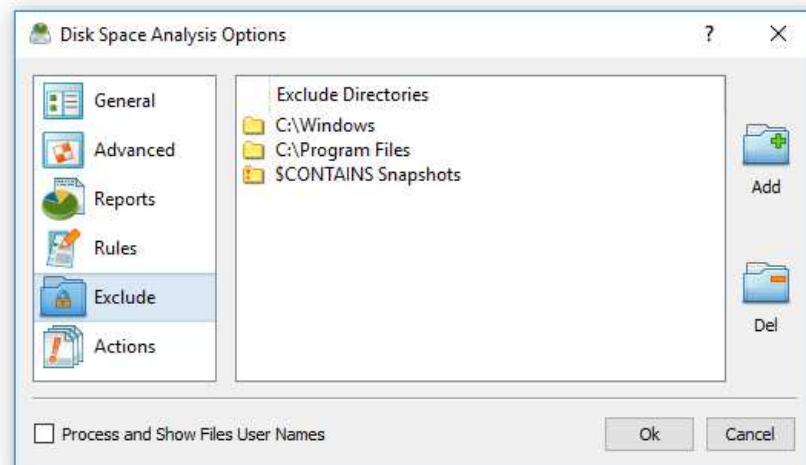
In order to add one or more directories to the exclude list, open the disk space analysis command dialog, press the 'Options' button, select the 'Exclude' tab and press the 'Add' button. All files and subdirectories located in the specified exclude directory will be excluded from the disk usage analysis process. In addition, advanced users are provided with a number of exclude directories macro commands allowing one to exclude multiple directories using a single macro command.

DiskBoss provides the following exclude directories macro commands:

- **$BEGINS <Text String>** - this macro command excludes all directories beginning with the specified text string.
- **$CONTAINS <Text String>** - this macro command excludes all directories containing the specified text string.
- **$ENDS <Text String>** - this macro command excludes all directories ending with the specified text string.
- **$REGEX <Regular Expression>** - this macro command excludes directories matching the specified regular expression.
- **$DIRLIST <File Name>** - this macro command excludes all directories listed in the user-specified text file.
- **$FILELIST <File Name>** - this macro command excludes all files listed in the user-specified text file.

For example, the exclude macro command '$CONTAINS Temporary Files' will exclude all directories with 'Temporary Files' in the full directory path and the exclude macro command '$REGEX \.(TMP|TEMP)$' will exclude directories ending with '.TMP' or '.TEMP'.

3.16   Conditional Disk Space Analysis Actions

IT professionals and storage administrators are provided with the ability to automatically detect abnormal disk space usage patterns, send E-Mail notification, save disk space usage reports and/or execute file management commands or custom actions. The user is provided with the ability to define one or more disk space analysis conditions, evaluate these conditions on disk space analysis results and send E-Mail notifications and/or execute actions if one or more of the specified conditions are met.
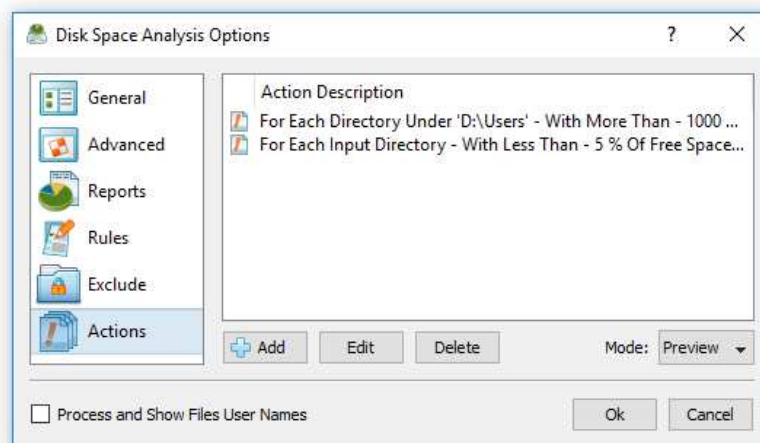
In order to add one or more disk space analysis conditions and actions, open the disk space analysis options dialog, select the 'Actions' tab and press the 'Add' button. On the action dialog, select the directory mode, enter the directory to evaluate the condition for, select the condition type, enter the condition value, select the action type and enter the action value.
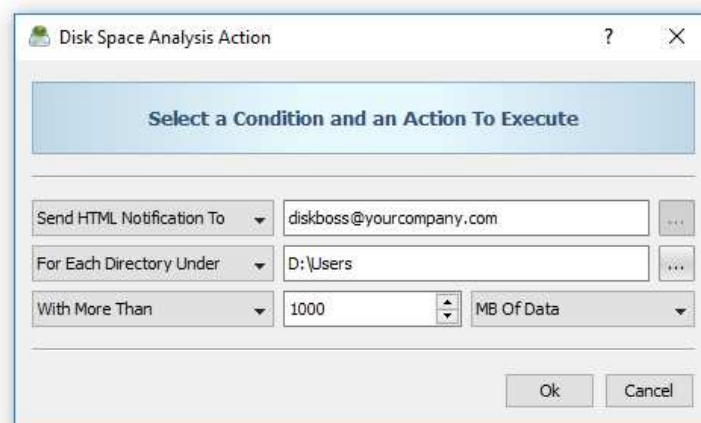
During runtime, DiskBoss will perform disk space analysis and evaluate the specified conditions for one or more directories depending on the selected directory mode. Execution of disk space analysis actions depends on the selected actions mode. In the 'Preview' mode, DiskBoss will mark directories matching the specified conditions in the results dialog and show the actions preview dialog allowing one to verify and manually confirm all disk space analysis actions, reports and E-Mail notifications to be executed.

In the 'Execute' mode, instead of showing the disk space analysis results dialog, DiskBoss will automatically send E-Mail notifications, save reports and/or execute actions for each directory matching the user-specified conditions. The 'Execute' mode is especially useful for automatic disk space analysis and file management operations performed periodically using DiskBoss Server allowing one to trigger user-defined disk cleanup and file management operations based on disk space analysis results.

3.17   Advanced Disk Space Analysis Options

DiskBoss provides a large number of advanced disk space analysis options allowing one to customize and configure disk space analysis operations for user-specific needs and custom hardware and storage configurations.
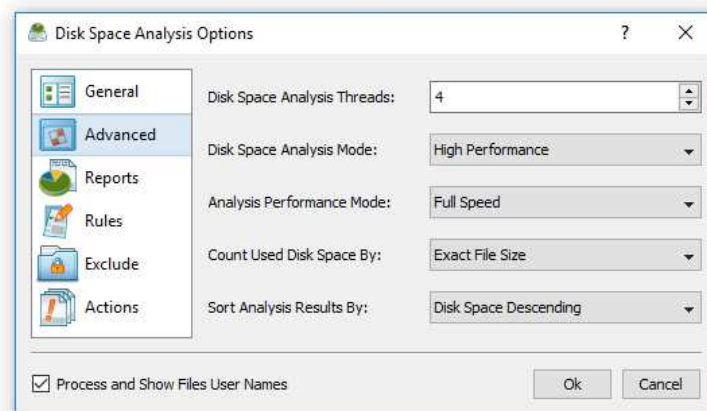
The disk space analysis options dialog allows one to control the directory scanning mode, the default report title, advanced reporting options, the performance mode and enable/disable automatic report generation. In addition, the user is provided with the ability to analyze specific file types, control performance tuning options, exclude specific directories from the disk space analysis process and specify one or more conditional analysis actions.

3.18   Pre-Configured Disk Space Analysis Commands

One of the most powerful and flexible capabilities of DiskBoss is the ability to pre-configure custom disk space analysis operations as user-defined commands and execute such commands in a single mouse click using the DiskBoss GUI application or direct desktop shortcuts.
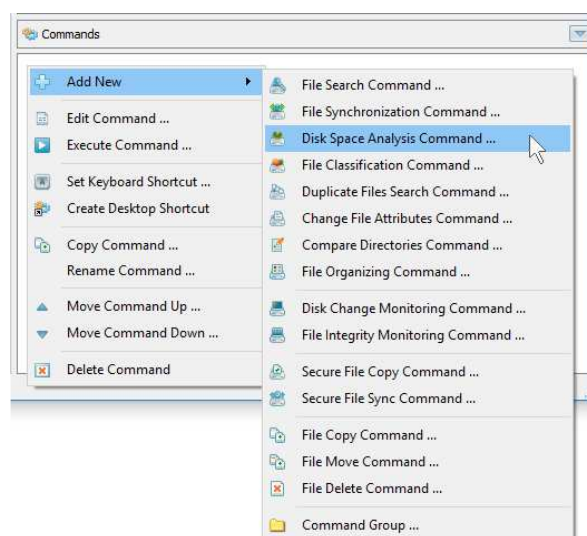
User-defined commands may be managed and executed through the commands dialog or the commands tool pane. In order to add a new command through the commands pane, press the right mouse button over the pane and select the 'Add New - Disk Space Analysis Command' menu item. In order to execute a previously saved command, just click on the command item in the commands tool pane or create a direct desktop shortcut on the Windows desktop.

3.19   Analyzing Disk Space Using the DiskBoss Command Line Utility

In addition to the GUI application, DiskBoss Ultimate provides a command line utility capable of performing disk space utilization analysis operations and executing user-defined disk space analysis commands from shell scripts and batch files. The DiskBoss command line tool is located in the '<ProductDir>/bin' directory.

Command Line Syntax:

diskboss –analyze -dir <Input Directory 1> [... <Input Directory X> <Options>]

This command analyzes the specified disks, directories or network shares.

diskboss –analyze -server <Host Name 1> [... <Host Name X> <Options>]

This command analyzes all network shares in the specified servers or NAS storage devices.

diskboss –analyze -network [Options]

This command analyzes all network shares in all servers on the network.

diskboss –execute <User-Defined Disk Space Analysis Command>

This command executes a user-defined disk space analysis command.

Parameters:

-dir <Input Directory 1> [... <Input Directory X>]

This parameter specifies the list of input disks or directories to analyze. In order to ensure proper parsing of input disks and directories, directories containing space characters should be double quoted. By default, DiskBoss will generate a combined disk space analysis report showing information about all analyzed disks, directories or network shares. In order to generate an individual report for each input directory use the '**-batch**' command line option to enable the batch report generation mode.

-server <Host Name 1> [... <Host Name X>]

This parameter specifies the list of host names or IP addresses of servers or NAS storage devices that should be analyzed. DiskBoss will enumerate all network shares accessible in the specified servers or NAS storage devices, perform disk space analysis and generate reports if required. By default, DiskBoss will generate a combined disk space analysis report showing information about all analyzed network shares. In order to generate an individual report for each network share use the '**-batch**' command line option to enable the batch report generation mode.

-network

In the network-wide disk space analysis mode, DiskBoss will discover servers and NAS storage devices accessible on the network, enumerate all network shares available in all detected servers and NAS storage devices, perform disk space analysis and generate reports if required. By default, DiskBoss will generate a combined disk space analysis report showing information about all analyzed network shares. In order to generate an individual report for each network share use the '**-batch**' command line option to enable the batch report generation mode.

Options:

-save_html_report [ReportFileName]

This option saves a disk space analysis report and the list of all file categories to an HTML file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_[date]_[time].html

-save_csv_report [ReportFileName]

This option saves a disk space analysis report and the list of all file categories to an Excel CSV file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_[date]_[time].csv

-save_text_report [ReportFileName]

This option saves a disk space analysis report and the list of all file categories to a text report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_[date]_[time].txt

-save_pdf_report [ReportFileName]

This option saves a disk space analysis report and the list of all file categories to a PDF report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_[date]_[time].pdf

-save_xml_report [ReportFileName]

This option saves a disk space analysis report and the list of all file categories to an XML report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_[date]_[time].xml

-save_report [ReportFileName]

This option saves a disk space analysis report and the list of all file categories to a native DiskBoss report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_[date]_[time].flr

-exclude_dir <Exclude Directory 1> [... <Exclude Directory X>]

This option specifies the list of directories that should be excluded from the disk space analysis operation. In order to ensure proper parsing of command line arguments, directories containing space characters should be double quoted.

-batch

This option enables the batch report generation mode. In the batch report generation mode DiskBoss saves an individual report file for each input disk, directory or network share.

-v

This option shows the product's major and minor versions.

-help

This option shows the command line usage information.

3.20   Disk Space Analysis Performance

DiskBoss is optimized for modern multi-core and multi-CPU systems and is capable of analyzing multiple disks, directories or network shares in parallel using all CPUs installed in the computer. DiskBoss provides a number of different performance optimization options allowing one to tune the disk space analysis operations for user-specific hardware and storage configurations.
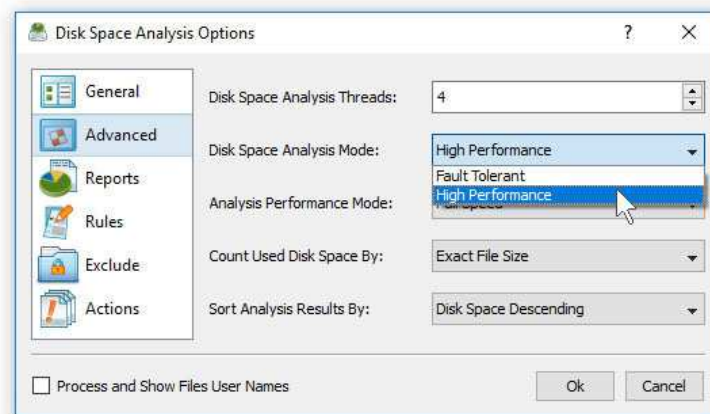
In order to customize the disk space analysis performance optimization options, open the disk space analysis operation dialog, press the 'Options' button and select the 'Advanced' tab. The 'Dir Scan Threads' option controls how many parallel disk space analysis threads are used to scan input disks, directories and network shares. In the 'Fault-Tolerant' directory scanning mode, DiskBoss uses an individual processing thread for each input disk, directory or network share, but limits the maximum number of parallel scanning threads to the specified value. In the high-performance directory scanning mode, DiskBoss always uses the specified number of parallel directory scanning threads even when processing a single input disk, directory or network share.
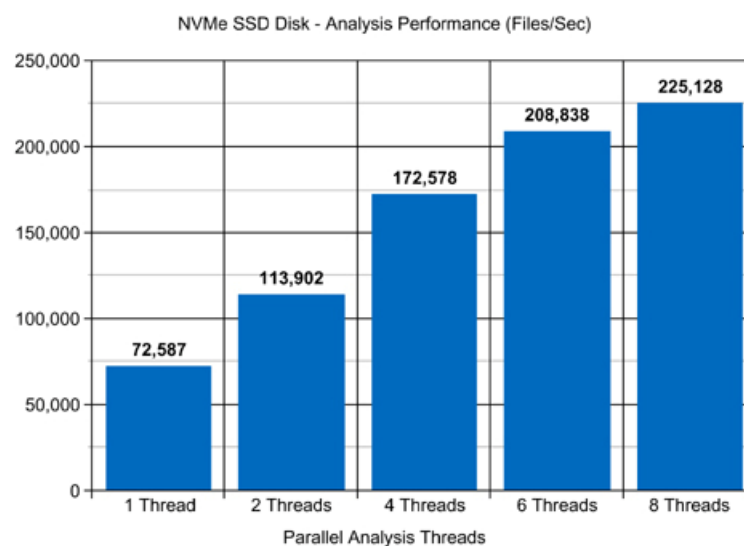
For example, when analyzing files stored on a high-speed NVMe SSD disk, DiskBoss reaches up to 72,000 files/sec using a single disk space analysis thread. With two parallel analysis threads, the performance scales up to 113,000 files/sec and with four parallel analysis threads, the performance increases up to 172,000 files/sec showing a very good level of multi-threaded performance scalability. With six processing threads the analysis performance reaches up to 208,000 files/sec and with eight processing threads the performance increases up to 225,000 files/sec, which makes it possible to analyze 10 millions files within one minute. When analyzing files stored on regular SATA SSD drives, which are significantly slower then NVMe SSD drives, the performance of the disk space analysis process reaches up to 26,000 files/sec using a single processing thread and scales up to 73,000 files/sec with four parallel analysis threads. With eight parallel analysis threads, the performance reaches up to 113,000 files/sec, which allows to analyze huge numbers of files relatively fast.
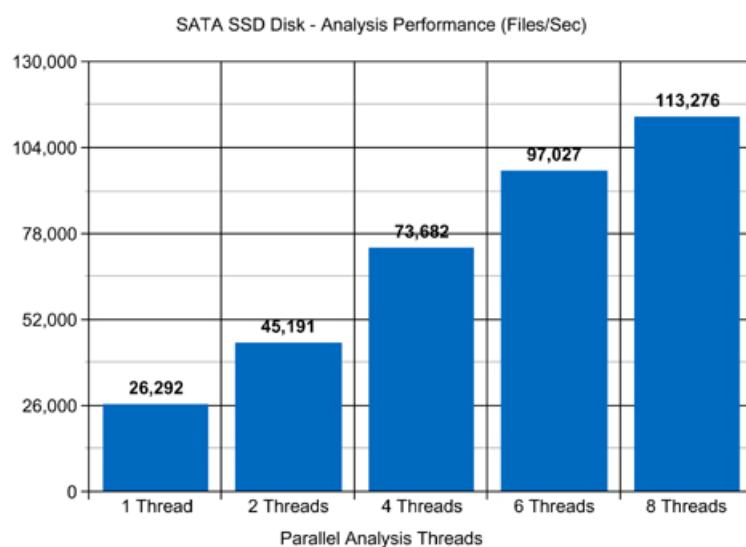
Analyzing files stored on NAS storage devices via a network is more complicated because the user needs to take into account the speed and the latency of the network. If the computer, on which DiskBoss is installed, is connected to the NAS storage device via a high-speed, low-latency network, the performance of the disk space analysis operations may reach up to 13,000 files/sec with one processing thread, scale up to 48,000 files/sec with four parallel processing threads and increase up to 81,000 files/sec with eight parallel analysis threads.
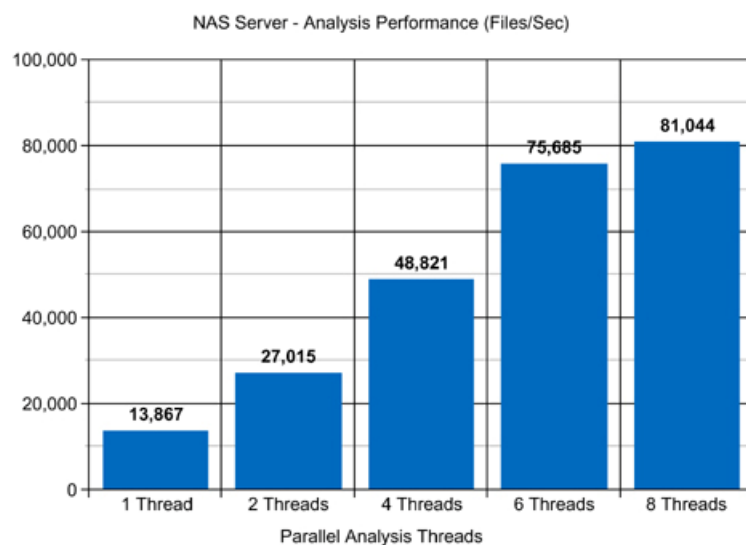
On the other hand, if DiskBoss will need to access network shares via the Internet or via a long-distance, high-latency network, the performance of the disk space analysis operations will be relatively slow. One of the options to increase the performance of the analysis operations in such configurations is to set the 'High-Performance' directory scanning mode and increase the number of parallel directory scanning threads to 16 or even 32 disregarding how many CPUs are actually installed on the computer.

Modern USB flash drives provide plenty of the storage space and are reasonably fast allowing one to store vast amounts of data for backup purposes. Sometimes, it may be required to analyze a USB flash drive in order to free the used disk space. When analyzing files stored on a USB flash drive, DiskBoss can reach up to 9,000 files/sec with a single disk space analysis thread. With two parallel disk space analysis threads, the performance increases up to 11,000 files/sec, which is good, but more than two parallel analysis threads improve the performance of the disk space analysis operations very slightly.
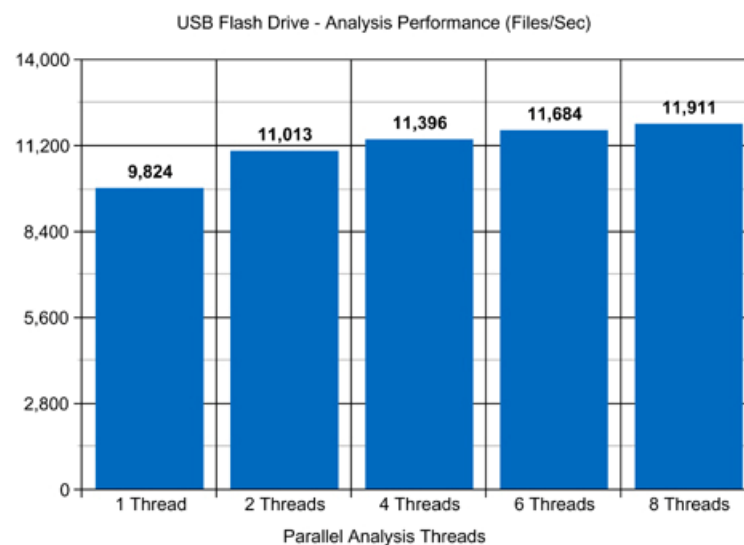
USB Flash Drive - Analysis Performance (Files/Sec)

Parallel Analysis Threads	Files/Sec
1 Thread	9,824
2 Threads	11,013
4 Threads	11,396
6 Threads	11,684
8 Threads	11,911

Today, modern IT environments widely deploy virtual servers and/or virtual workstations. Most of the popular virtualization platforms provide a high level of performance, but anyway some performance degradations are inevitable when a task is executed on a guest virtual machine compared to the same task executed directly on the host computer.

VM Local NVMe SSD - Analysis Performance (Files/Sec)

Parallel Analysis Threads	Files/Sec
1 Thread	22,637
2 Threads	29,226
4 Threads	41,403
6 Threads	42,690
8 Threads	45,888
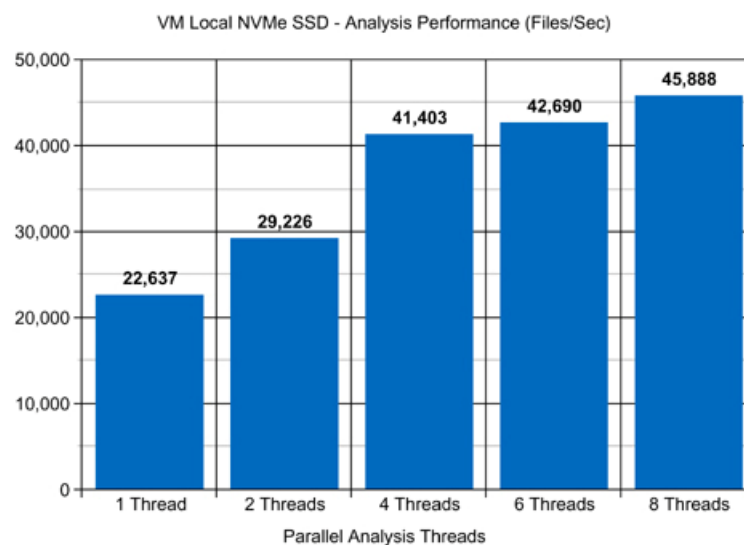
For example, when a virtual machine with 4 virtual CPUs is stored on an NVMe SSD disk and analyzing files stored on a virtual local disk drive, which is physically stored on the same NVMe SSD disk, the performance of the disk space analysis operations reaches up to 22,000 files/sec using one disk space analysis thread. With two parallel analysis threads, the performance of the analysis operations increases up to 29,000 files/sec and with four parallel analysis threads, the performance of the disk space analysis operations scales up to 41,000 files.

4   File Classification

4.1   Classifying Files in Disks and Directories

DiskBoss recognizes more than 3,500 types of files and is capable of classifying files and showing a categorized hierarchy of files sorted by the amount of the disk space used by each file category. DiskBoss includes a number of file classification plugins capable of classifying files by the file type, extension, user name, last access, modification and creation dates, etc. In order to classify files in one or more disks or directories, select the required directories in the DiskBoss file navigator and press the 'Classify' button.
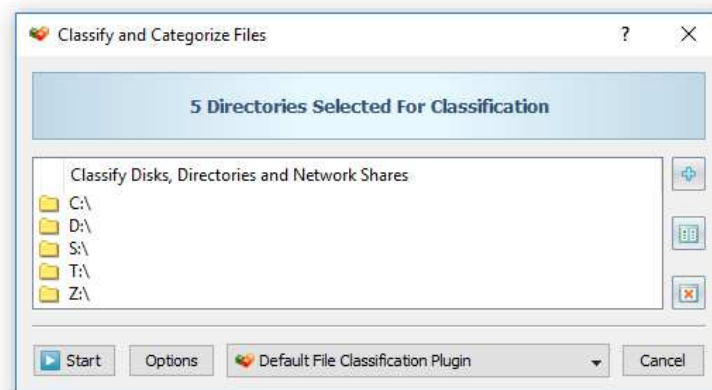
On the 'File Classification Plug-ins' dialog, select an appropriate file classification plug-in and press the 'Classify' button. DiskBoss will classify all the selected disks and directories and show the file classification results dialog displaying a categorized hierarchy of files sorted by the amount of the disk space used by each file category.
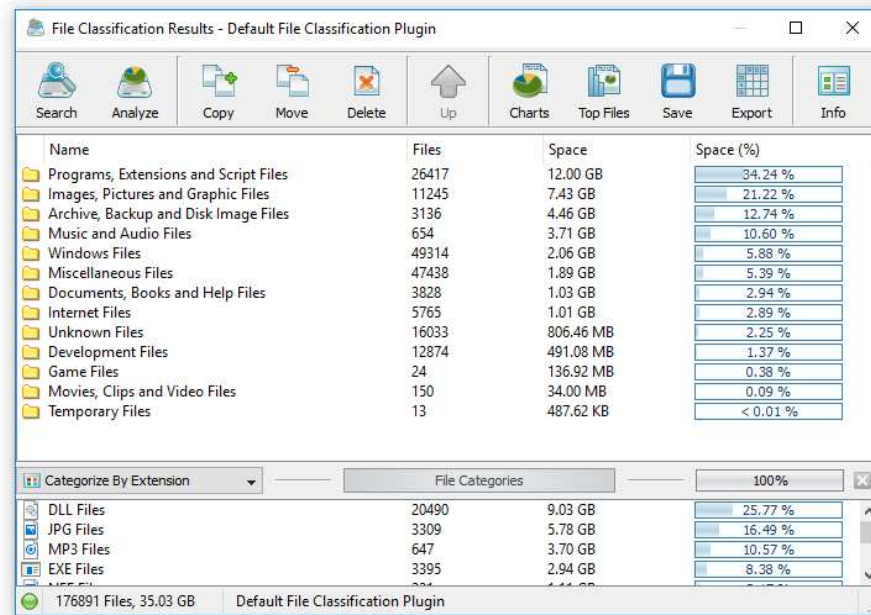
The file classification results dialog allows one to browse the file hierarchy, perform file management operations on files and file categories, generate various types of charts, export HTML, PDF, Excel, XML, text and CSV reports and submit file classification results to an SQL database. In addition, the user is provided with the ability to physically reorganize files on the disk according to the used file classification plug-in. Finally, power users are provided with the ability to design custom plug-ins using an open and easy-to-use XML-Based format.

4.2   File Filters and File Categories

The top view of the file classification results dialog shows the file categories and classes sorted by the amount of the used disk space and the bottom view shows the second-level file categories and filters, which may be used to filter files and categories displayed in the top view making it very easy to focus on specific types of files or file groups. DiskBoss allows one to categorize file classification results by the file extension, file size, user name, creation, last modification and last access dates.
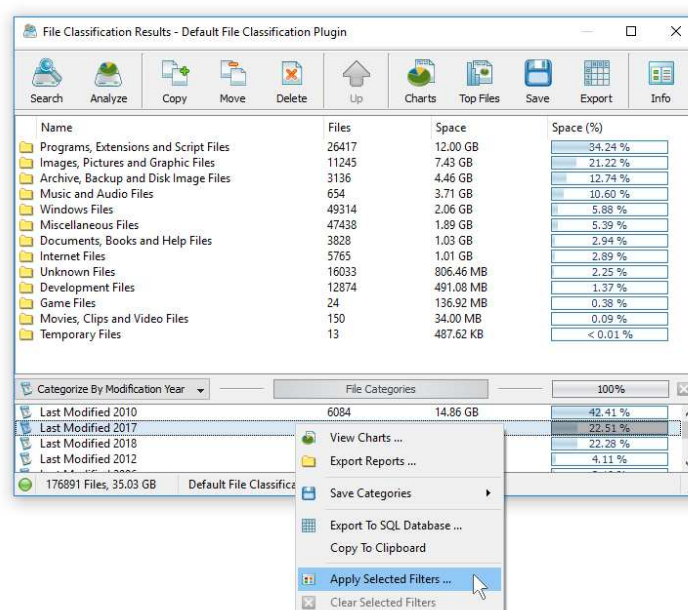
In order to change the current file categorization mode, click on the file categorization combo box located in the top-left corner of the second-level file categories view. In order to apply a second-level file filter, select one or more file categories in the filters view, press the right mouse button and select the 'Apply Selected Filters' menu item. DiskBoss will filter file classification results and display in the top view files matching the selected file filters and file categories containing these files.
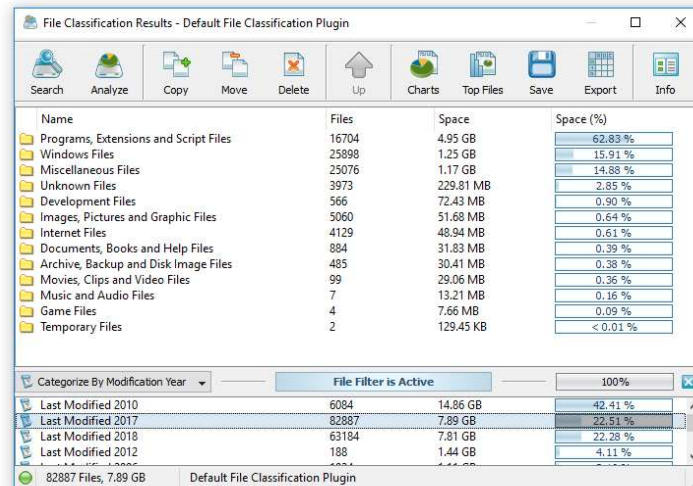
When a file filter is active, the file classification results dialog generates charts and exports HTML, PDF, Excel, XML, text and CSV reports for filtered files only. The user is provided with the ability to browse the filtered file hierarchy and perform file management operations in the usual way. In order to reset the file filter, press the right mouse button over the filters view and select the 'Clear Selected Filters' menu item.

In addition to the built-in file filters, DiskBoss provides the ability to pre-configure one or more custom file filters according to user-specific needs and requirements and then categorize and filter the file classification results using to the user-custom file filters. In order to add a custom file filter, select the custom file filters view, press the right mouse button over the filters view and select the 'Edit Custom Rules' menu item.

In order to add a new custom file filter, press the 'Add' button, enter a unique filter name and configure one or more file matching rules specifying which types or groups of files to display. In order to edit a custom file filter, select the filter in the custom file filters dialog and press the 'Edit' button.

Once finished configuring custom file filters, close the filters dialog and DiskBoss will categorize the currently displayed file classification results and show the list of user-specified custom file filters sorted by the amount of data and the number of files matching the specified file filters. In order to filter the currently displayed file classification results by one or more custom file filters, select the required custom file filters in the filters view, press the right mouse button and select the 'Apply Selected Filters' menu item. DiskBoss will filter the file classification results according to the selected custom file filters and display the amount of data and the number of files matching the selected file filters.

4.3   File Classification Pie Charts

The DiskBoss file classification utility provides multiple types of statistical pie charts and timeline charts capable of showing the amount of disk space usage and the number of files per file category, file extension, file size, file owner, creation, modification and last access time. In order to open the charts dialog, press the 'Charts' button located on the file classification results dialog and select an appropriate chart type.

For example, in order to open a chart showing the disk space usage and the number of files per file category, press the 'Charts' button located on the file classification results dialog and select the 'Disk Space Usage Per Category' chart type.

In addition, the charts dialog provides the user with the ability to export the chart data to a number of different formats, export the chart image to the BMP, JPEG and PNG image files, and copy the displayed chart image to the clipboard allowing one to easily integrate DiskBoss charts into user's documents and presentations. In order to customize the chart's description, press the 'Options' button and specify a custom chart title, host name, date or time.

One of the most powerful features of the DiskBoss file classification utility is the ability to filter file classification results using one or more user-specified filters and then categorize filtered results and display statistical pie charts. For example, in order to display a pie chart showing the amount of disk space usage per file extension for files that were modified during the last two years, set the file categorization mode to 'Categorize By Modification Year', select one or more years to show the information for, press the right mouse button over the file filters view and select the 'Apply Selected Filters' menu item.

DiskBoss will filter the file classification results and display files that were modified during the selected years. Now, press the 'Charts' button located on the file classification results dialog and select the 'Disk Space Usage Per Extension' menu item. DiskBoss will categorize the filtered file classification results and display a pie chart showing the amount of disk space usage per file extension for files that were modified during the selected years.
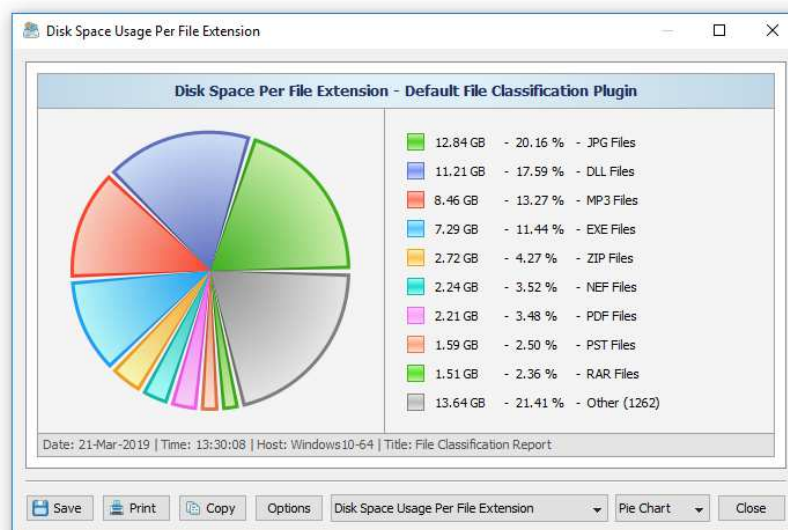
In a similar way, the user can filter file classification results by the file type, size, user name, file attributes, creation, modification and last access dates and then display various types of charts showing the disk space usage or the number of files according to user-specific needs.
Another powerful capability is the ability to display the disk space usage timeline charts for all or filtered file classification results. In the simplest case, press the 'Charts' button located on the file classification results dialog and select the 'Disk Space Usage Per Modification Year' menu item.
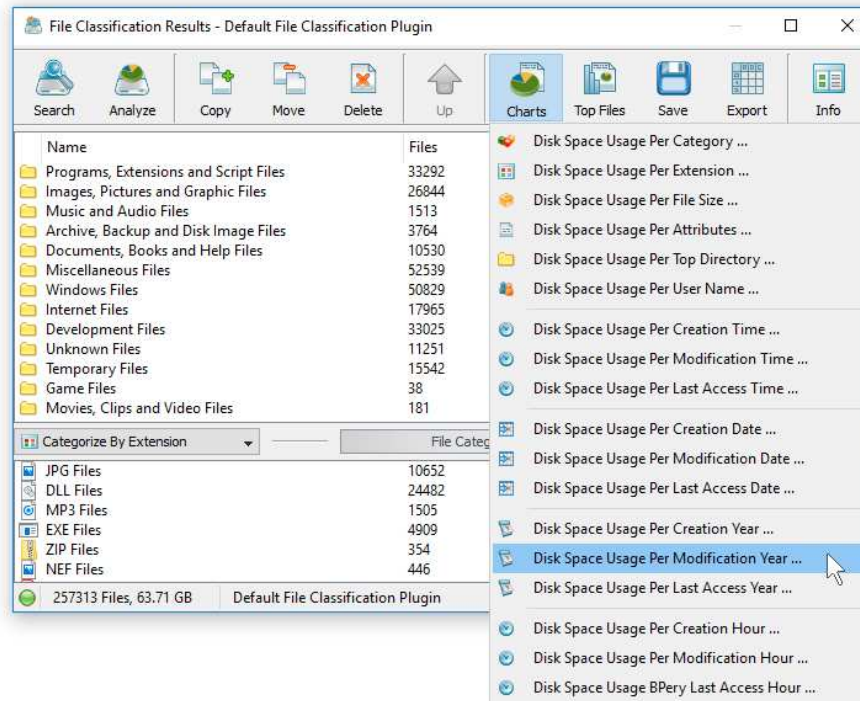
DiskBoss will display a time line chart showing how much data was modified per year. In order to display how many files were modified per year, set the chart mode to 'Number Of Files Per Modification Year'.
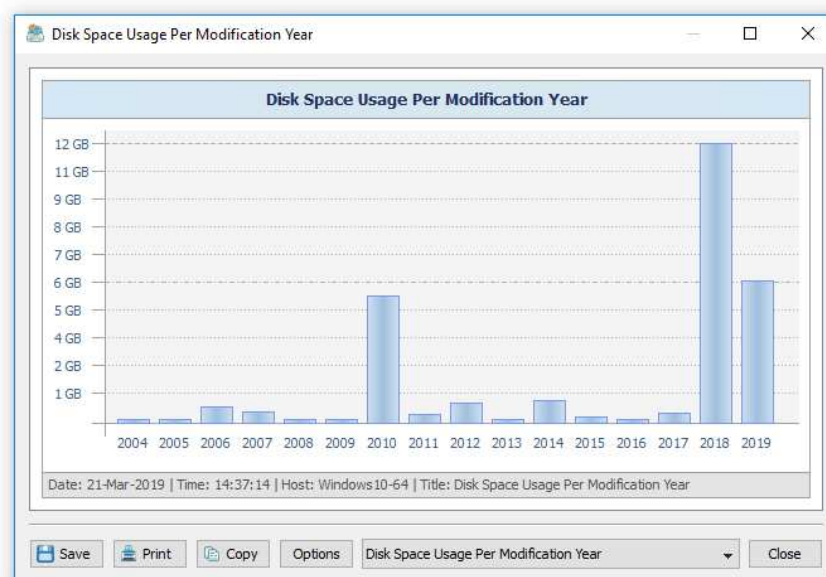
In addition, the user is provided with the ability to display timeline charts for filtered file classification results. For example, in order to display how many documents were created per year, set the file categorization mode to 'Categorize By File Type', select the 'Documents, Books and Help Files' file category, press the right mouse button and select the 'Apply Selected Filters' menu item. Now, press the 'Charts' button located on the main toolbar, and select the 'Disk Space Usage Per Creation Year' menu item.

4.4   Analyzing File Classification Results

DiskBoss provides multi-level file classification and disk space analysis capabilities allowing one to analyze file classification results and visualize physical locations of all files related to

one or more specific file categories or file classes. These capabilities are especially useful when used in conjunction with second-level file categories and filters providing the user with the ability to analyze categorized and filtered file classification results and making it very easy to reveal locations of very specific files the user is looking for.
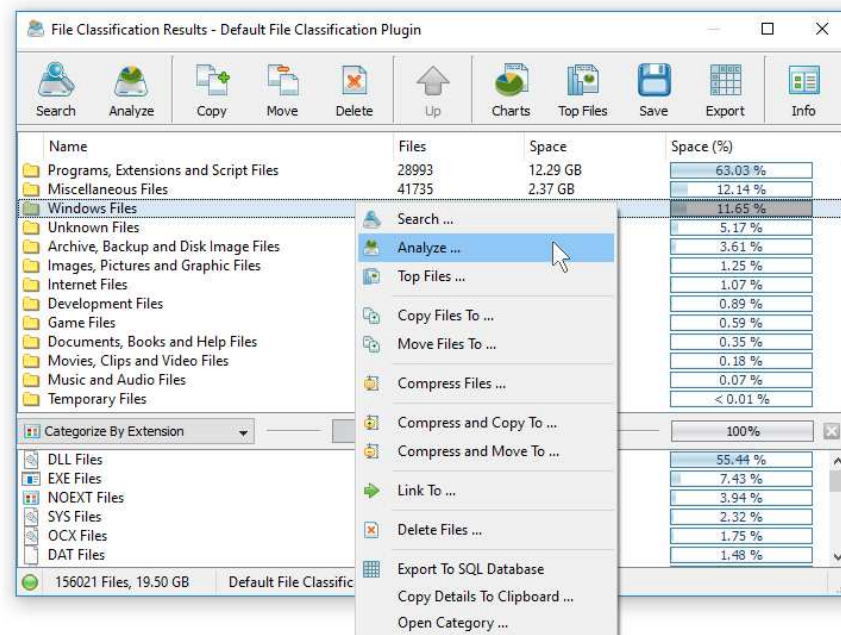
In order to analyze file classifications results, select one or more file classes or categories in the file classification results dialog, press the right mouse button and select the 'Analyze' menu item. DiskBoss will process the selected file categories and classes and display a file system hierarchy showing files related to the selected file categories or classes and the directories containing these files.
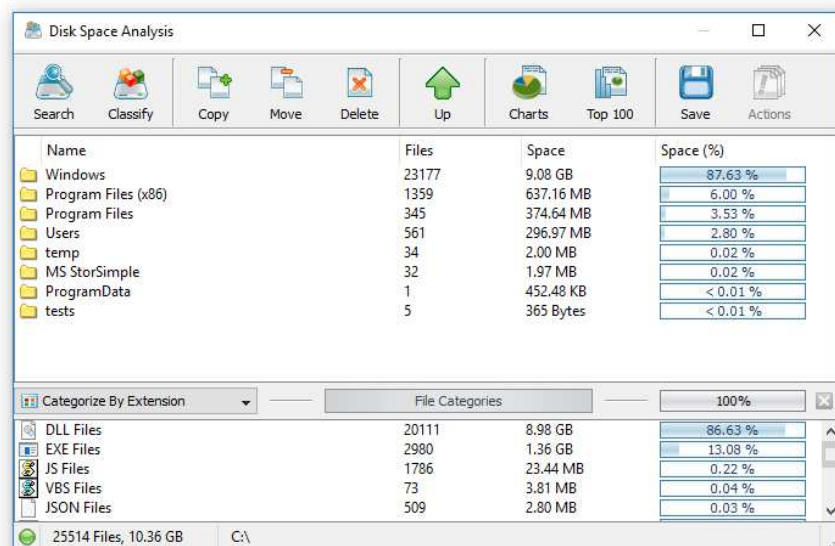
Analysis results are displayed in the standard disk space analysis dialog, which provides the user with the ability to generate pie charts, export HTML, PDF, Excel, XML, text and CSV reports, perform file management operations, etc.

4.5   Searching Files in File Classification Results

DiskBoss provides the ability to search files in file classification results by the file name, extension, full path, file category, file size, file attributes, creation, last modification and last access dates. In order to start a file search operation, classify one or more disks or directories and press the 'Search' button located on the main toolbar.
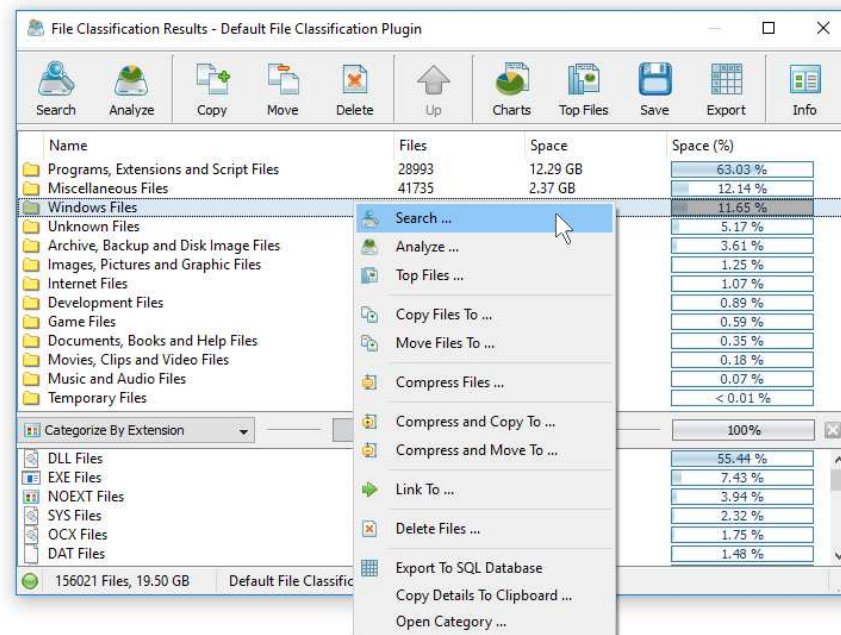
By default, the search operation will be performed on all file classification results. In order to search files in a specific file category, select the category in the file classification results view, press the right mouse button and select the 'Search Files' menu item. DiskBoss will search in the selected categories of files and display the file search results dialog showing a list of files matching the user specified criteria.
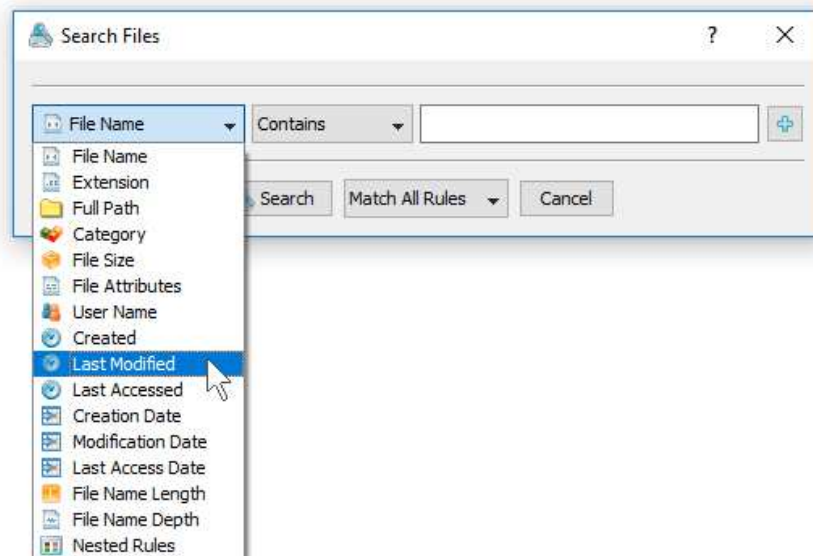
The search results dialog allows one to filter and categorize file search results, display various types of pie charts, copy, move and/or delete files, export file search results to a number of standard report formats including HTML, PDF, Excel, text, CSV and XML. In addition, advanced users are provided with the ability to export file search results to an SQL database.

4.6   Using File Management Operations

DiskBoss allows one to copy, move, compress and delete files and related to specific file categories. In order to perform a file operation on one or more file categories, select the required items in the file categories view, press the right mouse button and select an appropriate file management operation.

For copy and move operations, enter the destination directory and optionally press the 'Advanced Options' button to open the file copy options dialog. The copy options dialog allows one to control the file overwrite mode, file copy rules, performance tuning options and error handling options.

When copying files with an active file filter, DiskBoss automatically adds one or more file matching rules to the 'Rules' tab ensuring that only filtered files are copied to the destination directory. In order to delete files related to one or more file categories, select the required file categories in the categories view, press the right mouse button and select the 'Delete' menu item.
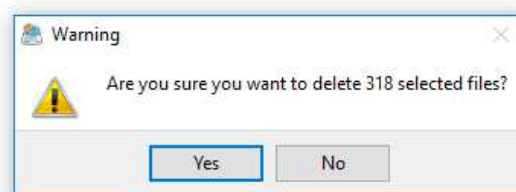
For example, in order to delete all types of document files, classify files in a disk or directory using the default file classification plug-in, select the 'Document Files' file category in the file classification results view, press the right mouse button and select the 'Delete' menu item.

4.7   Saving File Classification Reports

DiskBoss allows one to save file classification reports into a number of standard formats including HTML, PDF, Excel, XML, text and CSV. In the simplest case, perform a file classification operation and press the 'Save' button located on the file classification results dialog. On the save report dialog, select an appropriate report format, enter a report file name and press the 'Save' button.
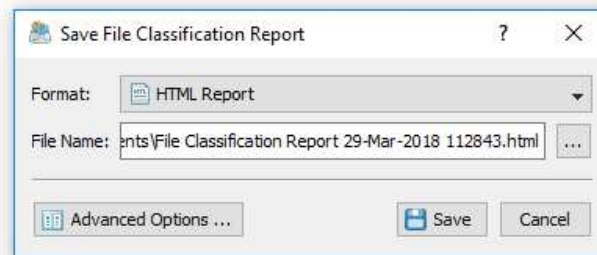
For the HTML, PDF, Excel, text, CSV and XML report formats, the user is provided with the ability to save a short summary report or a longer detailed report, which may be very long for large file systems containing millions of files. By default, DiskBoss will save a short, summary file classification report in the HTML report format, which will include a list of top-level file categories according to the selected file classification plug-in and a list of tables showing the disk space usage and the number of files per file extension, file attribute, user name, etc.

In addition, the user is provided with the ability to save file classification results to the DiskBoss native report format, which preserves all information related to each specific file classification operation and may be loaded at any time just by clicking on a report file in the DiskBoss file navigator.

Sometimes, it may be required to perform additional analysis of file classification results using external tools such as Microsoft Excel. In order to export file classification results to the Excel report format, perform a file classification operation, press the 'Save' button located on the file classification results dialog, select the 'Excel Summary' report format for a short summary report or the 'Excel Report' format for a detailed file classification report.
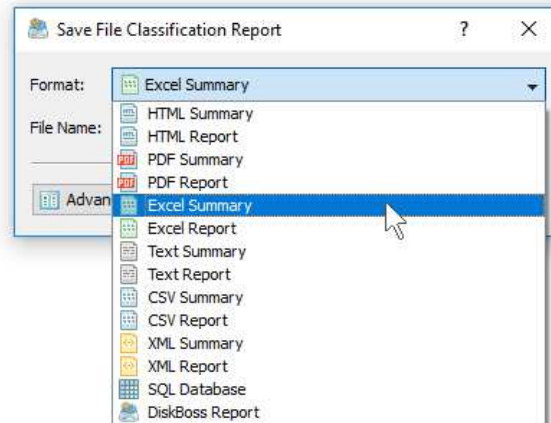
A summary Excel report will include a list of top-level file categories and a number of tables showing the used disk space and the number of files per file extension, file attribute, file creation time, last modification time, user name, etc.
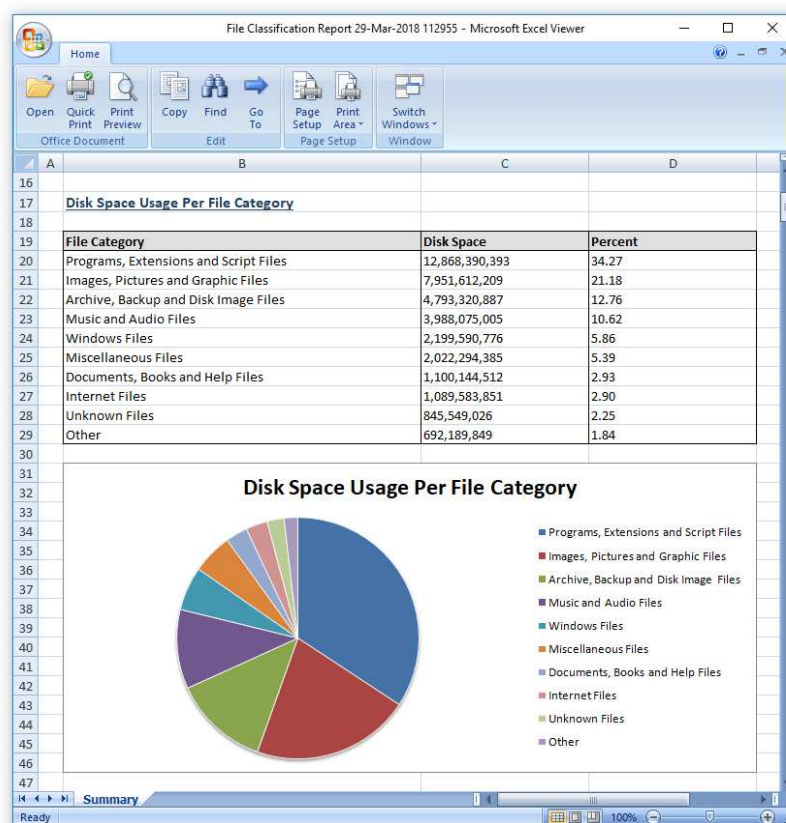
A detailed Excel report will include a list of file categories according to the currently selected file categorization mode and an hierarchy of file groups and file classes sorted by the amount of the used disk space, which may be very long for large file systems containing millions of files. In order to control how many hierarchy levels and how many files per level are exported in the detailed report, press the 'Advanced Options' button located on the 'Save Report' dialog and customize the file classification report according to your specific needs.

One of the most useful ways to export file classification results is to use the PDF summary or the PDF report formats. Both of these report formats include various types of graphical pie charts showing disk space usage and the number of files per file extension, file category, creation time, last modification time, user name, etc. In order to save file classification results to a PDF report file, press the 'Save' button located on the file classification results dialog and select the 'PDF Summary' report format for a short, summary report or the 'PDF Report' format for a detailed file classification report.
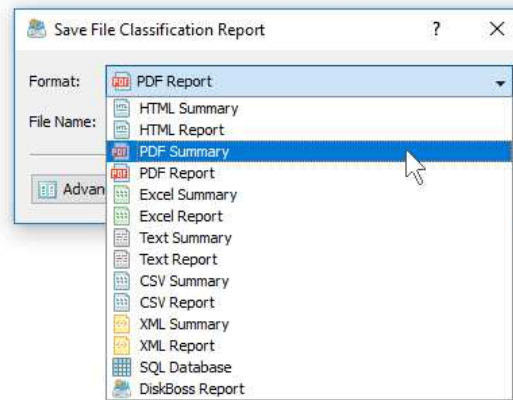
A summary PDF report will include a list of top-level categories of files according to the selected file classification plug-in sorted by the amount of the used disk space followed by a number of pie charts showing the disk space usage and the number of files per file extension, file attribute, file creation time, last modification time, user name, etc. A detailed PDF report will include an hierarchy of file groups and file classes sorted according to the used disk space, which may be very long for large file systems containing millions of files.
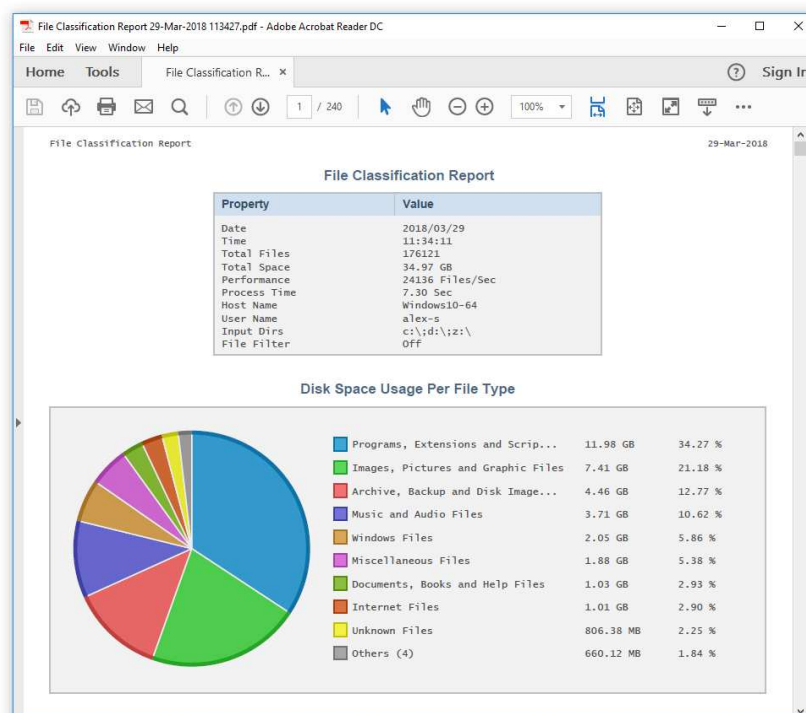
In addition to the hierarchy of file types sorted by the used disk space, detailed PDF reports include pie charts showing the disk space usage per file category and the number of files per file category according to the currently selected file categorization mode. For example, if the second-level file categories mode is set to categorize file classification results by the file extension, the PDF report will display pie charts showing the used disk space and the number of files per file extension.

4.8   Batch File Classification Reports

DiskBoss allows one to save batches of file classification reports according to the currently selected categories of files with each report showing the disk space usage and the number of files for a corresponding category of files. For example, let's assume that we need to save file classification reports for the last 10 years with each report showing categories of files and the disk space usage for all files that were created during each year.

In order to generate such reports, set the file categorization mode to 'Categorize By Creation Year', select all years for which you need to generate analysis reports in the file categories view, press the right mouse button and select the 'Export Reports' menu item. On the 'Export Reports' dialog, select an appropriate report format and report mode, specify a destination directory to export reports to and press the 'Save' button.

For each selected year, DiskBoss will filter file classification results by the file creation year and save an individual file classification report in the specified destination directory with each report file name and report title containing the file creation year.

In the same way, the user can generate batches of analysis reports showing categories of files and the disk space usage per user, last modification date, last access date, file attributes, file size, top directory or user-custom categories pre-configured using flexible file matching rules.

For example, in order to export individual file classification reports for all users, set the file categorization mode to 'Categorize By User Name', select all the required users, press the right mouse button and select the 'Export Reports' menu item. Now, the destination directory will contain a series of file classification reports with each report showing categories of files and the disk space usage per user.

The batch reports dialog provides the ability to export reports to a number of standard report formats including: HTML, PDF, Excel, text, CSV and XML. Depending on the selected report format and report mode, each report will include a summary table showing statistics about the report, a table showing categories of files sorted by the amount of used disk space and lists of files for each category sorted by the file size.
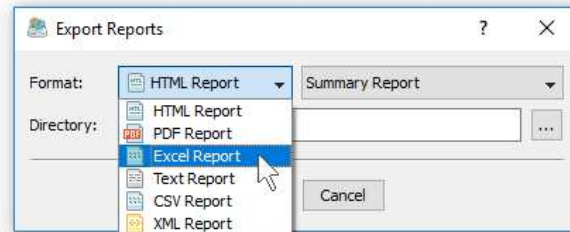
In addition, the batch reports dialog allows one to select one of the following report modes: summary report, compact report or full report. When the summary report mode is selected, each report will include a summary table and lists of file categories sorted by the amount of used disk space. When the compact report mode is selected, each report will include a summary table, lists of file categories and lists of top 100 files per file category. When the full report mode is selected, each report will include a summary table, lists of file categories and full lists of files per category sorted by the file size.
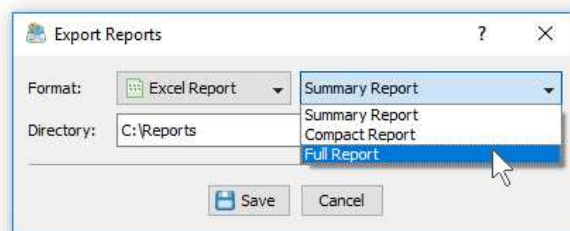
Once the export operation will be completed, the specified destination directory will contain a number of file classification reports according to the selected file categorization mode, selected categories of files and the selected report format.
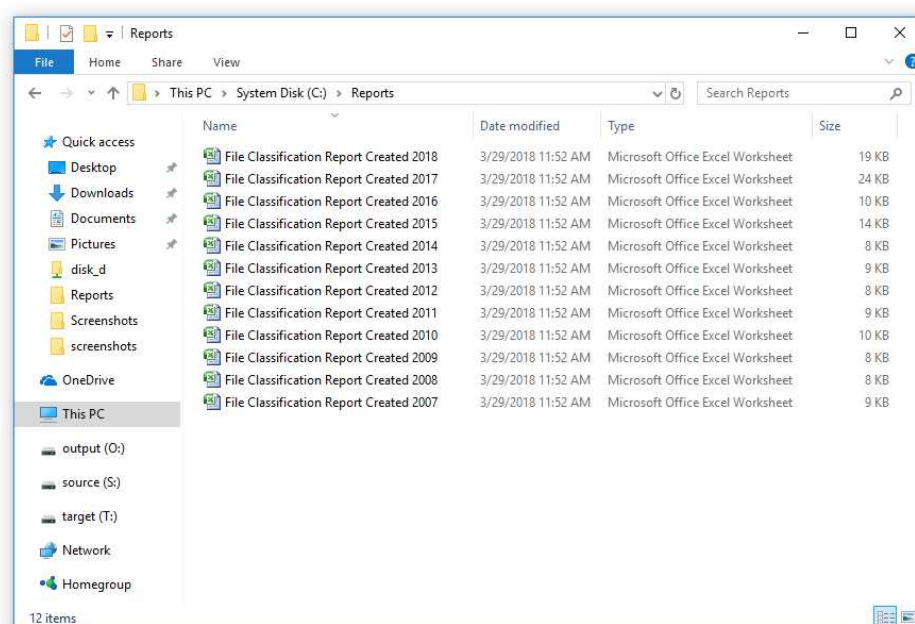
4.9   Exporting Reports to an SQL Database

IT professionals and storage administrators are provided with the ability to submit file classification reports from multiple servers and desktop computers to a centralized SQL database. A long-term history of file classification reports allows one to gain an in-depth visibility into disk usage trends across the entire enterprise. In order to submit a file classification report to an SQL database, select the 'SQL Database' report format and press the 'Save' button.
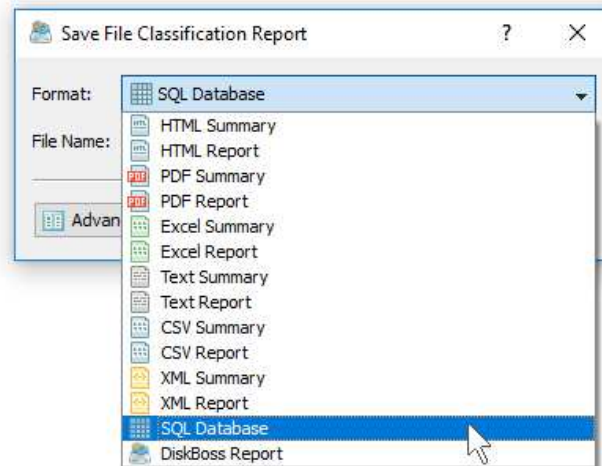
Before exporting reports to an SQL database, open the 'Options' dialog, enable the ODBC interface and specify the name of the data source, database user name and password to use to connect to the database.
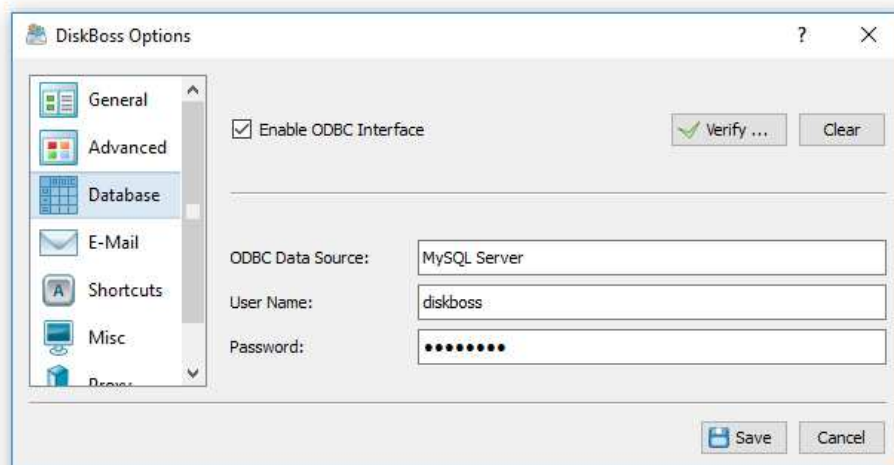
For each report in the database, DiskBoss displays the report date and time, the host name, the input directories, the total number of files and disk space and the report title. To open a previously saved report, just click on the report item in the database reports dialog.

4.10 Classifying Files in Network Servers and NAS Storage Devices

DiskBoss allows one to scan the network, discover network servers and NAS storage devices, automatically detect all accessible network shares and classify files in hundreds of network servers and NAS storage devices. In addition, the user is provided with the ability to export the list of detected servers and NAS storage devices (including lists of network shares for each server) into HTML, PDF, text and Excel CSV reports.
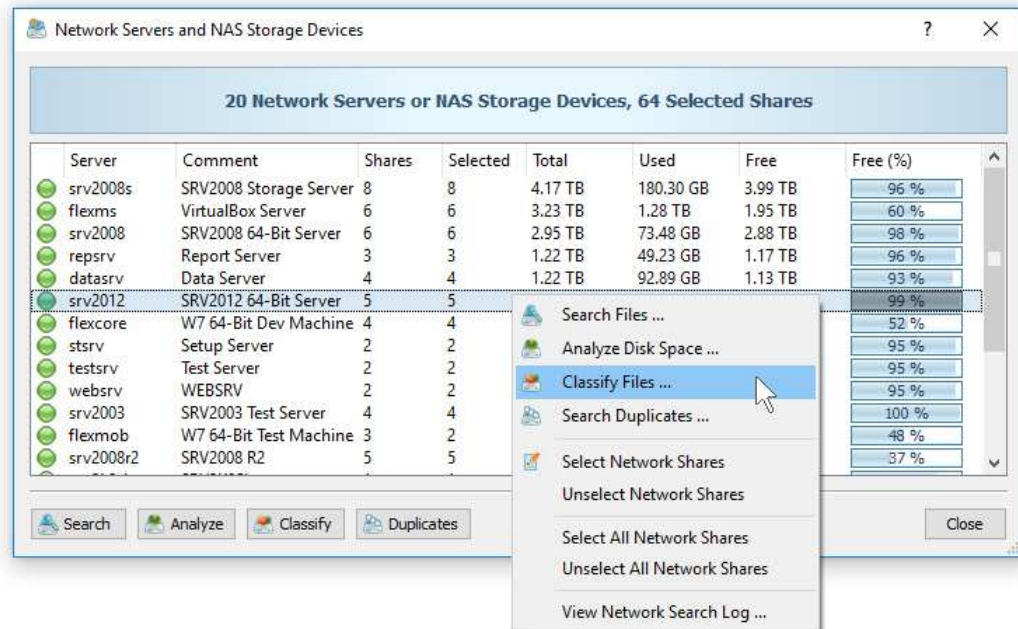
In order to discover all network servers and NAS storage devices on the network, press the 'Network' button located on the main toolbar and wait while DiskBoss will scan the network and show a list of detected network servers and NAS storage devices. In order to classify files in one or more servers or NAS storage devices, select the required servers and NAS storage devices and press the 'Classify' button.
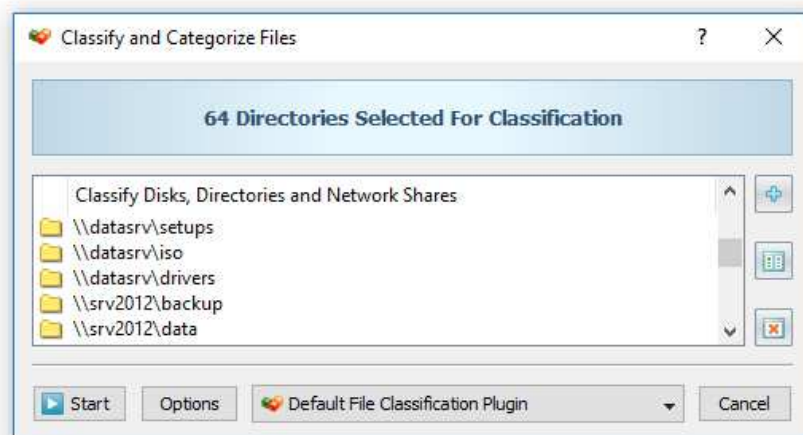
DiskBoss will show all accessible network shares hosted on the selected servers and NAS storage devices allowing one to classify files and save various types of file classification pie charts and reports. In addition, the user is provided with the ability to customize a large number of advanced file classification options allowing one to tune file classification operations for user specific needs and hardware configurations.

4.11   Batch File Classification Operations

DiskBoss Server and DiskBoss Enterprise provide the ability to execute one or more pre-configured file classification operations on all network servers and NAS storage devices on the network and generate an individual file classification report for each server and NAS storage device. In order to be able to use batch file classification operations, the user needs to pre-configure one or more file classification commands customized to generate file classification reports according to user-specific needs and requirements.
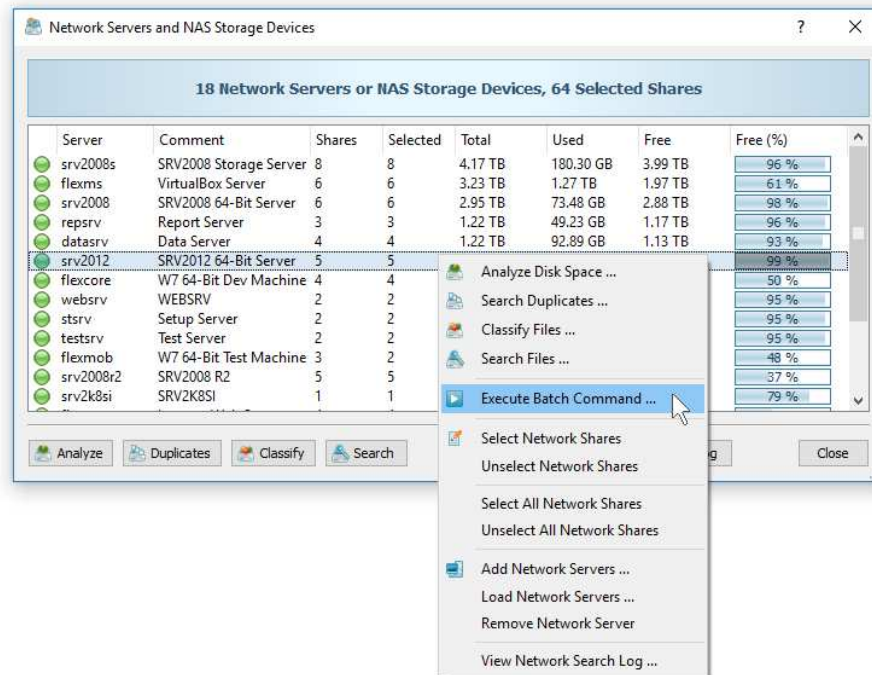
In order to start a batch file classification operation, press the 'Network' button located on the main toolbar, search all servers and NAS storage devices on the network, select one or more servers and NAS storage devices, press the right mouse button and select the 'Execute Batch Command' menu item.
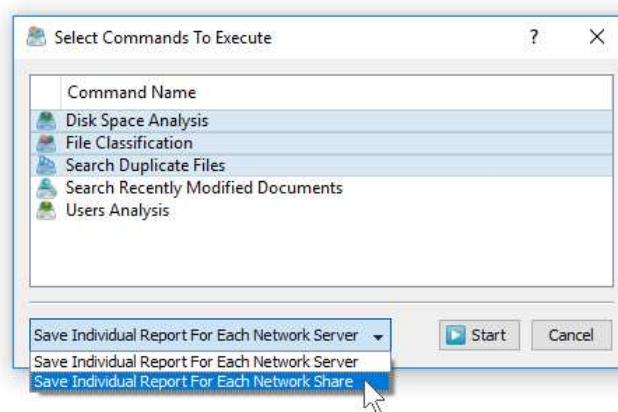
DiskBoss will display a list of pre-configured file classification commands allowing one to select one or more commands to be executed on all selected servers and NAS storage devices. In addition, the user is provided with the ability to select how to save file classification reports - for each server or for each network share. By default, all file classification reports will be saved in the DiskBoss internal reports database allowing one to open each report, review results, generate various types of pie charts and export reports into a number of standard formats including HTML, PDF, Excel, text, CSV and XML.

4.12   Classifying Specific File Types and File Groups

On of the most powerful capabilities of DiskBoss is the integration between file search and file classification capabilities allowing one to classify files matching one or more user-specified rules. For example, the user is provided with the ability to classify files with the file size greater than X MB that were last modified more than Y months ago or any other combination of user-specific file matching rules.
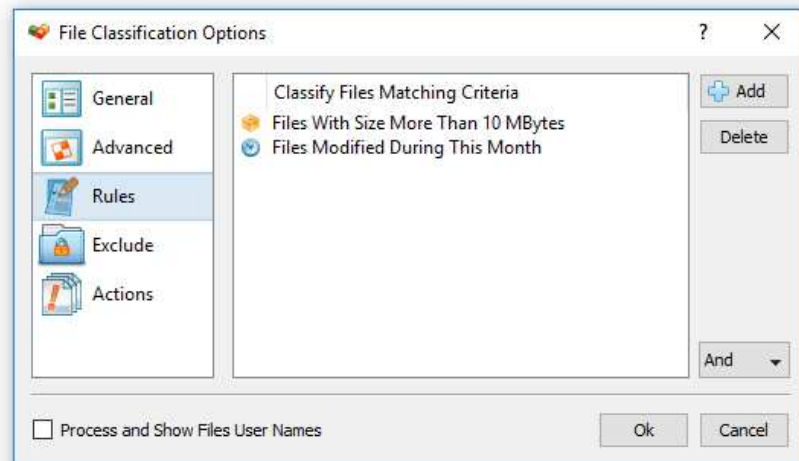
In order to add one or more file matching rules to a file classification operation, open the file classification options dialog, select the 'Rules' tab and press the 'Add' button. Once finished adding file matching rules, select an appropriate rules logic mode (AND/OR) and press the 'Ok' button. During the file classification process, DiskBoss will first evaluate all existing files using the specified file matching rules and classify matching files only. Files not matching the specified rules will be just skipped from the file classification process and not displayed in the file classification results dialog making it very easy to focus on files the user is looking for.
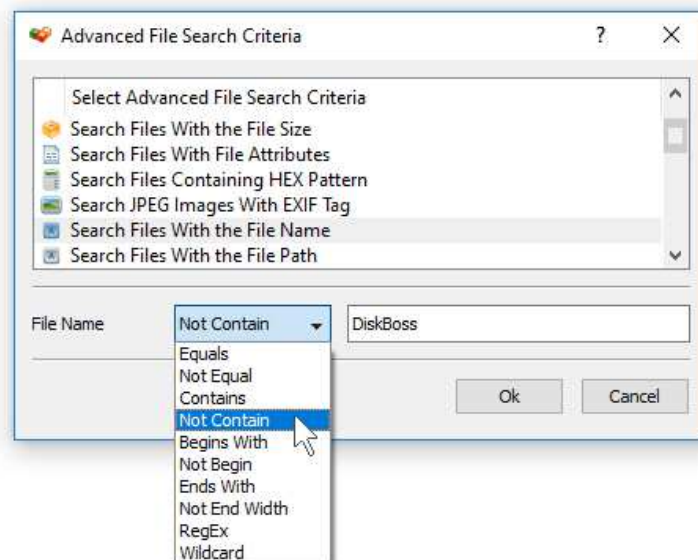
Another option is to exclude specific types of groups of files from the file classification process using one or more negative file matching rules. For example, in order to exclude files with a specific text pattern in the file name, add a file name file matching rule, select the 'Not Contain' rule operator and enter a text pattern to search for.

4.13 Excluding Subdirectories from File Classification Process

Sometimes, it may be required to exclude one or more subdirectories from the file classification process. For example, if you need to classify files in a disk excluding one or two special directories, you may specify the whole disk as an input directory and add the directories that should be skipped to the exclude list.
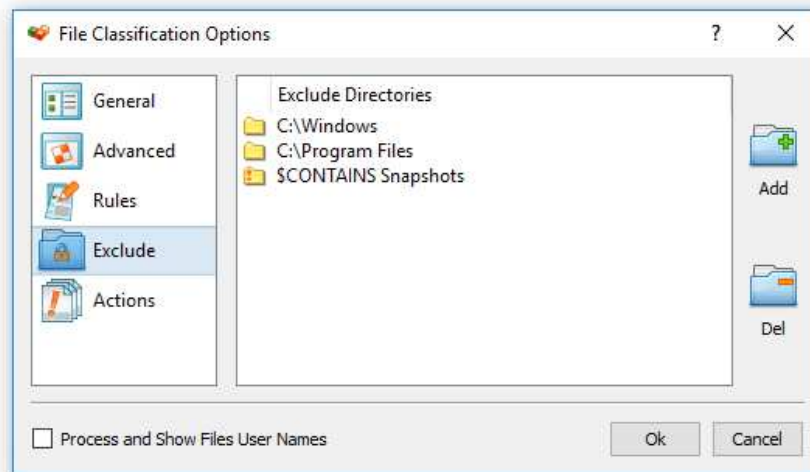
In order to add one or more directories to the exclude list, open the file classification command dialog, press the 'Options' button, select the 'Exclude' tab and press the 'Add' button. All files and subdirectories located in the specified exclude directory will be excluded from the file classification process. In addition, advanced users are provided with a number of exclude directories macro commands allowing one to exclude multiple directories using a single macro command.

DiskBoss provides the following exclude directories macro commands:

- **$BEGINS <Text String>** - this macro command excludes all directories beginning with the specified text string.
- **$CONTAINS <Text String>** - this macro command excludes all directories containing the specified text string.
- **$ENDS <Text String>** - this macro command excludes all directories ending with the specified text string.
- **$REGEX <Regular Expression>** - this macro command excludes directories matching the specified regular expression.
- **$DIRLIST <File Name>** - this macro command excludes all directories listed in the user-specified text file.
- **$FILELIST <File Name>** - this macro command excludes all files listed in the user-specified text file.

For example, the exclude macro command '$CONTAINS Temporary Files' will exclude all directories with 'Temporary Files' in the full directory path and the exclude macro command '$REGEX \.(TMP|TEMP)$' will exclude directories ending with '.TMP' or '.TEMP'.

4.14 Automatic File Organizing Operations

One of the most powerful capabilities of the DiskBoss file classification engine is the ability to physically organize files on the disk according to the selected file classification plug-in. File organizing may be performed manually on file classification results displayed in the file classification results dialog or automatically by selecting an automatic file organizing mode in the file classification options dialog.
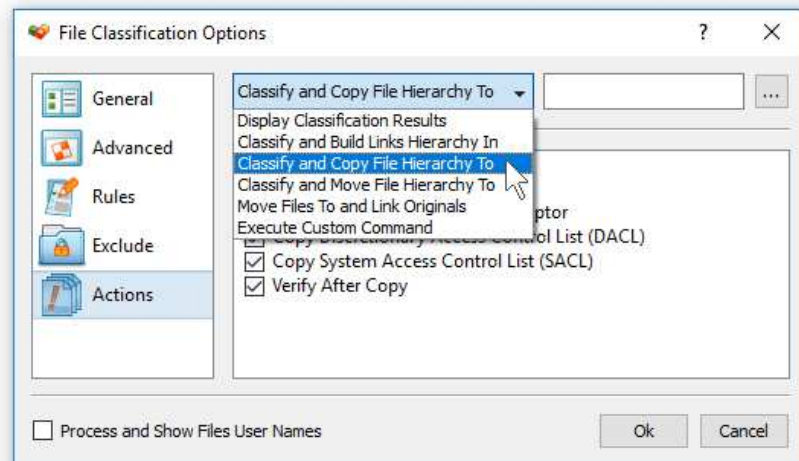
DiskBoss provides the user with the following advanced file organizing operations that may be performed on file classification results:

- **Build Hierarchy of Links** – in this mode DiskBoss will construct an organized hierarchy of directories and populate it with links to original files according to the selected file classification plug-in.
- **Copy File Hierarchy** – in this mode DiskBoss will construct an organized hierarchy of directories and populate it with copies of original files according to the selected file classification plug-in.
- **Move File Hierarchy** – in this mode DiskBoss will construct an organized hierarchy of directories and move all files into that hierarchy according to the selected file classification plug-in.
- **Move Files and Link Originals** – in this mode DiskBoss will construct an organized hierarchy of directories, move all files to that hierarchy according to the selected file classification plug-in and create links instead of original files pointing to files located in the organized file hierarchy.
- **Execute Custom Command** – in this mode DiskBoss will execute a custom command for each file passing the name of the file and the full file category as command line arguments allowing one to implement custom file organizing solutions.

By default, file classification results are displayed in the results dialog and the user is provided with the ability to perform these operations manually by selecting one or more file categories or classes in the file classification results dialog.

In addition, power computer users and IT professionals are provided with the ability to physically reorganize files on the disk by using one of the mentioned automatic file organizing modes. In an automatic file classification mode, DiskBoss will physically reorganize files on the disk according to the selected file classification plug-in without showing the file classification results dialog.

Automatic file classification modes are especially useful in conjunction with the DiskBoss command line utility allowing one to perform automatic file classification operations from shell scripts and batch files and integrate file classification capabilities in other products and solutions. Finally, DiskBoss provides the user with the ability to design custom file classification plugins using an open and easy-to-use XML-Based format making it possible to reorganize files into custom directory structures designed according to user-specific needs.

4.15   File Classification Plugins

By default, DiskBoss classifies and categorizes files using the 'Default File Classification Plug-in', which is capable of recognizing more than 3,000 of the standard file types and formats and allows one to organize them into a logical file hierarchy. In addition, a number of advanced file classification plug-ins are available for registered users of DiskBoss Ultimate and DiskBoss Server.
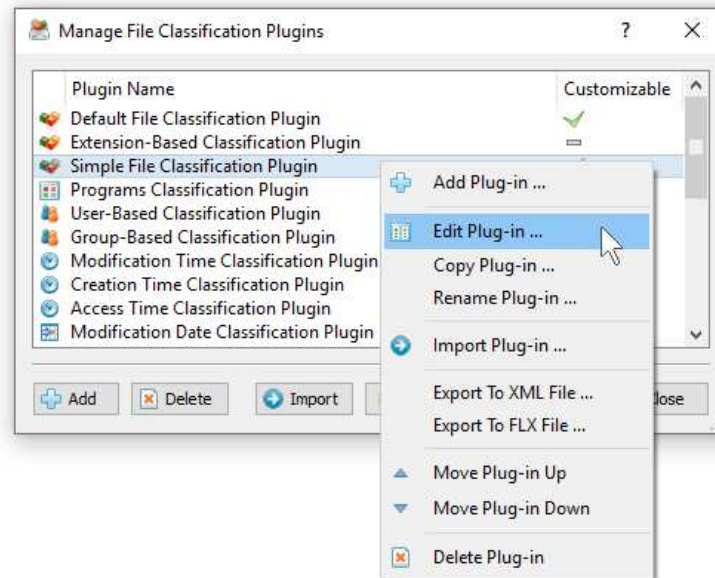
Finally, DiskBoss Ultimate provides the ability to add user-custom file classification plugins and customize the built-in file classification plug-ins allowing one to classify and categorize files according to the user-specific needs and requirements. In order to add a custom file classification plug-in, select the menu 'Tools - Manage Plugins', press the 'Add' button, specify a unique file classification plug-in name and then use the file classification plug-in designer dialog to create your custom file categories and file classes.
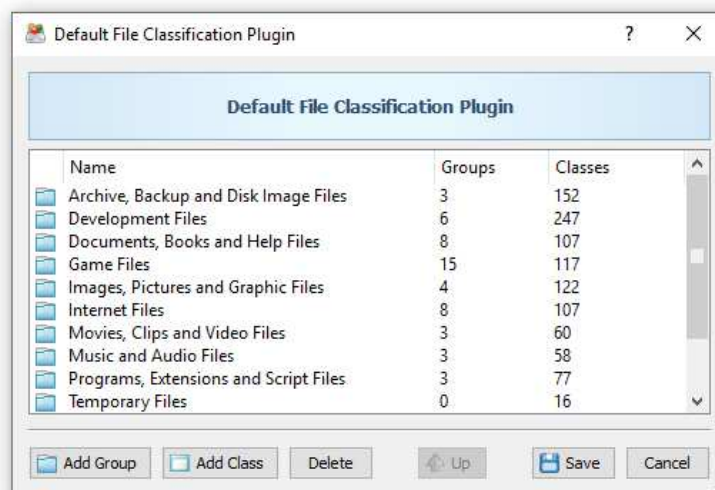
Another option is to customize a built-in file classification plug-in by adding support for one or more additional file type or file categories. In order to customize a built-in file classification plug-in, select the menu 'Tools - Manage Plugins', select the required file classification plug-in item, click the right mouse button and select the 'Copy Plug-in' menu, specify a new plug-in name and then double click on the newly copied plug-in item to open the plug-in copy in the file classification plug-ins designer dialog.

4.16   Analyzing File Categories Per Host

DiskBoss Server and DiskBoss Enterprise provide the ability to automatically detect all servers and NAS storage devices on the network, classify files in hundreds of servers and/or NAS storage devices via the network, submit reports to the reports database and display charts showing the disk space usage per server or NAS storage device across the entire enterprise.

In order to analyze disk space usage per server, perform one or more file classification operations on multiple servers and/or NAS storage devices, open the 'Reports' dialog, press the 'Analyze' button and select the 'Analyze Disk Space Usage Per Host' menu item. DiskBoss will analyze all reports saved in the reports database and display the hosts analysis dialog showing the disk space usage per host.

The hosts analysis dialog provides the ability to display pie charts and bars charts showing the disk space usage per server or NAS storage device according to file classification reports saved in the reports database. The user is provided with the ability to select the types of file classification operations and file system locations to analyze, edit the chart header and footer, copy the chart image to the clipboard and export graphical PDF reports including pie charts.

4.17   Analyzing File Categories Per User

DiskBoss Server and DiskBoss Enterprise provide the ability to automatically detect all servers and NAS storage devices on the network, classify files in hundreds of servers and/or NAS storage devices via the network, submit file classification reports to the reports database and display charts showing the used disk space per user across the entire enterprise.

In order to analyze disk space usage per user, perform one or more file classification operations on multiple servers and/or NAS storage devices, open the 'Reports' dialog, press the 'Analyze' button and select the 'Analyze Disk Space Usage Per User' menu item. DiskBoss will analyze all reports saved in the reports database and display the users analysis dialog showing the disk space usage per user.

The users analysis dialog provides the ability to display pie charts and bars charts showing the disk space usage per user according to file classification reports saved in the reports database. The user is provided with the ability to select the types of file classification operations and file system locations to analyze, edit the chart header and footer, copy the chart image to the clipboard and export graphical PDF reports including pie charts.

IMPORTANT: In order to be able to display the disk space usage per user, the file classification operation should be configured to process and display files user names.

4.18   Advanced File Classification Options

DiskBoss provides a large number of advanced file classification options allowing one to customize and configure file classification operations for user-specific needs and custom hardware and storage configurations.
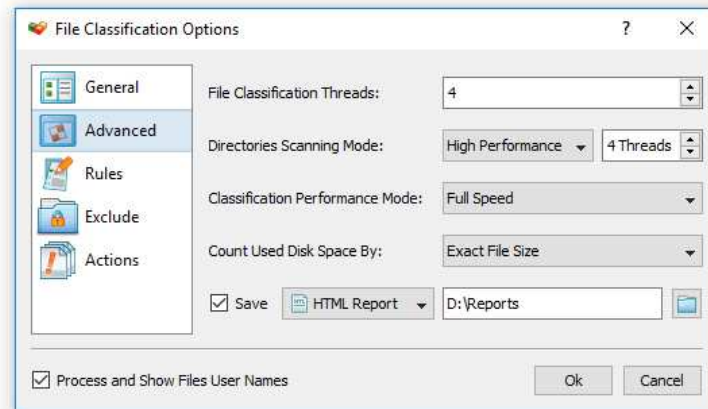
The file classification options dialog allows one to control the file scanning mode, the default report title, advanced reporting options, the default file scanning filter and enable/disable automatic report generation. In addition, the user is provided with the ability to classify specific file types, control performance tuning options, exclude specific directories from the file classification process and physically reorganize files on the disk.

4.19   Pre-Configured File Classification Commands

One of the most powerful and flexible capabilities of DiskBoss is the ability to pre-configure custom file classification operations as user-defined commands and execute such commands in a single mouse click using the DiskBoss GUI application or direct desktop shortcuts.
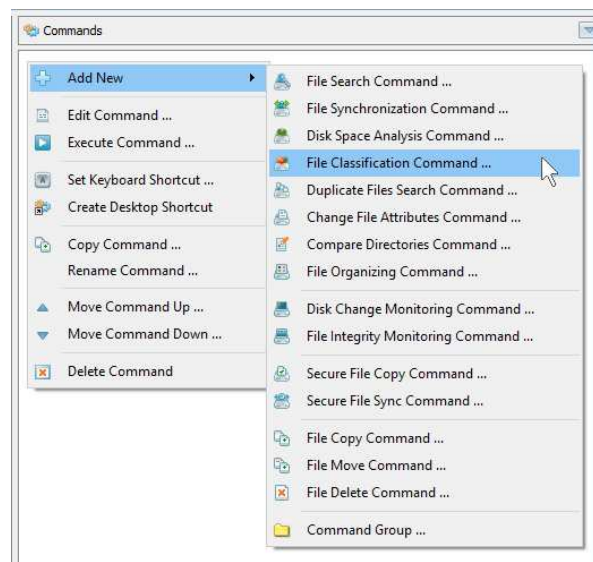
User-defined commands may be managed and executed through the commands dialog or the commands tool pane. In order to add a new command through the commands pane, press the right mouse button over the pane and select the 'Add New - File Classification Command' menu item. In order to execute a previously saved command, just click on the command item in the commands tool pane or create a direct desktop shortcut on the Windows desktop.

4.20   Classifying Files Using the DiskBoss Command Line Utility

In addition to the GUI application, DiskBoss Ultimate provides a command line utility capable of performing file classification operations and executing user-defined file classification commands from shell scripts and batch files. The DiskBoss command line tool is located in the '<ProductDir>/bin' directory.

Command Line Syntax:

diskboss -classify -dir <Input Directory 1> [... <Input Directory X> <Options>]

This command classifies files in the specified disks, directories or network shares.

diskboss -classify -server <Host Name 1> [... <Host Name X> <Options>]

This command classifies files in all network shares in the specified servers.

diskboss -classify -network [Options]

This command classifies files in all network shares in all servers on the network.

diskboss -execute <User-Defined File Classification Command>

This command executes the specified user-defined file classification command.

Parameters:

-dir <Input Directory 1> [... <Input Directory X>]

This parameter specifies the list of input disks or directories to classify. In order to ensure proper parsing of input directories, directories containing space characters should be double quoted. By default, DiskBoss will generate a combined file classification report showing information about all processed disks, directories and network shares. In order to generate an individual report for each input directory, use the '**-batch**' command line option to enable the batch report generation mode.

-server <Host Name 1> [... <Host Name X>]

This parameter specifies the list of host names or IP addresses of servers or NAS storage devices that should be classified. DiskBoss will enumerate all network shares accessible in the specified servers or NAS storage devices, perform file classification and generate reports if required. By default, DiskBoss will generate a combined file classification report showing information about all processed network shares. In order to generate an individual report for each network share, use the '**-batch**' command line option to enable the batch report generation mode.

-network

In the network-wide file classification mode, DiskBoss will discover servers and NAS storage devices accessible on the network, enumerate all network shares available in all detected servers and NAS storage devices, perform file classification and generate reports if required. By default, DiskBoss will generate a combined file classification report showing information about all processed network shares. In order to generate an individual report for each network share, use the '**-batch**' command line option to enable the batch report generation mode.

Options:

–save_html_report [ReportFileName]

This option saves file classification results to an HTML report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_[date]_[time].html and save a report file in the user's home directory.

-save_csv_report [ReportFileName]

This option saves file classification results to a CSV report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_[date]_[time].csv and save a report file in the user's home directory.

-save_text_report [ReportFileName]

This option saves file classification results to a text report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_[date]_[time].txt and save a report file in the user's home directory.

-save_pdf_report [ReportFileName]

This option saves file classification results to a PDF report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_[date]_[time].pdf and save a report file in the user's home directory.

-save_xml_report [ReportFileName]

This option saves file classification results to an XML report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_[date]_[time].xml and save a report file in the user's home directory.

-exclude_dir <Exclude Directory 1> [... <Exclude Directory X>]

This option specifies the list of directories that should be excluded from the file classification operation. In order to ensure proper parsing of command line arguments, directories containing space characters should be double quoted.

-workers <Number of Processing Threads>

This parameter sets the number of working threads to process files. DiskBoss is optimized for Multi-Core and Multi-CPU computers and capable of distributing the workload to an unlimited number of CPUs. By default, DiskBoss processes files with one working thread.

-batch

Enables the batch report generation mode. In the batch report generation mode DiskBoss saves an individual report file for each input disk, directory or network share.

-v

This command shows the product's major version, minor version, revision and build date.

-help

This command shows the command line usage information.

4.21   File Classification Performance

DiskBoss is optimized for modern multi-core and multi-CPU systems and is capable of classifying files stored on multiple disks, directories or network shares in parallel using all CPUs installed in the computer. DiskBoss provides a number of different performance optimization options allowing one to tune the file classification operations for user-specific hardware and storage configurations.
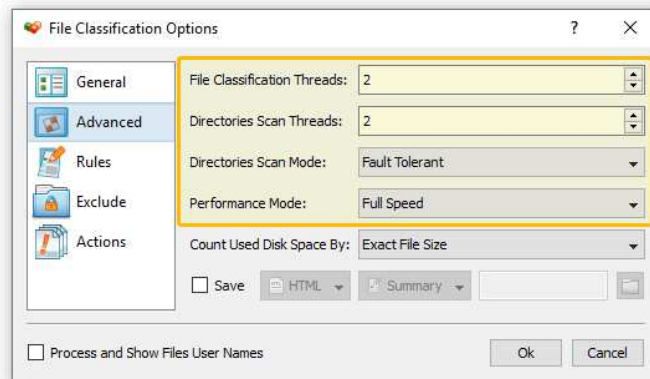
In order to customize the file classification performance optimization options, open the file classification operation dialog, press the 'Options' button and select the 'Advanced' tab. The 'File Classification Threads' option controls how many parallel threads are used to classify files. The 'Directories Scanning Threads' option controls how many parallel threads are used to scan input disks, directories and network shares. In the 'Fault-Tolerant' directory scanning mode, DiskBoss uses an individual processing thread for each input disk, directory or network share, but limits the maximum number of parallel scanning threads to the specified value. In the high-performance directory scanning mode, DiskBoss always uses the specified number of parallel directory scanning threads even when processing a single input disk, directory or network share.
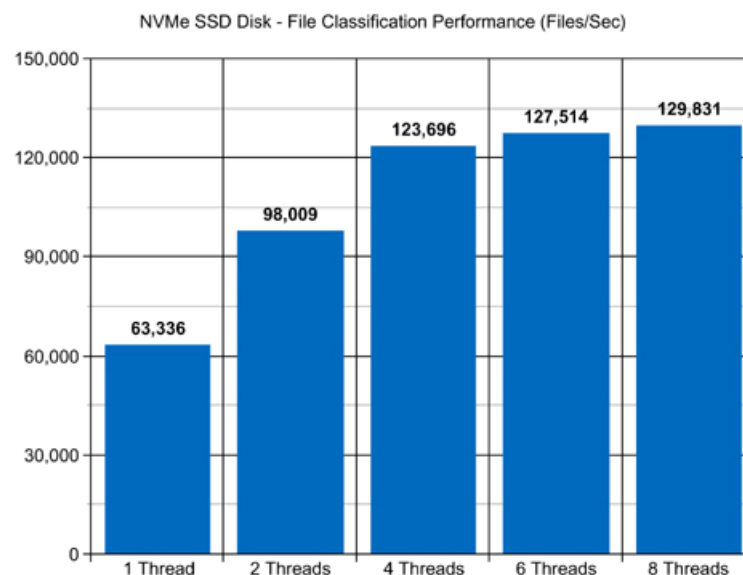
For example, when classifying files stored on a high-speed NVMe SSD disk, DiskBoss reaches up to 63,000 files/sec using a single file classification thread. With two parallel file classification threads, the performance scales up to 98,000 files/sec and with four parallel file classification threads, the performance increases up to 123,000 files/sec showing a very good multi-threaded performance scalability. With six processing threads the file classification performance reaches up to 127,000 files/sec and with eight processing threads the performance increases up to 129,000 files/sec, which makes it possible to classify and categorize 10 millions files within two minutes.

When classifying files stored on regular SATA SSD drives, which are significantly slower than NVMe SSD drives, the performance of the file classification process reaches up to 24,000 files/sec using a single file classification thread and scales up to 69,000 files/sec with four parallel file classification threads. With eight parallel file classification threads, the performance reaches up to 98,000 files/sec, which allows to classify and categorize huge numbers of files relatively fast.

SATA SSD - File Classification Performance (Files/Sec)

Threads	Files/Sec
1 Thread	24,379
2 Threads	42,690
4 Threads	69,937
6 Threads	87,056
8 Threads	98,030
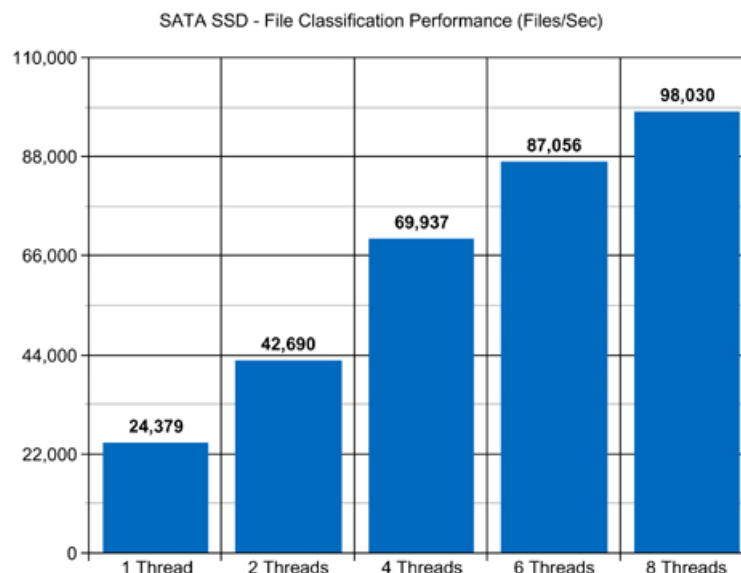
Classifying files stored on a NAS storage device via a network is more complicated because the user needs to take into account the speed and the latency of the network. If the computer, on which DiskBoss is installed, is connected to the NAS storage device via a high-speed, low-latency network, the performance of the file classification operations may reach up to 12,000 files/sec with one file classification thread, scale up to 49,000 files/sec with four parallel file classification threads and increase up to 82,000 files/sec with eight parallel file classification threads.
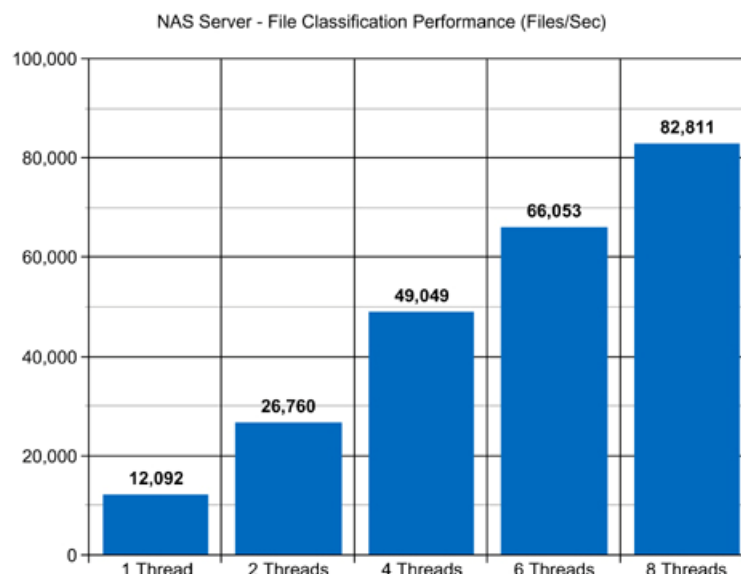
NAS Server - File Classification Performance (Files/Sec)

Threads	Files/Sec
1 Thread	12,092
2 Threads	26,760
4 Threads	49,049
6 Threads	66,053
8 Threads	82,811

On the other hand, if DiskBoss will need to access network shares via the Internet or via a long-distance, high-latency network, the performance of the file classification operations will be relatively slow. One of the options to increase the performance of the file classification operations in such configurations is to set the 'High-Performance' directory scanning mode and increase the number of parallel directory scanning threads to 16 or even 32 disregarding how many CPUs are actually installed on the computer.

Modern USB flash drives provide plenty of the storage space and are reasonably fast allowing one to store vast amounts of data for backup purposes. Sometimes, it may be required to classify and categorize files on a USB flash drive in order to free the used disk space. When classifying files stored on a USB flash drive, DiskBoss can reach up to 15,000 files/sec with a single file classification thread. With two parallel file classification threads, the performance increases up to 18,000 files/sec, which is good, but more than two file classification threads will slightly degrade the performance of the file classification operations.
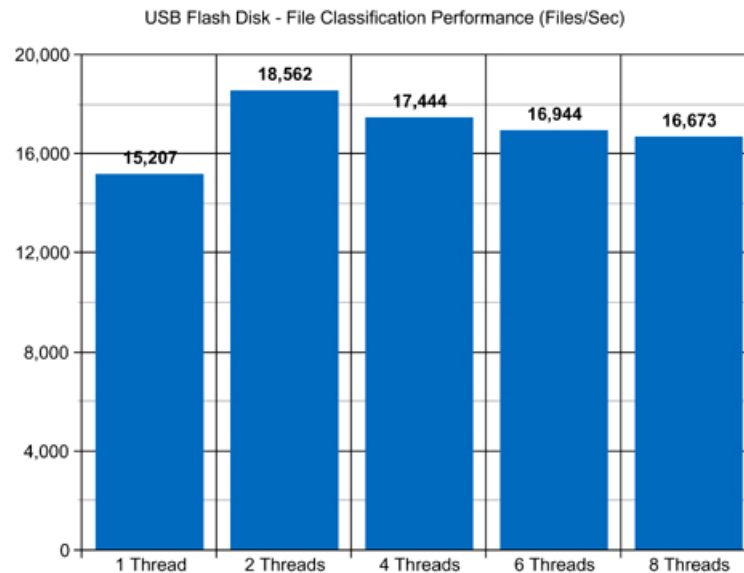
USB Flash Disk - File Classification Performance (Files/Sec)

15,207	18,562	17,444	16,944	16,673
1 Thread	2 Threads	4 Threads	6 Threads	8 Threads

Today, modern IT environments widely deploy virtual servers and/or virtual workstations. Most of the popular virtualization platforms provide a high level of performance, but anyway some performance degradations are inevitable when a file classification operation is executed on a guest virtual machine compared to the same file classification operation executed directly on the host computer.

Virtual Machine - File Classification Performance (Files/Sec)

25,501	37,716	48,430	50,525	51,369
1 Thread	2 Threads	4 Threads	6 Threads	8 Threads
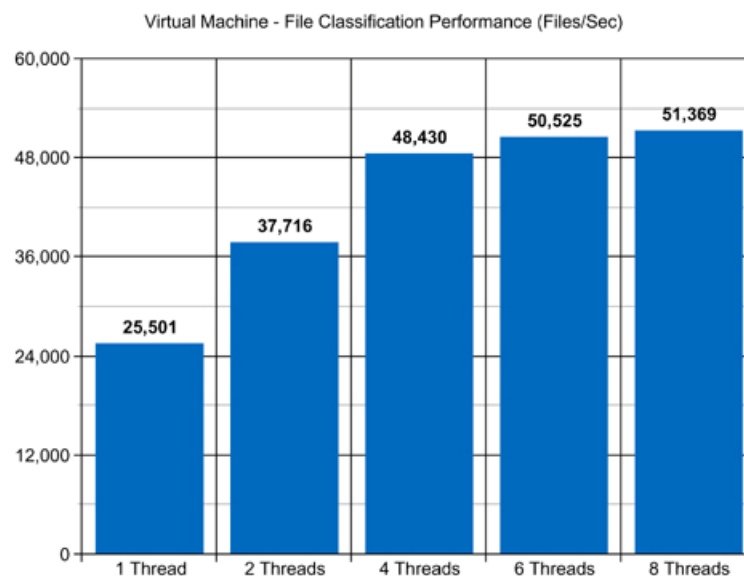
For example, when a virtual machine with 4 virtual CPUs is stored on an NVMe SSD disk and classifying files stored on a virtual local disk drive, which is physically stored on the same NVMe SSD disk, the performance of the file classification operations reaches up to 25,000 files/sec using a single file classification thread. With two parallel file classification threads, the performance of the file classification operations scales up to 37,000 files/sec and with four parallel file classification threads, the performance of the file classification operations increases up to 48,000 files allowing one to classify and categorize huge numbers of files relatively fast.

5   Duplicate Files Finder

5.1   Searching Duplicate Files in a Disk or Directory

DiskBoss includes a built-in duplicate files finder allowing one to search duplicate files, generate various types of charts showing duplicate disk space, remove duplicate files and save reports into a number of different formats. In order to search duplicate files in one or more disks or directories, select the required directories in the DiskBoss file navigator and press the 'Duplicates' button located on the main toolbar. DiskBoss will scan the selected disks and directories and display a dialog showing the list of detected duplicate files.
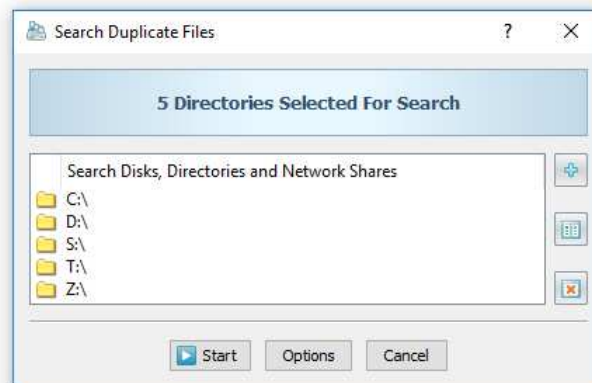
For each duplicate file set, DiskBoss shows the name of the original file, the number of duplicate files in the set, the size of each file in the set, the amount of wasted disk space and the currently selected duplicates removal action. In order to see all duplicate files related to a set, click on the set item in the set list.
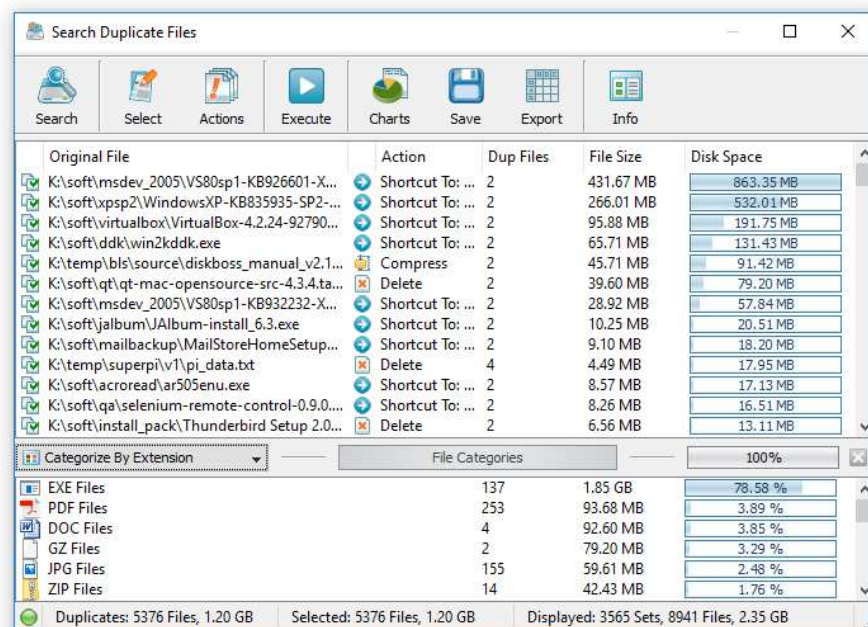
The duplicate set dialog shows all duplicate files related to the set and allows one to select the original file, the duplicate files and the duplicates removal action. In order to select a file as the original, select the file item, press the right mouse button and select the 'Set as Original File' menu item. In order to see more information about a file, just click on the file item in the file list. Once finished selecting the duplicate files, use the removal actions combo box located in the bottom-left corner of the dialog to select an appropriate duplicates removal action.

5.2   File Categories and File Filters

The DiskBoss duplicate files finder allows one to categorize and filter duplicate files by the file type, extension, category, size, user name, etc. In order to change the current duplicate files categorization mode, click on the file categories combo box located in the top-left corner of the categories view.
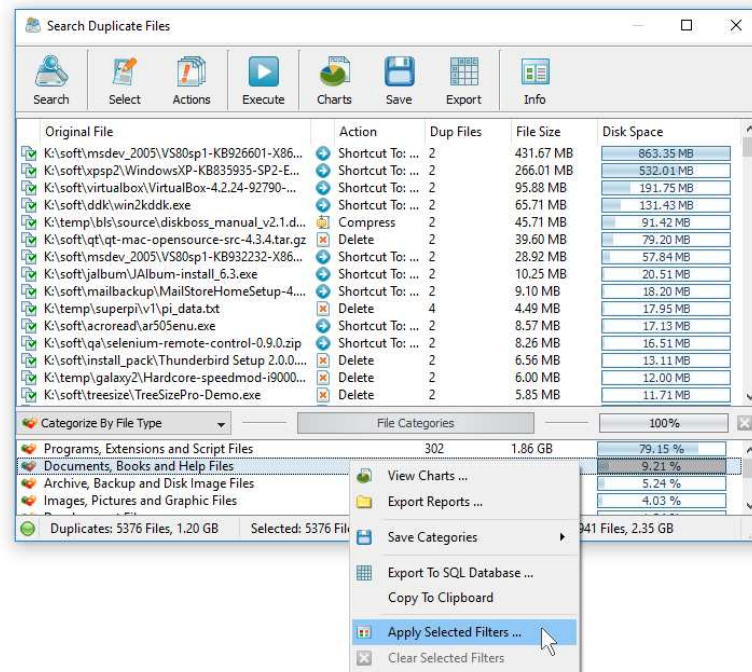
The user is provided with the ability to apply multiple file filters, display specific types of duplicate files and apply duplicate files removal actions to or export reports showing filtered duplicate files only. In order to set one or more file filters, select an appropriate type of file categories in the categories combo box, select one or more file filters in the filters view, press the right mouse button and select the 'Apply Selected Filters' menu item.
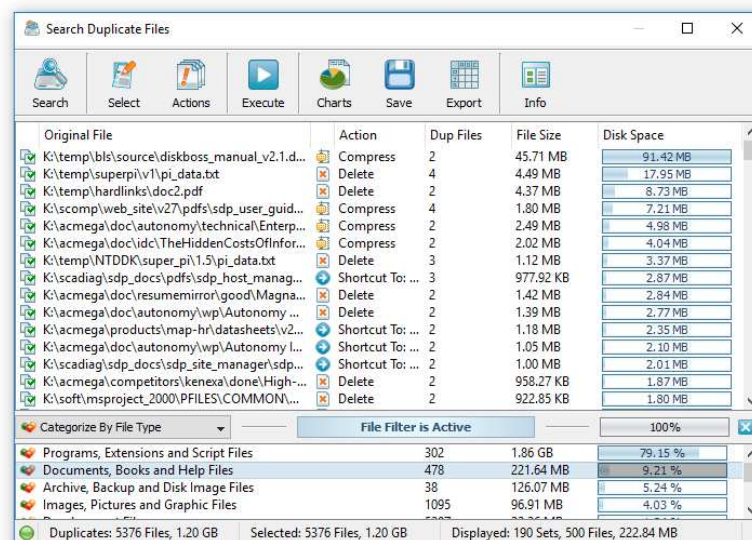
With active file filters, DiskBoss shows duplicate files matching the selected filters, exports reports showing matching files only and significantly simplifies selection of duplicates removal actions for specific file types or file categories. In order to clear the selected file filters, just press the 'Clear' button located on the right side of the categories selector.

In addition to the built-in file filters, DiskBoss provides the ability to pre-configure one or more custom file filters according to user-specific needs and requirements and then categorize and filter the duplicate files search results using to the user-custom file filters. In order to add a custom file filter, select the custom file filters view, press the right mouse button over the filters view and select the 'Edit Custom Rules' menu item.

In order to add a new custom file filter, press the 'Add' button, enter a unique filter name and configure one or more file matching rules specifying which types or groups of files to display. In order to edit a custom file filter, select the filter in the custom file filters dialog and press the 'Edit' button.

Once finished configuring custom file filters, close the filters dialog and DiskBoss will categorize the currently displayed duplicate files search results and show the list of user-specified custom file filters sorted by the amount of data and the number of files matching the specified file filters. In order to filter the currently displayed duplicate files search results by one or more custom file filters, select the required custom file filters in the filters view, press the right mouse button and select the 'Apply Selected Filters' menu item. DiskBoss will filter the duplicate files search results according to the selected custom file filters and display the amount of data and the number of files matching the selected file filters.

5.3   Duplicate Files Statistics and Pie Charts

The DiskBoss duplicate files finder provides multiple types of statistical pie charts and timeline charts capable of showing the amount of duplicate disk space and the number of duplicate files per directory, file extension, file type, file size, file owner, creation, modification and last access time. In order to open the charts dialog, press the 'Charts' button located on the duplicate files search results dialog and select an appropriate chart type.
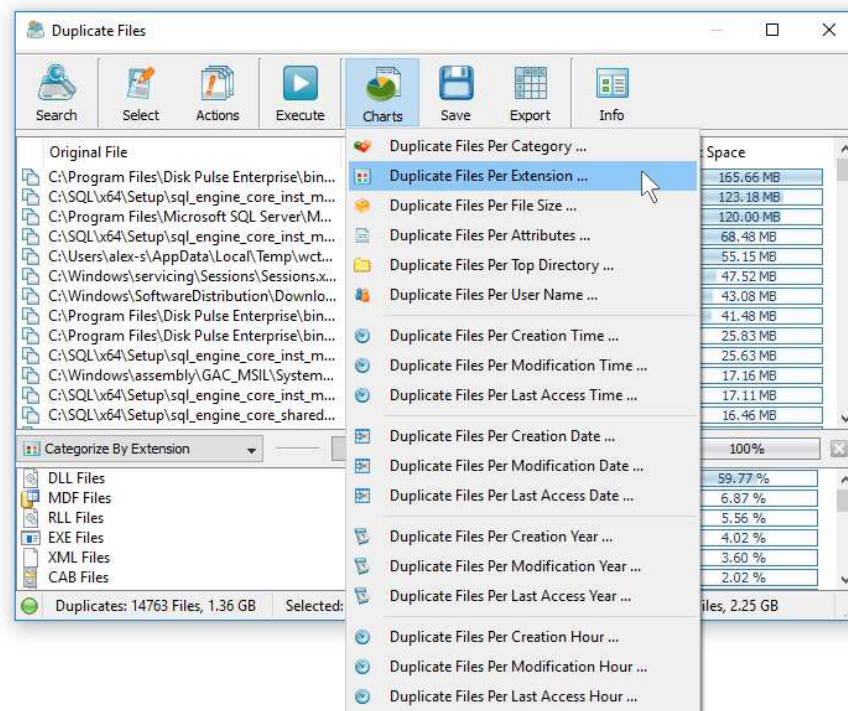
For example, in order to open a chart showing the duplicate disk space and the number of duplicate files per file category, press the 'Charts' button located on the duplicate files search results dialog and select the 'Duplicate Files Per Category' chart type.
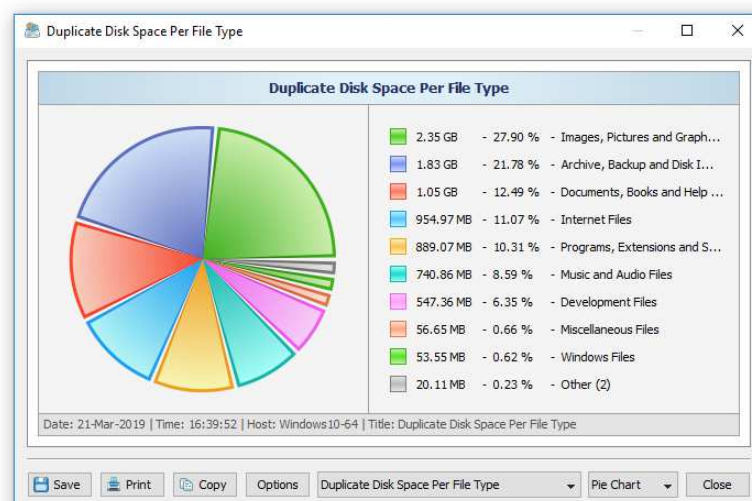
In addition, the charts dialog provides the user with the ability to export the chart data to a number of different formats, export the chart image to the BMP, JPG and PNG image formats and copy the displayed chart image to the clipboard allowing one to easily integrate DiskBoss charts into user's documents and presentations. In order to customize the chart's description, press the 'Options' button and specify a custom chart title, host name, date or time.

One of the most powerful features of the DiskBoss duplicate files finder is the ability to filter duplicate files search results using one or more user-specified filters and then categorize filtered results and display statistical pie charts. For example, in order to display a pie chart showing the amount of duplicate disk space per file extension for duplicate files that were modified during the last two years, set the file categorization mode to 'Categorize By Modification Year', select one or more years to show the information for, press the right mouse button over the file filters view and select the 'Apply Selected Filters' menu item.
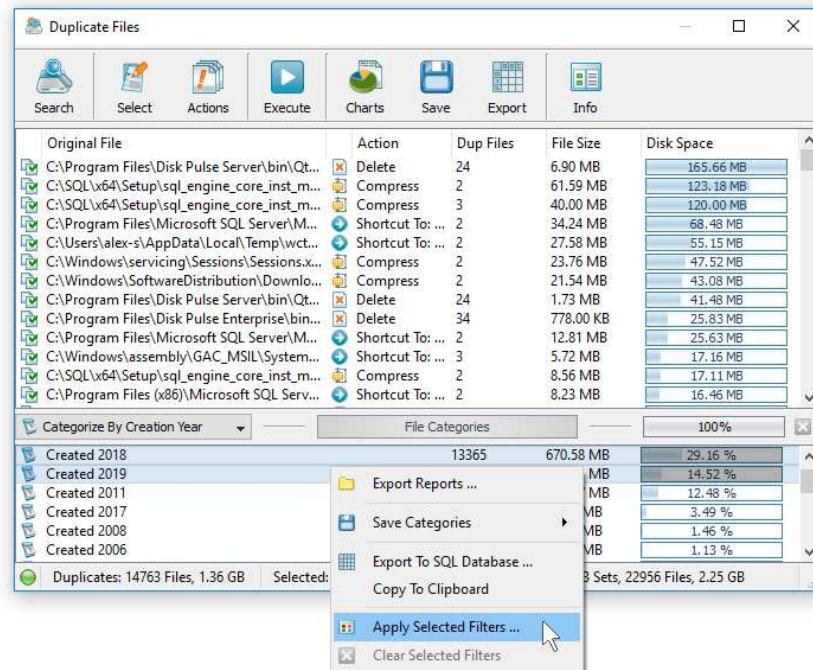
DiskBoss will filter the duplicate files search results and display duplicate files that were modified during the selected years. Now, press the 'Charts' button located on the duplicate files search results dialog and select the 'Duplicate Files Per Extension' menu item. DiskBoss will categorize the filtered duplicate files search results and display a pie chart showing the amount of duplicate disk space per file extension for duplicate files that were modified during the selected years.
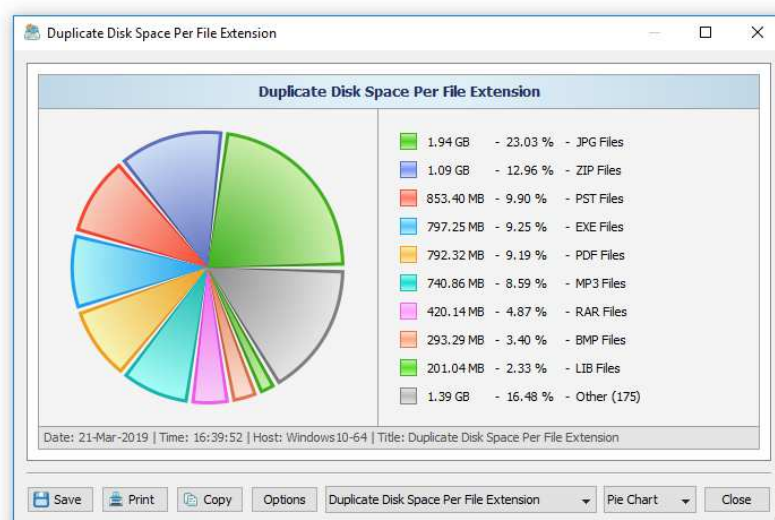
In a similar way, the user can filter duplicate files search results by the file type, size, user name, file attributes, creation, modification and last access dates and then display various types of charts showing the duplicate disk space or the number of duplicate files according to user-specific needs.

Another powerful capability is the ability to display the duplicate disk space timeline charts for all or filtered duplicate files search results. In the simplest case, press the 'Charts' button located on the duplicate files search results dialog and select the 'Duplicate Files Per Modification Year' menu item.
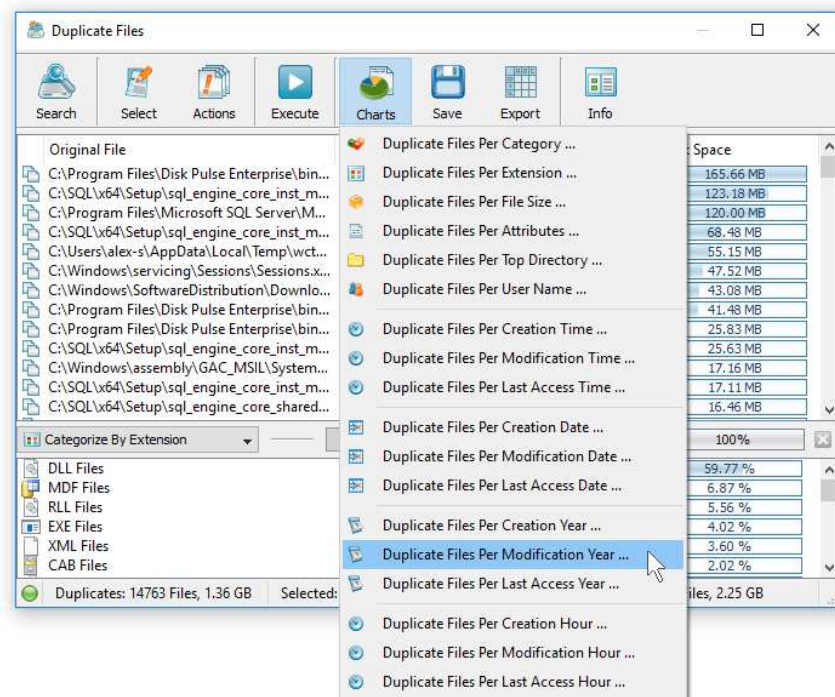
DiskBoss will display a time line chart showing how much duplicate data was modified per year. In order to display how many duplicate files were modified per year, set the chart mode to 'Number Of Duplicates Per Modification Year'.
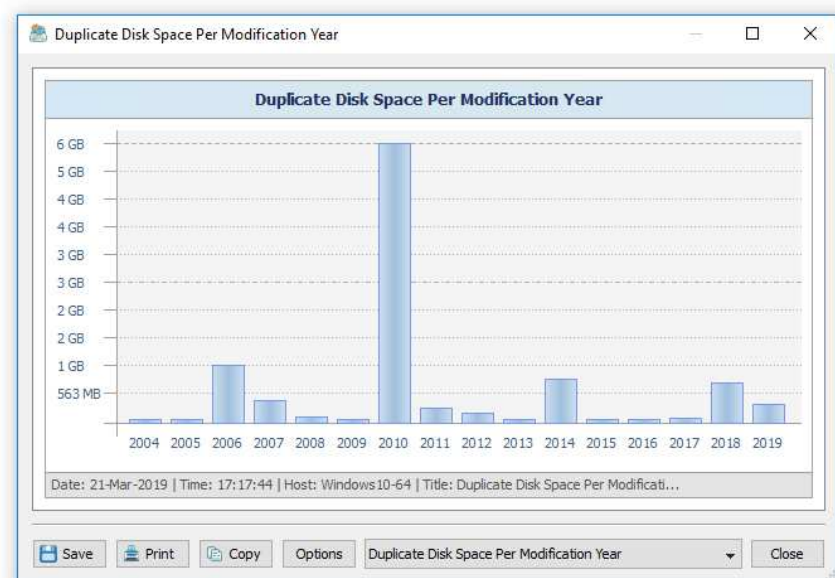
In addition, the user is provided with the ability to display timeline charts for filtered duplicate files search results. For example, in order to display how many duplicate documents were created per year, set the file categorization mode to 'Categorize By File Type', select the 'Documents, Books and Help Files' file category, press the right mouse button and select the 'Apply Selected Filters' menu item. Now, press the 'Charts' button located on the duplicate files search results dialog, and select the 'Duplicate Files Per Creation Year' menu item.

5.4   Searching Files in Duplicate Files Search Results

DiskBoss provides the ability to search files in duplicate files results by the file name, extension, full path, file category, file size, file attributes, creation, last modification and last access dates. In order to start a file search operation, search duplicate files in one or more disks or directories and press the 'Search' button located on the main toolbar.
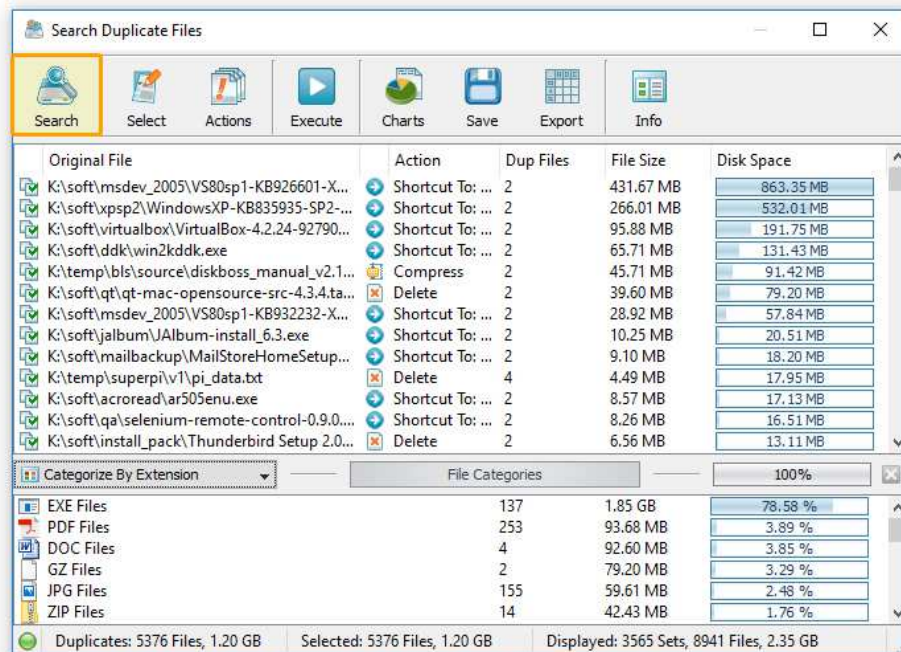
By default, DiskBoss will search duplicate files matching the user-specified rules in all duplicate file sets in the current duplicate files report. Once the file search operation is completed, DiskBoss will display the search results dialog showing all duplicate files matching the rules.
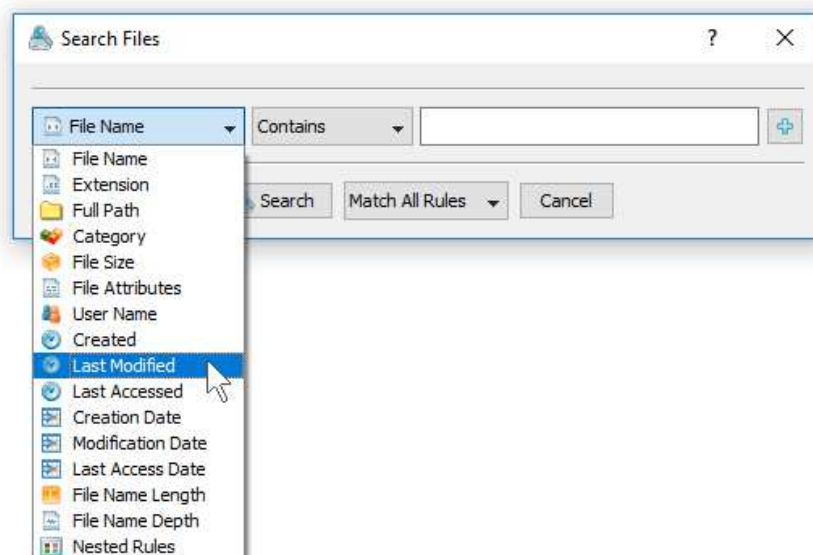
The search results dialog allows one to filter and categorize file search results, display various types of pie charts, copy, move and/or delete files, export file search results to a number of standard report formats including HTML, PDF, Excel, text, CSV and XML. In addition, advanced users are provided with the ability to export file search results to an SQL database.

5.5   Selecting Duplicate Files Removal Actions

The DiskBoss duplicate files finder allows one to delete duplicate files, move duplicate files to another directory, replace duplicate files with shortcuts pointing to the original file, replace duplicate files with hard links, compress duplicate files, compress and move duplicate files to another directory.
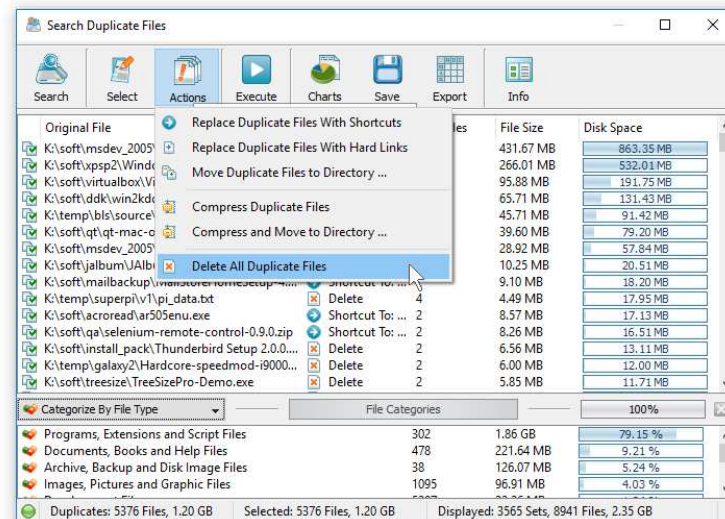
In order to select a specific duplicates removal action for one or more sets of duplicate files, select the sets in the set list, press the right mouse button and select an appropriate duplicate files removal action.

> **WARNING:** There are many duplicate files in the Windows system directory, which are important for proper operation of the operating system. Removal of duplicate files located in the Windows system directory may permanently damage the operating system and render the computer completely non-functional.

By default, DiskBoss selects the oldest file in each set as the original file and all other files in the set as duplicates. In order to change that, select one or more sets, press the right mouse button and select the 'Select Oldest Files as Duplicates' menu item.
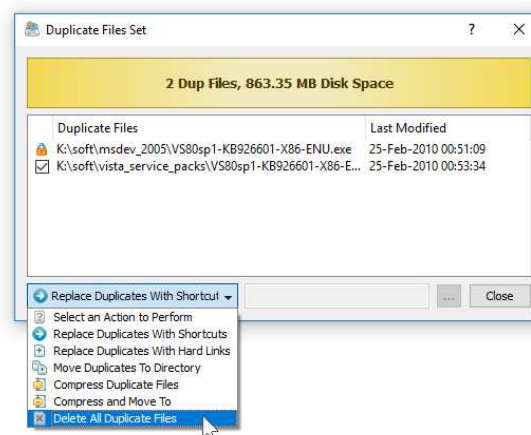
Alternatively, open the duplicate files set dialog, select any arbitrary duplicate file in the set as the original file, select an appropriate duplicate files removal action that should be executed for this specific duplicate files set and select one or more duplicate files in the set that the removal action should be applied to.

5.6   Executing Duplicate Files Removal Actions

Once finished selecting duplicates and removal actions, press the 'Execute' button to see the duplicate files removal actions preview dialog. The duplicates removal actions preview dialog shows the selected duplicate files and removal actions that will be executed and allows one to review and manually confirm each specific action before execution.
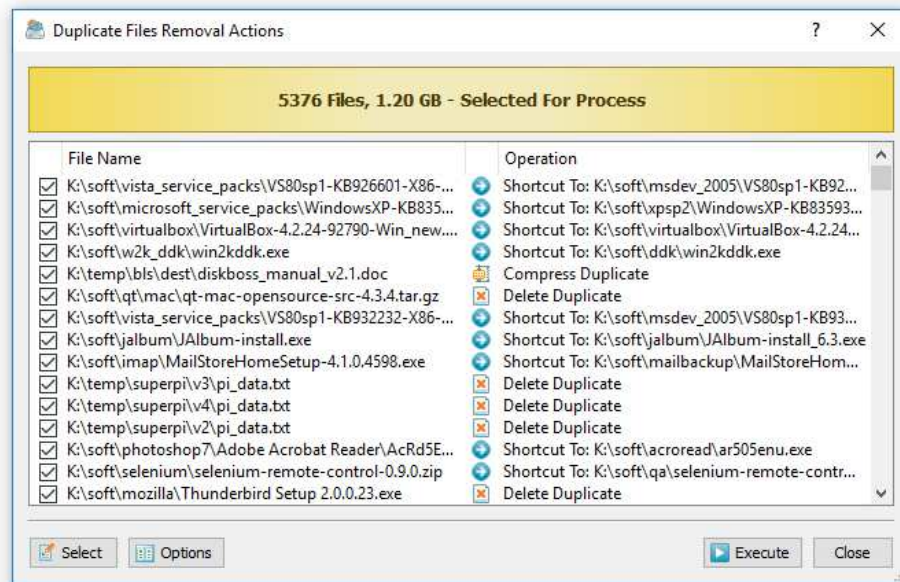
The operating system and other system applications may have a large number of duplicate files located in various system directories. These duplicate files may be very important for proper operation of the operating system and other system applications and it is highly dangerous to remove these duplicate files. To be on the safe side, use the duplicates removal actions only for your own documents, music files, videos, etc.
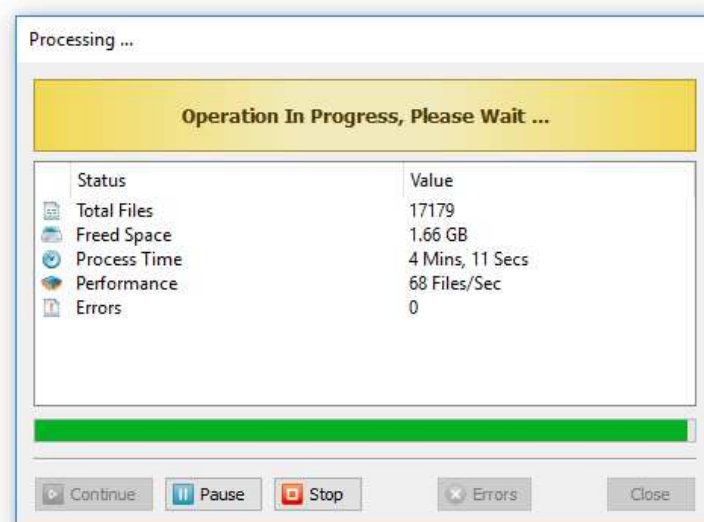
In order to execute the selected duplicates removal actions, press the 'Execute' button located in the bottom-right corner of the 'Preview' dialog. DiskBoss will process the selected duplicate files and execute the specified duplicates removal actions.

5.7   Saving Duplicate Files Reports

DiskBoss allows one to save duplicate files search reports into a number of standard formats including HTML, PDF, Excel, XML, text and CSV. In the simplest case, perform a duplicate files search operation and press the 'Save' button located on the duplicate files search results dialog. On the save report dialog, select an appropriate report format, enter a report file name and press the 'Save' button.
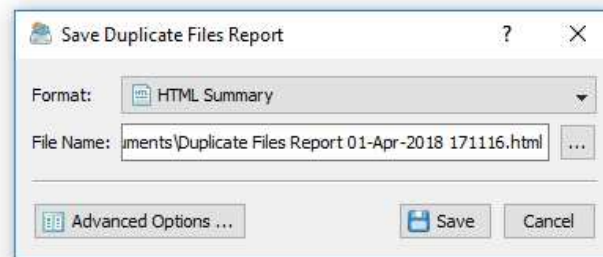
For the HTML, PDF, Excel, text, CSV and XML report formats, the user is provided with the ability to save a short summary report or a longer detailed report, which may be very long for large file systems containing millions of files. By default, DiskBoss will save a short, summary duplicate files search report in the HTML report format, which will include a list of top 20 duplicate file sets sorted by the amount of duplicate disk space and a list of tables showing the amount of duplicate disk space and the number of duplicate files per file extension, file type, top-level directory, user name, etc.

In addition, the user is provided with the ability to save duplicate files search results to the DiskBoss native report format, which preserves all information related to each specific duplicate files search operation and may be loaded at any time just by clicking on a report file in the DiskBoss file navigator.

Sometimes, it may be required to perform additional analysis of duplicate files search results using external tools such as Microsoft Excel. In order to export duplicate files search results to the Excel report format, perform a duplicate files search operation, press the 'Save' button located on the duplicate files search results dialog, select the 'Excel Summary' report format for a short summary report or the 'Excel Report' format for a detailed duplicate files search report.
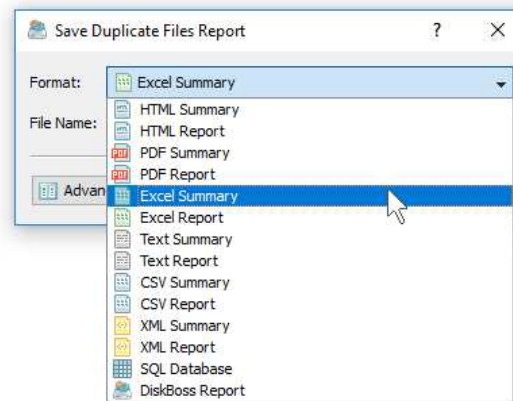
A summary Excel report will include a list of top 20 duplicate file sets sorted by the amount of duplicate disk space and a number of tables showing the amount of duplicate disk space and the number of duplicate files per file extension, file category, file creation time, last modification time, top-level directory, user name, etc.
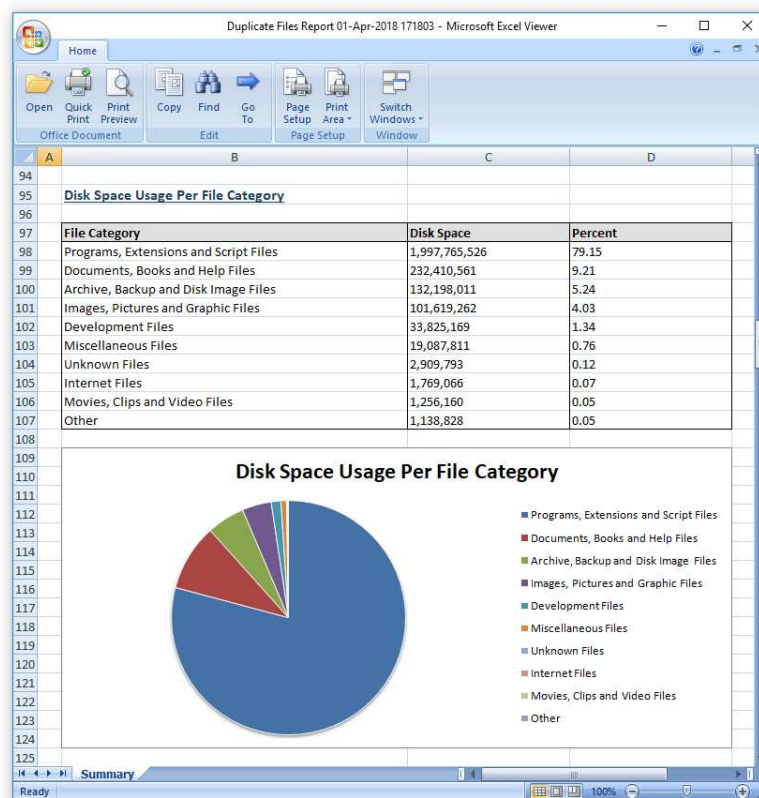
A detailed Excel report will include the list of duplicate file sets sorted by the amount of the duplicate disk space followed by lists of duplicate files in each set, which may be very long for large file systems containing millions of files. In order to control how many duplicate file sets are exported in the detailed report, press the 'Advanced Options' button located on the 'Save Report' dialog and customize the duplicate files search report for your specific needs.

One of the most useful ways to export duplicate files search results is to use the PDF summary or the PDF report formats. Both of these report formats include various types of graphical pie charts showing the amount of duplicate disk space and the number of duplicate files per file extension, file category, creation time, last modification time, user name, etc. In order to save duplicate files search results to a PDF report file, press the 'Save' button located on the duplicate files search results dialog and select the 'PDF Summary' report format for a short, summary report or the 'PDF Report' format for a detailed duplicate files search report.
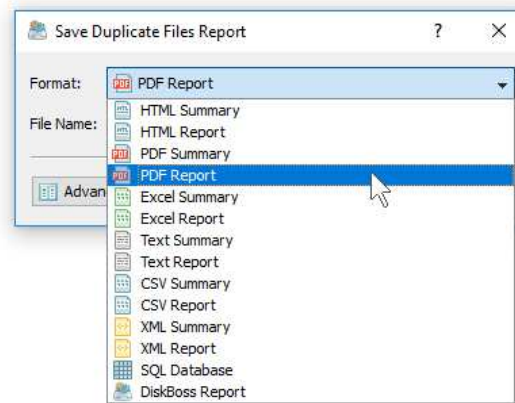
A summary PDF report will include a list of top 20 duplicate file sets sorted by the amount of the duplicate disk space followed by a number of pie charts showing the amount of duplicate disk space and the number of duplicate files per file extension, file category, file creation time, last modification time, user name, etc. A detailed PDF report will include a list of duplicate file sets sorted by to the amount of duplicate disk space followed by lists of duplicate files in each set, which may be very long for large file systems containing millions of files.
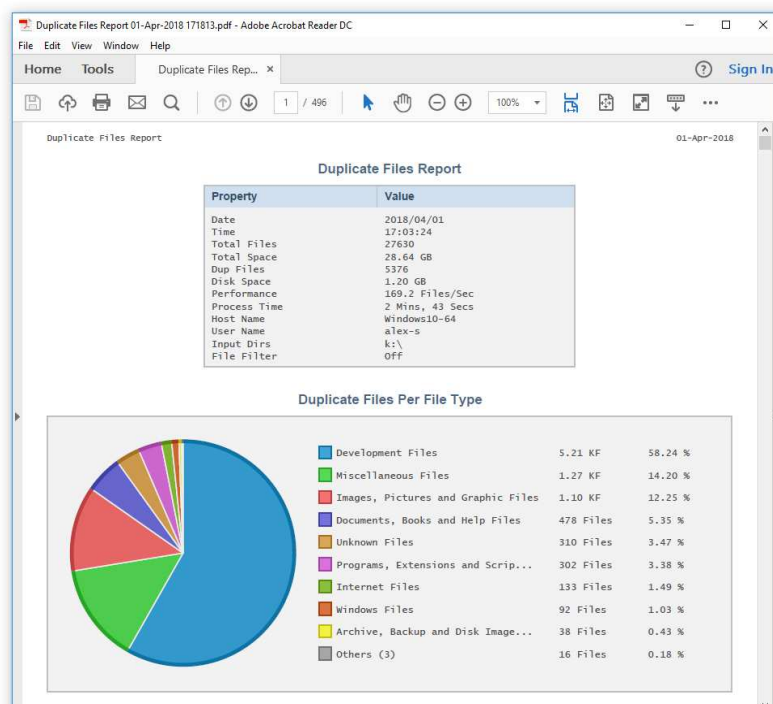
In addition to the list of duplicate file sets sorted by the amount of duplicate disk space, detailed PDF reports include pie charts showing the duplicate disk space per file category and the number of duplicate files per file category according to the currently selected file categorization mode. For example, if the second-level file categories mode is set to categorize duplicate files search results by the file extension, the PDF report will display pie charts showing the amount of duplicate disk space and the number of duplicates per file extension.

5.8   Batch Duplicate Files Search Reports

DiskBoss allows one to save batches of duplicate files search reports according to the currently selected categories of files with each report showing duplicate files and the amount of duplicate disk space for a corresponding category of files. For example, let's assume that we need to save duplicate files search reports for the last 10 years with each report showing duplicate files and the duplicate disk space for all files that were created during each corresponding year.
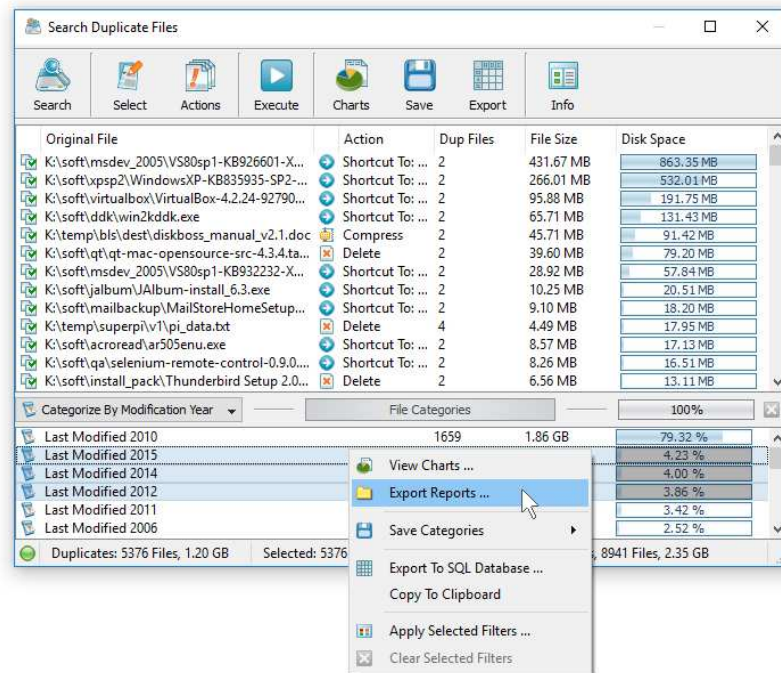
In order to generate such reports, set the file categorization mode to 'Categorize By Creation Year', select all years for which you need to generate duplicate files reports in the file categories view, press the right mouse button and select the 'Export Reports' menu item. On the 'Export Reports' dialog, select an appropriate report format and report mode, specify a destination directory to export reports to and press the 'Save' button.
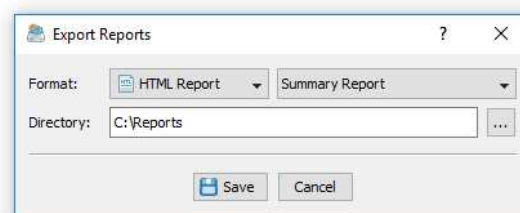
For each selected year, DiskBoss will filter duplicate files search results by the file creation year and save an individual duplicate files search report in the specified destination directory with each report file name and report title containing the corresponding file creation year.

In the same way, the user can generate batches of reports showing duplicate files and the disk space usage per user, last modification date, last access date, file attributes, file size, top directory or custom categories of files pre-configured using flexible file matching rules.

For example, in order to export individual duplicate files search reports for all users, set the file categorization mode to 'Categorize By User Name', select all the required users, press the right mouse button and select the 'Export Reports' menu item. Now, the destination directory will contain a series of duplicate files search reports with each report showing duplicate files and the disk space usage for the corresponding user.

The batch reports dialog provides the ability to export reports to a number of standard report formats including: HTML, PDF, Excel, text, CSV and XML. Depending on the selected report format and report mode, each report will include a summary table showing statistics about the report, a table showing the list of duplicate file sets sorted by the amount of duplicate disk space and lists of duplicate files for each duplicate file set.
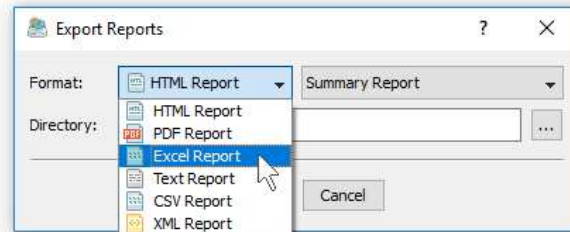
In addition, the batch reports dialog allows one to select one of the following report modes: summary report, compact report or full report. When the summary report mode is selected, each report will include a summary table and a list of duplicate file sets sorted by the amount of the used disk space. When the compact report mode is selected, each report will include a summary table and a list of top 100 duplicate file sets sorted by the amount of duplicate disk space. When the full report mode is selected, each report will include a summary table, a full list of duplicate file sets and full lists of duplicate files for each duplicate file set.
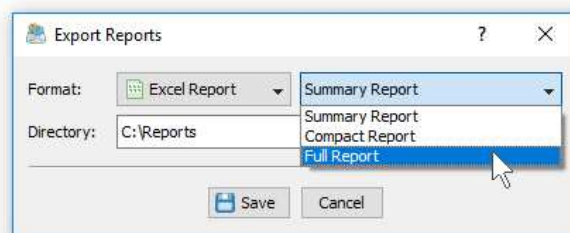
Once the export operation will be completed, the specified destination directory will contain a number of duplicate files search reports according to the selected file categorization mode, selected categories of files and the selected report format.
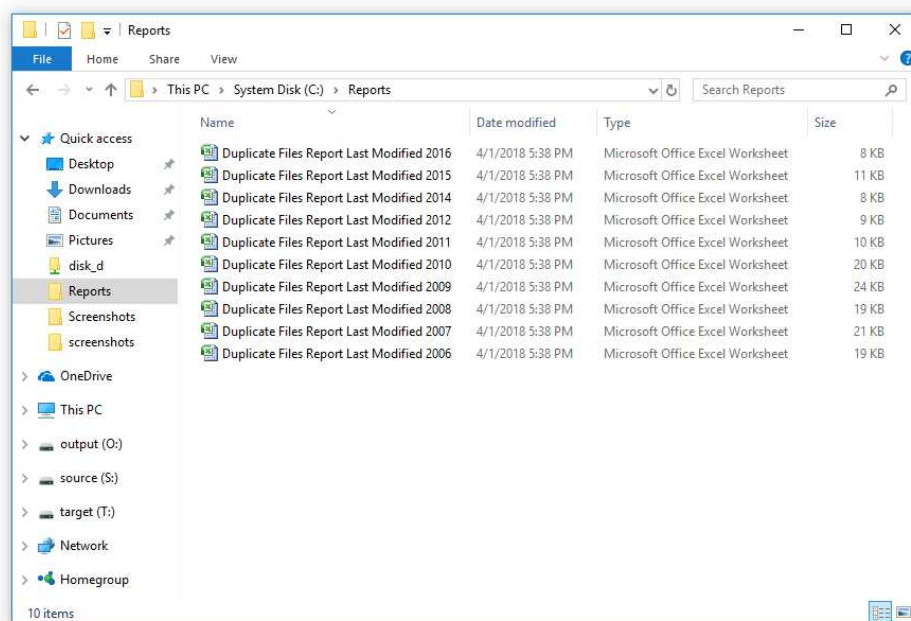
5.9   Exporting Reports to an SQL Database

IT professionals and storage administrators are provided with the ability to submit reports listing duplicate files detected on multiple storage systems, servers and desktop computers to a centralized SQL database enabling system and storage administrators to gain an in-depth visibility into amounts of duplicate files and wasted disk space across the entire enterprise.
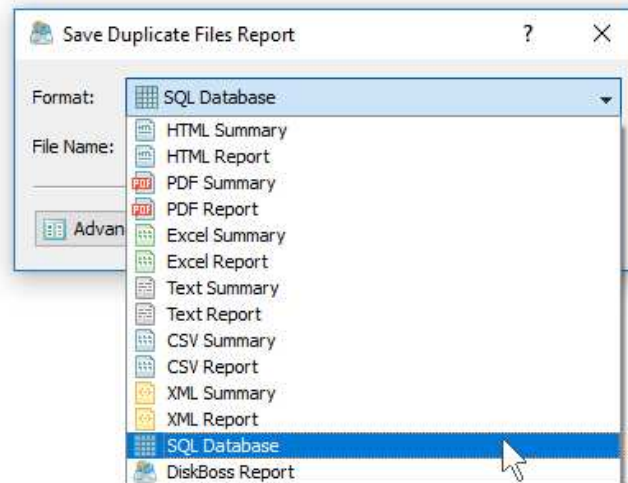
In order to submit a report to an SQL database, press the 'Save' button located on the duplicate files search results dialog toolbar, select the 'SQL Database' report format and press the 'Save' button. Before exporting a report to an SQL database, the user needs to open the options dialog, enable the ODBC interface and specify the name of the ODBC data source, the database user name and password to use for database export operations.
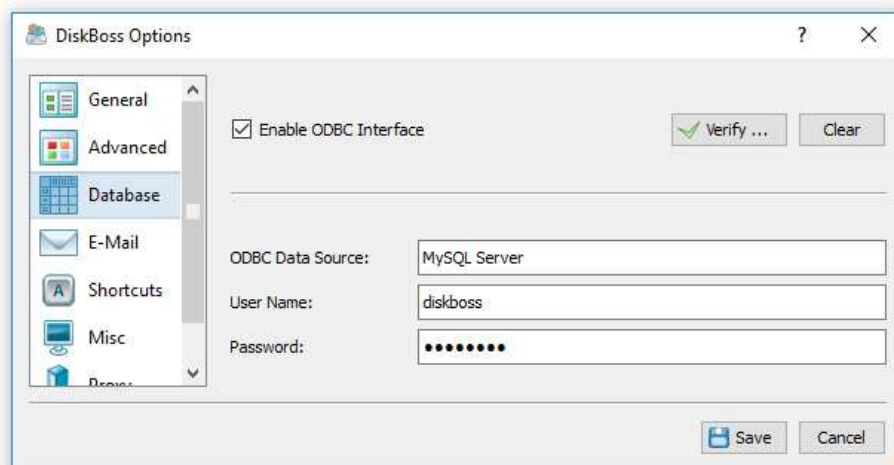
For each report in the database, DiskBoss shows the report date and time, the name of the host computer the operation was performed on, disks and directories that were processed, the total amount of disk space and the number of files that were processed and the report title. In order to open a report, just click on the report item in the report list.

5.10 Search Duplicate Files in Network Servers and NAS Storage Devices

DiskBoss allows one to scan the network, discover network servers and NAS storage devices, automatically detect all accessible network shares and search duplicate files in hundreds of network servers and NAS storage devices. In addition, the user is provided with the ability to export the list of detected servers and NAS storage devices (including lists of network shares for each server) into HTML, PDF, text and Excel CSV reports.

In order to discover all network servers and NAS storage devices on the network, press the 'Network' button located on the main toolbar and wait while DiskBoss will scan the network and show a list of detected network servers and NAS storage devices. In order to search duplicate files in one or more servers or NAS storage devices, select the required servers and NAS storage devices and press the 'Duplicates' button.

DiskBoss will show all accessible network shares hosted on the selected servers and NAS storage devices allowing one to search duplicate files and save various types of duplicate files pie charts and reports. In addition, the user is provided with the ability to customize a large number of advanced duplicate files search options allowing one to tune duplicate files search operations for user specific needs and hardware configurations.

5.11   Batch Duplicate Files Search Operations

DiskBoss Server and DiskBoss Enterprise provide the ability to execute one or more pre-configured duplicate files search operations on all network servers and NAS storage devices on the network and generate an individual duplicate files search report for each server and NAS storage device. In order to be able to use batch duplicate files search operations, the user needs to pre-configure one or more duplicate files search commands customized to generate duplicate files search reports according to user-specific needs and requirements.
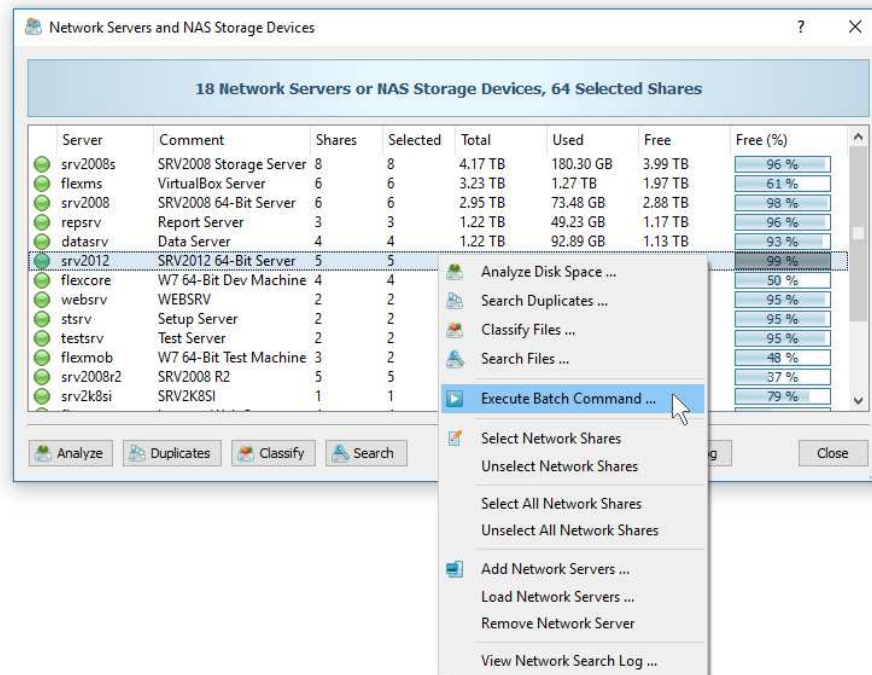
In order to start a batch duplicate files search operation, press the 'Network' button located on the main toolbar, search all servers and NAS storage devices on the network, select one or more servers and NAS storage devices, press the right mouse button and select the 'Execute Batch Command' menu item.
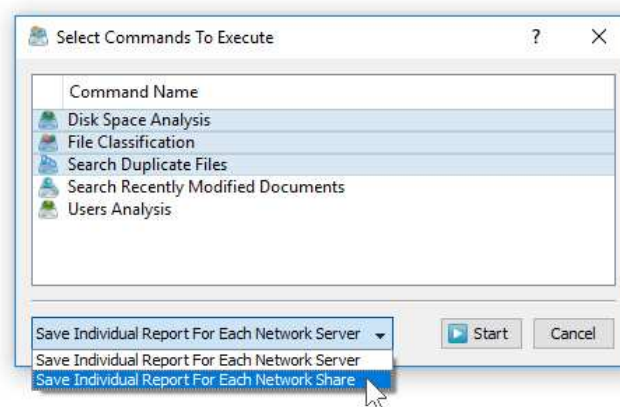
DiskBoss will display a list of pre-configured duplicate files search commands allowing one to select one or more commands to be executed on all selected servers and NAS storage devices. In addition, the user is provided with the ability to select how to save duplicate files search reports - for each server or for each network share. By default, all duplicate files search reports will be saved in the DiskBoss internal reports database allowing one to open each report, review results, generate various types of pie charts and export reports into a number of standard formats including HTML, PDF, Excel, text, CSV and XML.

5.12   Searching Specific Types of Duplicate Files

One of the most powerful capabilities of DiskBoss is the ability to search specific types of duplicate files according to one or more user-specified file matching rules. Files not matching the specified rules, will be just skipped from the duplicate files search process.
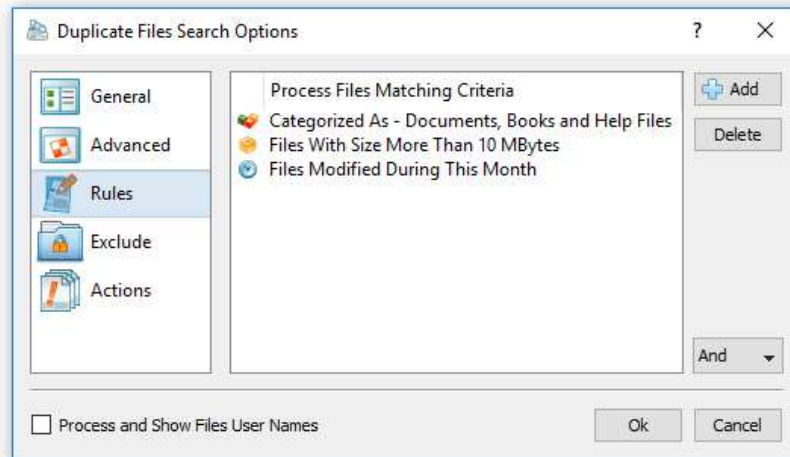
In order to add one or more file matching rules to a duplicate files search operation, open the command dialog, select the rules tab and press the 'Add' button located on the right side of the dialog. Once finished adding file matching rules, select an appropriate rules logic and press the 'Save' button.
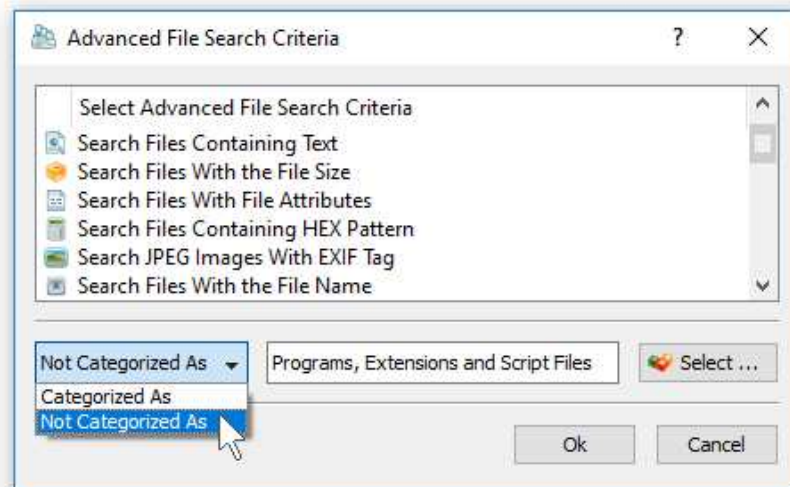
Another option is to exclude specific types of duplicate files from the search process using one or more negative file matching rules. For example, in order to exclude all types of programs and executable files from the duplicate files search process, add a file category rule, select the 'Not Categorized As' rule operator and select the 'Programs and Executable Files' file category.

5.13 Excluding Subdirectories from Duplicate Files Search Process

Sometimes, it may be required to exclude one or more subdirectories from the duplicate files search process. For example, if you need to search duplicate files in a disk excluding one or two special directories, you may specify the whole disk as an input directory and add the directories that should be skipped to the exclude list. By default, in order to prevent accidental deletion of critical system files, DiskBoss automatically adds the operating system directory to the list of exclude directories in all duplicate files search commands.
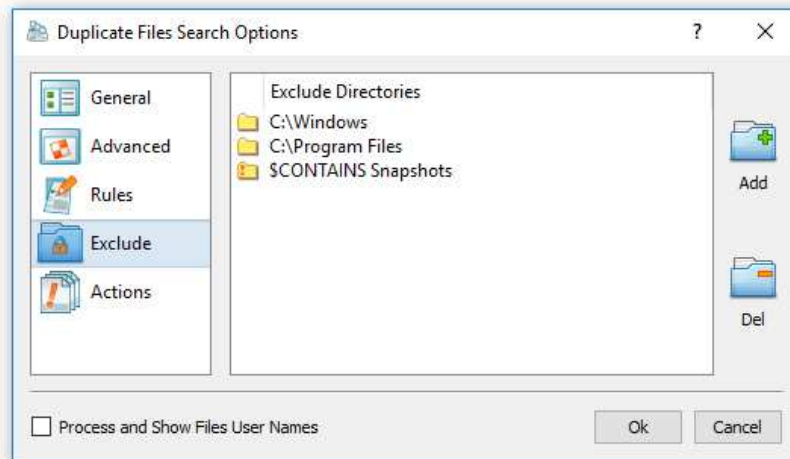
In order to add one or more directories to the exclude list, open the duplicate files search command dialog, press the 'Options' button, select the 'Exclude' tab and press the 'Add' button. All files and subdirectories located in the specified exclude directory will be excluded from the duplicate files search process. In addition, advanced users are provided with a number of exclude directories macro commands allowing one to exclude multiple directories using a single macro command.

DiskBoss provides the following exclude directories macro commands:

- **$BEGINS <Text String>** - this macro command excludes all directories beginning with the specified text string.
- **$CONTAINS <Text String>** - this macro command excludes all directories containing the specified text string.
- **$ENDS <Text String>** - this macro command excludes all directories ending with the specified text string.
- **$REGEX <Regular Expression>** - this macro command excludes directories matching the specified regular expression.
- **$DIRLIST <File Name>** - this macro command excludes all directories listed in the user-specified text file.
- **$FILELIST <File Name>** - this macro command excludes all files listed in the user-specified text file.

For example, the exclude macro command '$CONTAINS Temporary Files' will exclude all directories with 'Temporary Files' in the full directory path and the exclude macro command '$REGEX \.(TMP|TEMP)$' will exclude directories ending with '.TMP' or '.TEMP'.

5.14   Automatic Duplicate Files Removal Actions

DiskBoss Ultimate and DiskBoss Server provide the user with the ability to automatically execute one or more duplicate files removal actions for files matching user-specified rules. In order to define one or more automatic duplicate files removal actions, open the duplicate files search command dialog, select the 'Actions' tab and press the 'Add' button.
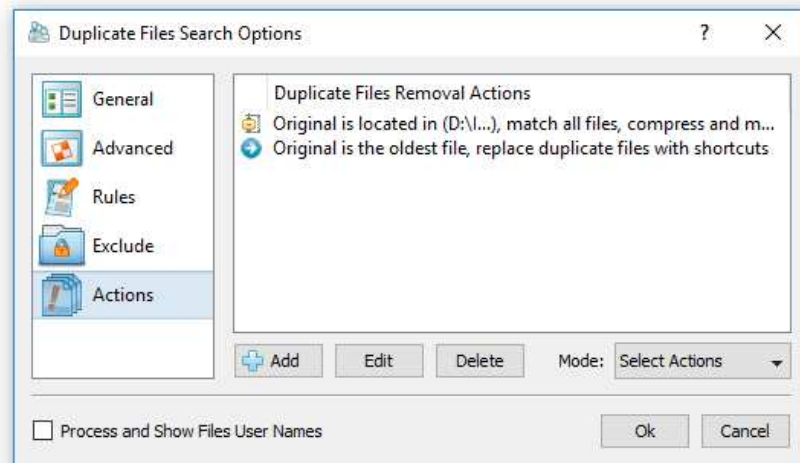
On the 'Action' dialog select the original file detection mode, an appropriate duplicates removal action and specify one or more file matching rules defining files the action should be applied to. During runtime, DiskBoss will process detected duplicate files, apply the specified file matching rules, detect the original file and execute the duplicates removal actions for files matching the specified rules and policies.
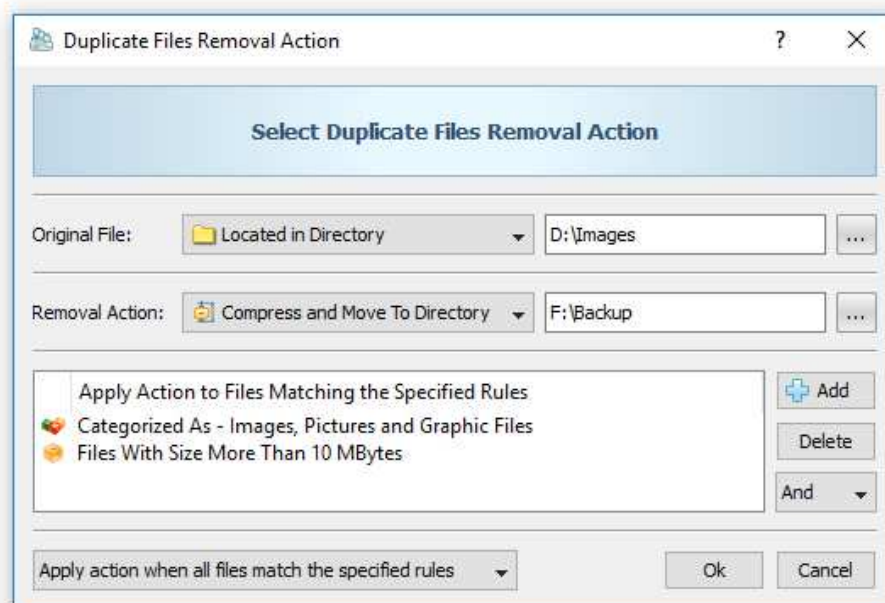
By default, DiskBoss executes automatic duplicates removal actions in the 'Auto-Select' mode, which selects the specified actions and displays the duplicates removal actions preview dialog allowing one to review and manually confirm each specific action. After testing the duplicate files search command in the preview mode, change the actions mode to 'Execute' to automatically execute the specified duplicates removal actions without showing the actions preview dialog.

5.15   Analyzing Duplicate Files Per Host

DiskBoss Server and DiskBoss Enterprise provide the ability to automatically detect all servers and NAS storage devices on the network, search duplicate files in hundreds of servers and/or NAS storage devices via the network, submit duplicate files search reports to a centralized report database and display charts showing the number of duplicate files and the amount of duplicate disk space per server or NAS storage device across the entire enterprise.
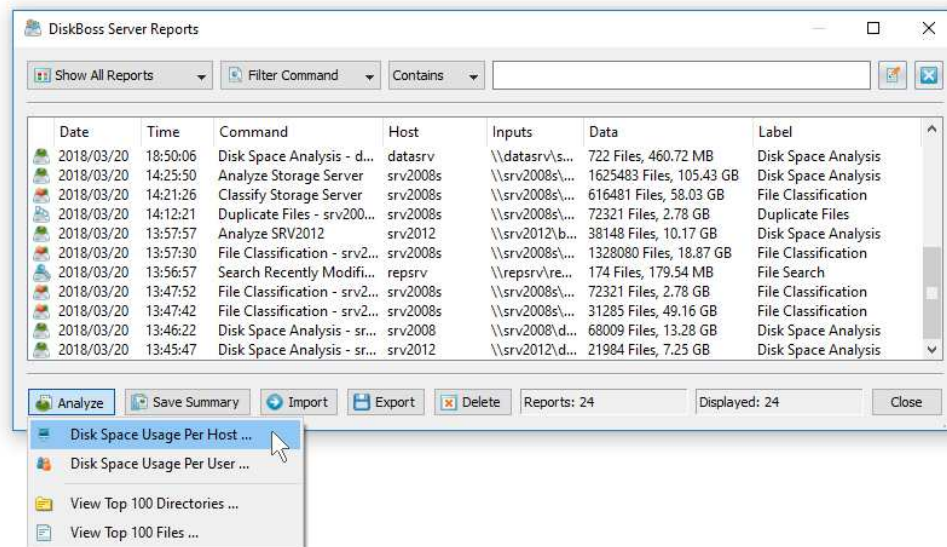
In order to analyze duplicate files per server, perform one or more duplicate files search operations on multiple servers and/or NAS storage devices, open the 'Reports' dialog, press the 'Analyze' button and select the 'Analyze Disk Space Usage Per Host' menu item. DiskBoss will analyze all reports saved in the reports database and display the hosts analysis dialog showing the number of duplicate files and the amount of duplicate disk space per host.

The hosts analysis dialog provides the ability to display pie charts and bars charts showing the number of duplicate files and the amount of duplicate disk space per host according to duplicate files search reports saved in the reports database. The user is provided with the ability to select the types of duplicate files search operations and file system locations to analyze, edit the chart header and footer, copy the chart image to the clipboard and export graphical PDF reports including pie charts.

5.16   Analyzing Duplicate Files Per User

DiskBoss Server and DiskBoss Enterprise provide the ability to automatically detect all servers and NAS storage devices on the network, search duplicate files in hundreds of servers and/or NAS storage devices via the network, submit duplicate files search reports to the reports database and display charts showing the number of duplicate files and the amount of duplicate disk space per user across the entire enterprise.
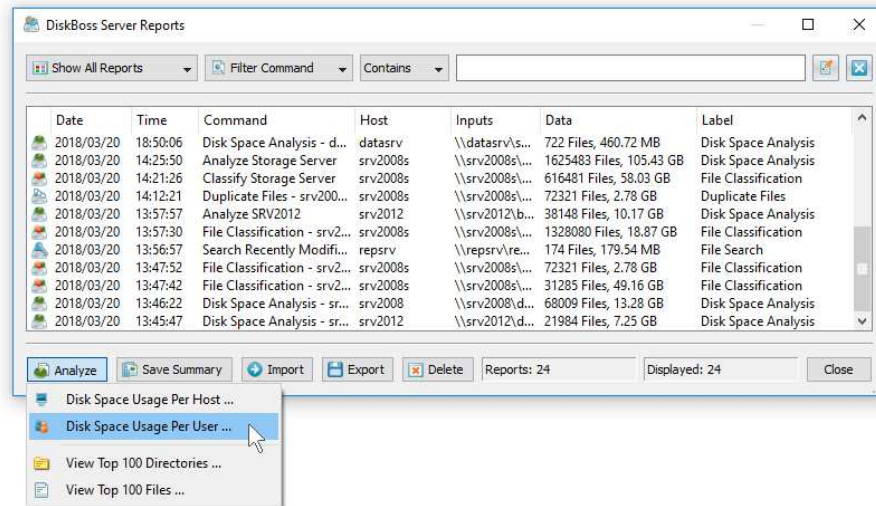
In order to analyze duplicate files per user, perform one or more duplicate files search operations on multiple servers and/or NAS storage devices, open the 'Reports' dialog, press the 'Analyze' button and select the 'Analyze Disk Space Usage Per User' menu item. DiskBoss will analyze all reports saved in the reports database and display the users analysis dialog showing the number of duplicate files and the amount of duplicate disk space per user.

The users analysis dialog provides the ability to display pie charts and bars charts showing the number of duplicate files and the amount of duplicate disk space per user according to duplicate files search reports saved in the reports database. The user is provided with the ability to select the types of duplicate files search operations and file system locations to analyze, edit the chart header and footer, copy the chart image to the clipboard and export graphical PDF reports including pie charts.

> **IMPORTANT:** In order to be able to display duplicate files per user, the duplicate files search operation should be configured to process and display files user names.

5.17   Duplicate Files Search Performance

DiskBoss is optimized for modern multi-core and multi-CPU systems and is capable of searching duplicate files stored on multiple disks, directories or network shares in parallel using all CPUs installed in the computer. DiskBoss provides a number of different performance optimization options allowing one to tune the duplicate files search operations for user-specific hardware and storage configurations.
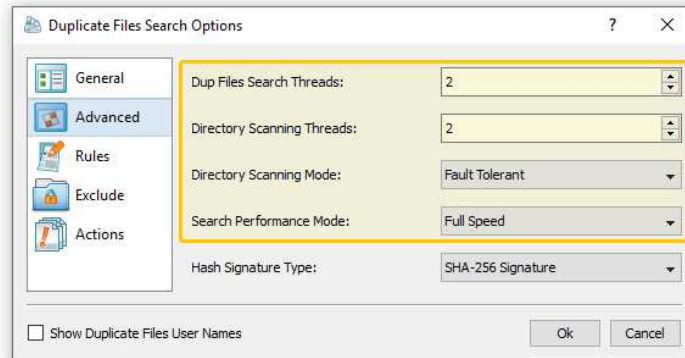
In order to customize the duplicate files search performance optimization options, open the duplicate files search operation dialog, press the 'Options' button and select the 'Advanced' tab. The 'Dup Files Search Threads' option controls how many parallel threads are used to search duplicate files. The 'Directories Scanning Threads' option controls how many parallel threads are used to scan input disks, directories and network shares. In the 'Fault-Tolerant' directory scanning mode, DiskBoss uses an individual processing thread for each input disk, directory or network share, but limits the maximum number of parallel scanning threads to the specified value. In the high-performance directory scanning mode, DiskBoss always uses the specified number of parallel directory scanning threads even when processing a single input disk, directory or network share.
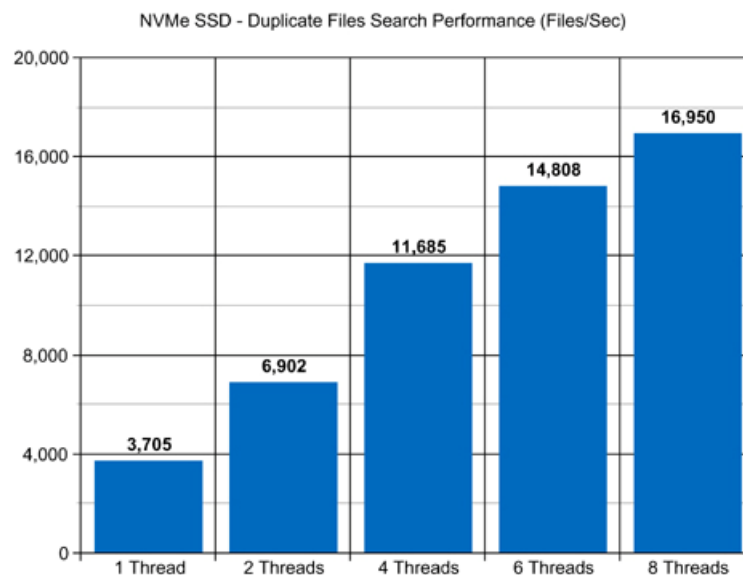
For example, when searching duplicate files stored on a high-speed NVMe SSD disk, DiskBoss reaches up to 3,000 files/sec using a single search thread. With two parallel search threads, the performance scales up to 6,000 files/sec and with four parallel search threads, the performance increases up to 11,000 files/sec showing a very good level of multi-threaded performance scalability. With six processing threads the duplicate files search performance reaches up to 14,000 files/sec and with eight processing threads the performance increases up to 16,000 files/sec allowing one to quickly process large numbers of files and identify how many files are duplicates and how much duplicate disk space these files are using.

When searching duplicate files stored on regular SATA SSD drives, which are significantly slower than NVMe SSD drives, the performance of the duplicate files search process reaches up to 2,000 files/sec using a single process thread and scales up to 4,400 files/sec with four parallel duplicate files search threads. With eight parallel threads, the performance reaches up to 5,900 files/sec, which allows to process large numbers of files relatively fast.
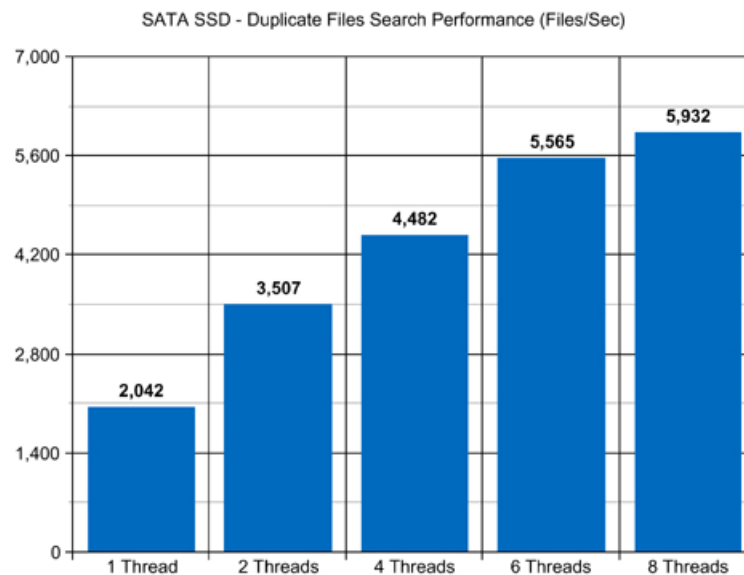
Searching duplicate files stored on a NAS storage device via a network is a more complicated task because the user needs to take into account the speed and the latency of the network. If the computer, on which DiskBoss is installed, is connected to the NAS storage device via a high-speed, low-latency network, the performance of the duplicate files search operations may reach up to 200 files/sec with one duplicate files search thread, scale up to 684 files/sec with four parallel search threads and increase up to 1,057 files/sec with eight parallel duplicate files search threads.
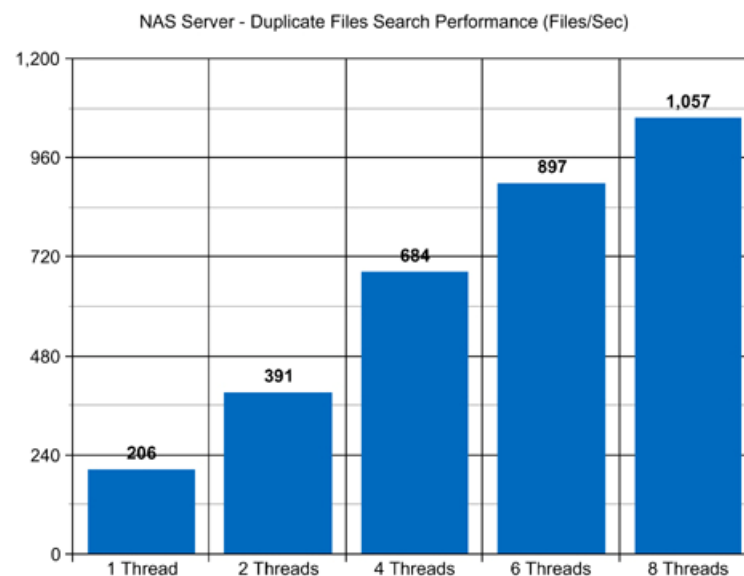
On the other hand, if DiskBoss will need to access network shares via the Internet or via a long-distance, high-latency network, the performance of the duplicate files search operations will be relatively slow. One of the options to increase the performance of the duplicate files search operations in such configurations is to set the 'High-Performance' directory scanning mode and increase the number of parallel duplicate files search threads to 16 or even 32 disregarding how many CPUs are actually installed on the computer.

Modern USB flash drives provide plenty of the storage space and are reasonably fast allowing one to store vast amounts of data for backup purposes. Sometimes, it may be required to search duplicate files on a USB flash drive in order to free the used disk space. When searching duplicate files stored on a USB flash drive, DiskBoss can reach up to 357 files/sec with a single search thread. With two parallel search threads, the performance increases up to 644 files/sec, with four parallel threads the performance increases up to 1,008 files/sec and with eight parallel duplicate files search threads the performance scales up to 1,174 files/sec.
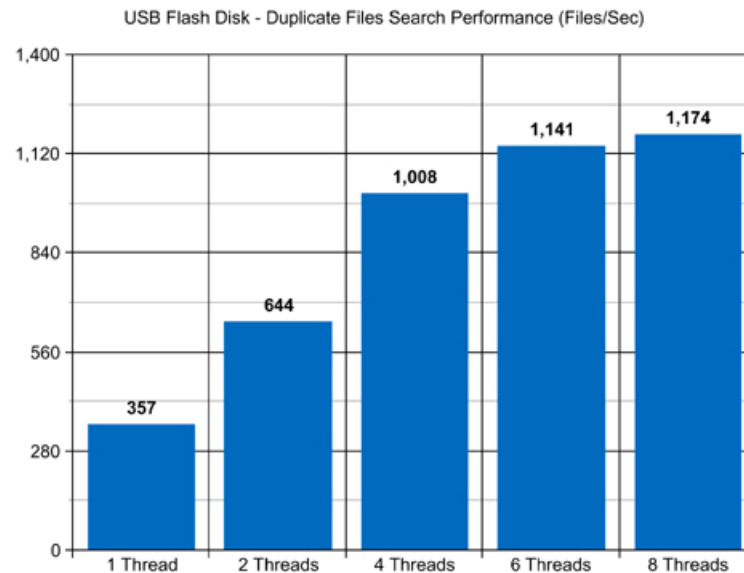
USB Flash Disk - Duplicate Files Search Performance (Files/Sec)

Today, modern IT environments widely deploy virtual servers and/or virtual workstations. Most of the popular virtualization platforms provide a high level of performance, but depending on the target hardware and software platforms, significant performance degradations are inevitable when a duplicate files search operation is executed on a guest virtual machine compared to the same duplicate files search operation executed directly on the host computer.
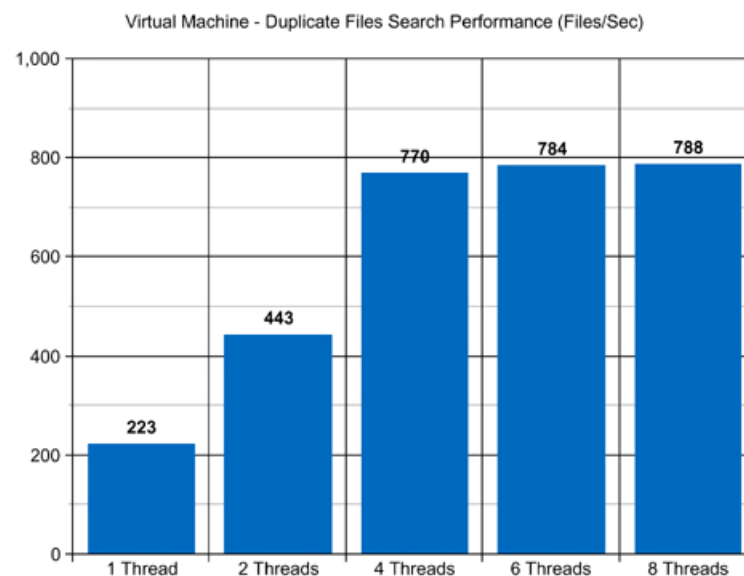
Virtual Machine - Duplicate Files Search Performance (Files/Sec)

For example, when a virtual machine with 4 virtual CPUs is stored on an SSD disk and searching duplicate files stored on a virtual local disk drive, which is physically stored on the same SSD disk, the performance of the duplicate files search operations reaches up to 223 files/sec using a single search thread. With two parallel search threads, the performance of the duplicate files search operations scales up to 443 files/sec and with four parallel search threads, the performance of the duplicate files search operations increases up to 770 files/sec.

5.18   Advanced Duplicate Files Search Options

The DiskBoss duplicate files finder provides a large number of advanced options allowing one to customize duplicate files search operations for user-specific hardware and storage configurations. The 'General' tab allows one to control the file signature type, the file scanning mode, the maximum number of duplicate file sets to display in the results dialog.
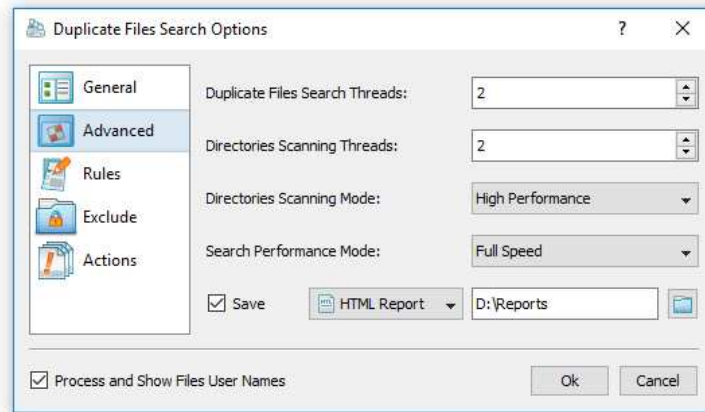
The 'Advanced' tab provides the ability to intentionally slow down the duplicate files search process in order to minimize the potential performance impact on running production systems. The 'Exclude' tab allows one to define one or more subdirectories to be excluded from the duplicate files detection process.

5.19   Pre-Configured Duplicate Files Search Commands

One of the most powerful and flexible capabilities of DiskBoss is the ability to pre-configure custom duplicate files search operations as user-defined commands and execute such commands in a single mouse click using the DiskBoss GUI application or direct desktop shortcuts.
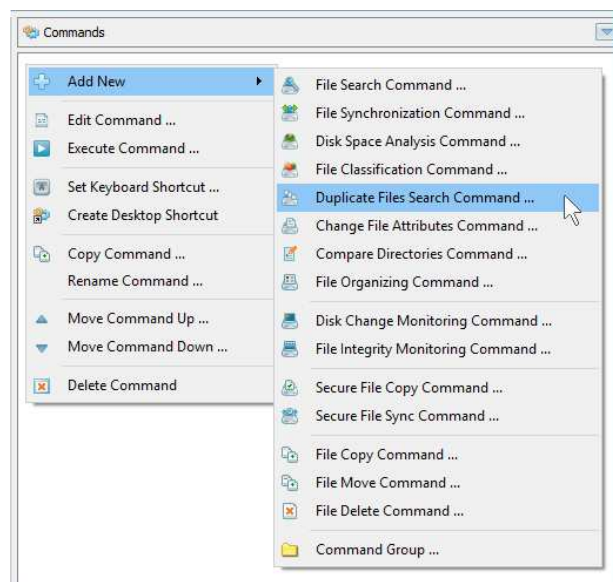
User-defined commands may be managed and executed through the commands dialog or the commands tool pane. In order to add a new command through the commands pane, press the right mouse button over the pane and select the 'Add New - Duplicate Files Search Command' menu item. In order to execute a previously saved command, just click on the command item in the commands tool pane or create a direct desktop shortcut on the Windows desktop.

5.20   Searching Duplicate Files Using the DiskBoss Command Line Utility

In addition to the DiskBoss GUI application, DiskBoss Ultimate provides a command line utility allowing one to execute duplicate files detection and removal operations from batch files and shell scripts. The command line tool is located in the **'<ProductDir>\bin'** directory.

Command Line Syntax:

diskboss -duplicates -dir <Input Directory 1> [... <Input Directory X> <Options>]

Parameters:

-dir < Directory 1> [... < Directory X> -file <File 1> ... <File 2>]

This parameter specifies the list of input directories or files to process. In order to ensure proper parsing of command line arguments, directories and file names containing space characters should be double quoted.

Options:

-signature_type <MD5 | SHA1 | SHA256>

This parameter sets the type of algorithm used to calculate signatures of files. By default, DiskBoss uses the SHA256 algorithm.

-exclude_dir <Exclude Directory 1> [... <Exclude Directory X>]

This parameter specifies the list of directories that should be excluded from processing. In order to ensure proper parsing of command line arguments, directories containing space characters should be double quoted.

-filter <FileFilter>

This parameter sets the directory search filter (default *.*).

-workers <WorkingThreadCount>

This parameter sets the number of working threads to process files. DiskBoss is optimized for Multi-Core and Multi-CPU computers and is capable of distributing the workload to an unlimited number of CPUs. By default, DiskBoss processes files with one working thread.

-max_dup_set <MaxNumberOfDuplicateSets>

This parameter sets the maximum number of duplicate file sets to report about. By default, DiskBoss will report about up to 1000 duplicate file sets sorted by the amount of wasted storage space.

-min_wasted_space <MinWastedStorageSpace>

This parameter sets the minimum amount of wasted storage space to report about. By default, DiskBoss will report about duplicate file sets wasting at least 1 MBytes of storage space.

-save_html_report | save_csv_report | save_text_report [ReportFileName]

This parameter saves a report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template:

 diskboss_duplicates_[date]_[time].html

-v   - This command shows the product's version, revision and build date.

-help   - This command shows the command line usage information.

6   Rule-Based File Search

6.1   Searching Files Using File Matching Rules

DiskBoss provides extensive file search capabilities allowing one to search files by the file name, extension, type, location, size, attributes, text and binary patterns, creation, last access and modification dates, user name, JPEG EXIF tags, etc. Users are provided with the ability to use different types of file matching rules combined with logical operators to compose file search queries capable of finding files matching multiple criteria.
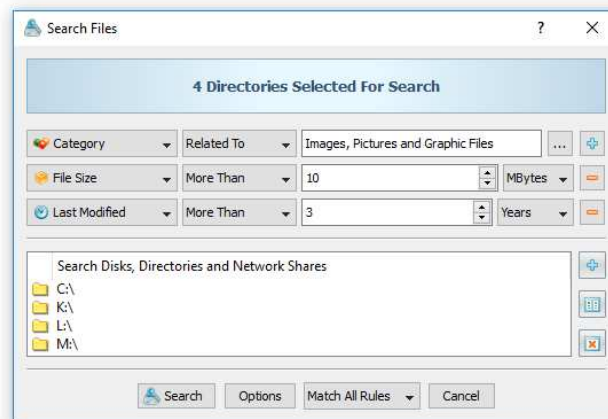
The DiskBoss file search capabilities are fully integrated with other product features allowing one to perform disk space analysis, file classification, duplicate files detection, file copy, delete and disk change monitoring operations on files matching one or more user-defined rules. In order to start a file search operation, just press the 'Search' button located on the main toolbar, enter a file name pattern and press the 'Search' button. If nothing is selected in the DiskBoss' file navigator, the search operation will be performed in the current location. Alternatively, DiskBoss will search the selected disks and directories and display search results.
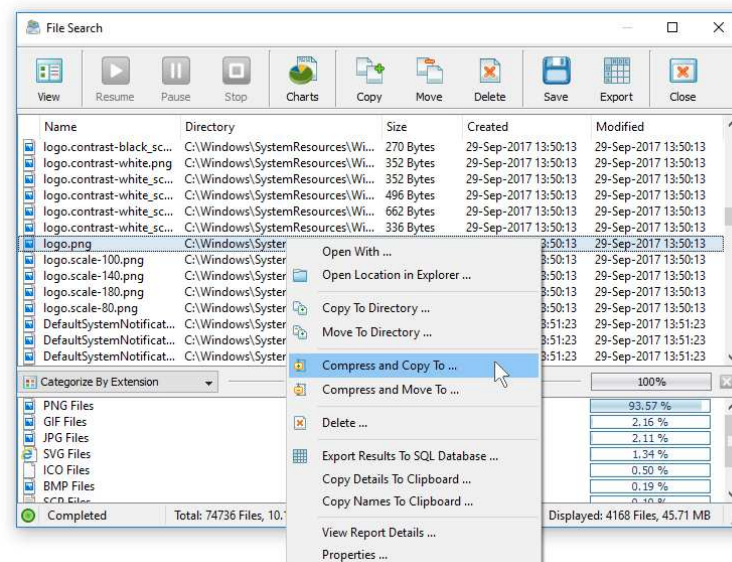
The search results dialog displays files matching the specified rules and allows one to export HTML, PDF, Excel, XML, text and CSV reports and perform a number of file management operations such as file copy, move or delete. For each search result, the results dialog displays the file name, directory, the file size and the last modification date. In order to see more information about a file, select the file in the result list, press the right mouse button and select the 'File Properties' menu item.

6.2   Searching Files by Category

DiskBoss is capable of automatically recognizing more that 3,500 file types and categories organized into a logical hierarchy of file classes and class groups, making it very easy to search for broad categories of files such as documents, music files, videos, images, etc. In order to search for files by the file type select the 'Search Files Categorized As' file matching rule and press the 'Select' button to select a file category.
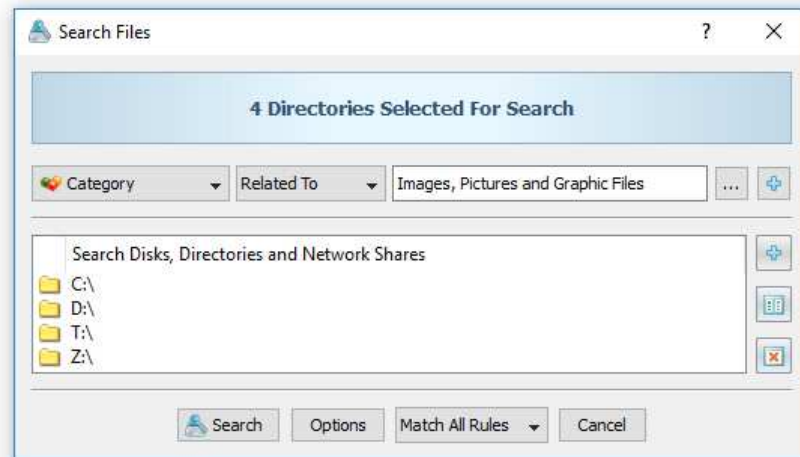
File categories and file classes are organized into a logical hierarchy representing specific file types grouped into a number of broad file categories. DiskBoss includes a number of file classification plugins, which provide different types of file categories allowing one to categorize files by the file type, size, creation, last access and modification dates, etc. In order to select a different file classification plug-in, use the plug-in combo box located on the top side of the file categories dialog.
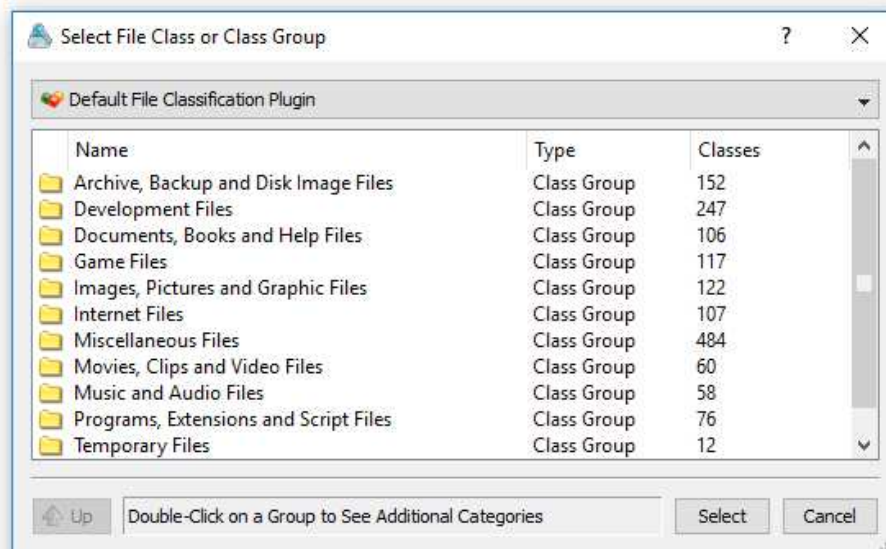
In order to open a file category, just click on the category item in the list. Select the required file category or file class and press the 'Select' button to select the file category for the file matching rule. During runtime, DiskBoss will match files related to any file class in the selected file category or the exact file class if the file matching rule was set to match an individual file type.

6.3   Searching Files by File Name

In order to search files by the file name, open the search operation dialog, press the 'Add' button, select the 'Search Files with the File Name' rule, select an appropriate file name comparison operator and enter a file name pattern string to compare file names with.
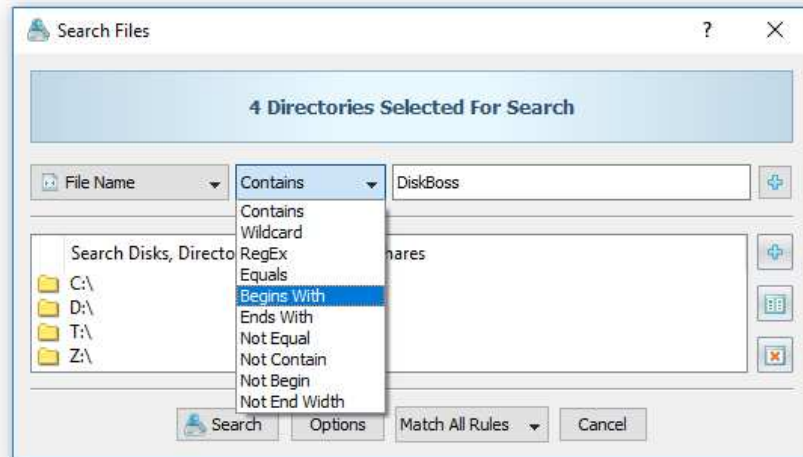
The file name comparison operator allows one to find files matching, beginning with, ending with or containing the specified string pattern. In addition, negative comparison operators are provided as well. File name searches are case insensitive and the entered file name pattern string will match both low case and upper case letters.

6.4   Searching Files by File Extension

In order to search files by the file extension, open the search operation dialog, press the 'Add' button, select the 'Search Files with the File Extension' rule, select an appropriate file extension comparison operator and enter a file extension pattern string to compare file extensions with.
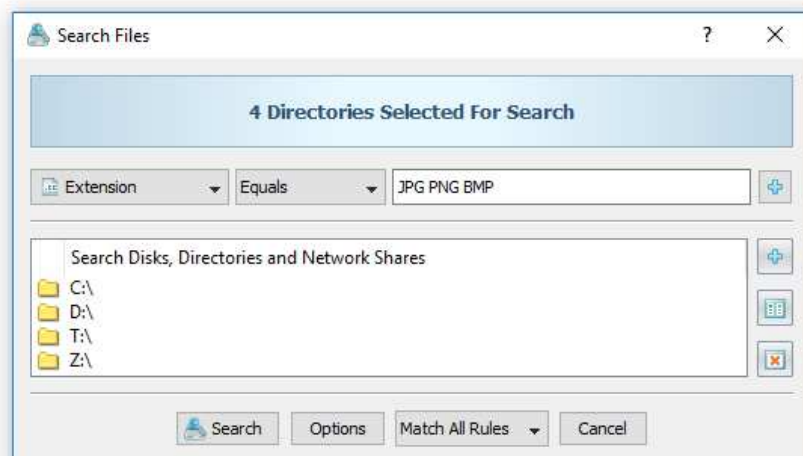
The file extension comparison operator allows one to find files matching, beginning with, ending with or containing the specified string pattern. In addition, negative comparison operators are provided as well. File extension searches are case insensitive and the entered file extension pattern string will match both low case and upper case letters.

115

6.5   Searching Files by File Path

In order to search files by the directory name, open the search operation dialog, press the 'Add' button, select the 'Search Files with the Directory Name' rule, select an appropriate directory name comparison operator and enter a directory name pattern string to compare directories with.
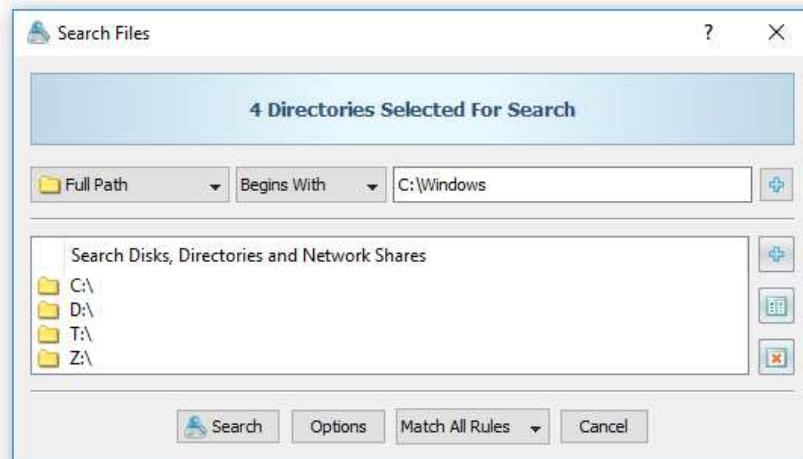
The directory name comparison operator allows one to find directories matching, beginning with, ending with or containing the specified string pattern. In addition, negative comparison operators are provided as well. Directory name searches are case insensitive and the entered directory name pattern string will match both low case and upper case letters.
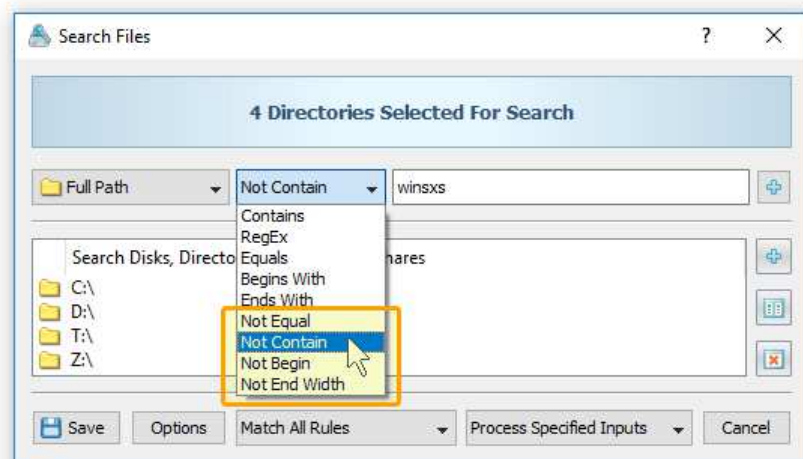
In addition, the user is provided with a number of negative file search operators allowing one to exclude files by a text pattern in the directory name. For example, in order to exclude all files containing a specific pattern in the full file path, add the 'Full Path' rule, set the operator to 'Not Contain' and enter a text pattern to match.

6.6   Searching Files by Date

DiskBoss provides a set of file matching rules allowing one to search files by the creation, modification and last access dates. The set of date-based file matching rules provides the ability to search files created, last modified or last accessed on a specific date, older or newer than a specific date. In addition, the user is provided with the ability to search files created, last modified or last accessed between user-specified dates.
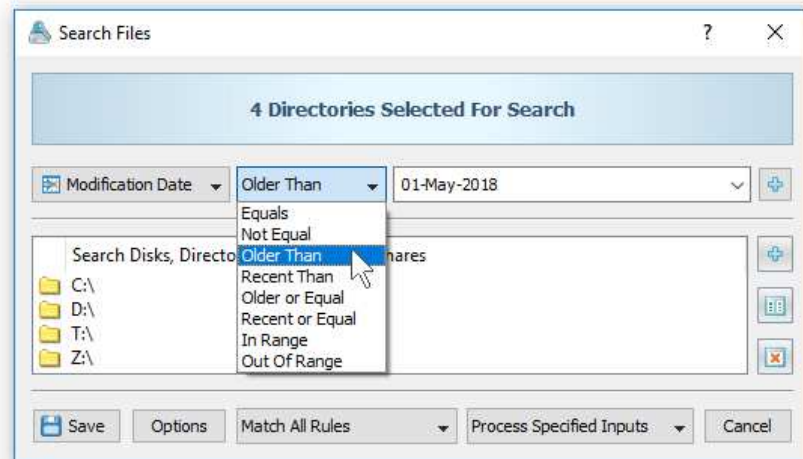
For example, in order to search files which were created before 1-May-2018, set the file search rule type to 'Modification Date', set the operator to 'Older Than' and set the date to 1-May-2018. In a similar way, the user can search files that were created before the specified date or exactly on the user-specified date.
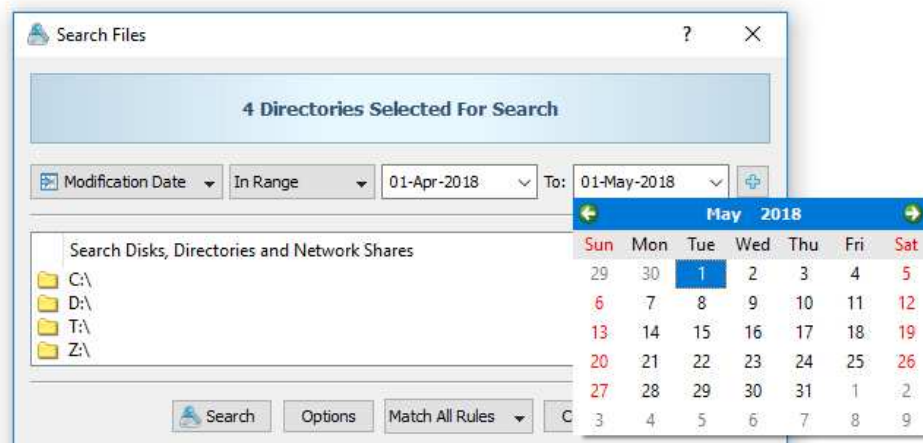
Finally, the user is provided with the ability to search files created, last modified or last accessed within a user-specified range of dates. For example, in order to search files that were created between two dates, set the rule operator to 'Creation Date', set the operator to 'In Range', enter the start date and enter the end date.

6.7 Searching Files by Time

In addition to the file matching rules capable of searching files by user-specified dates, DiskBoss provides an additional set of file matching rules allowing one to search files by relative periods of time. For example, the user can search files that were created, last modified or last accessed during the last X years, months, days, hours, minutes or seconds.
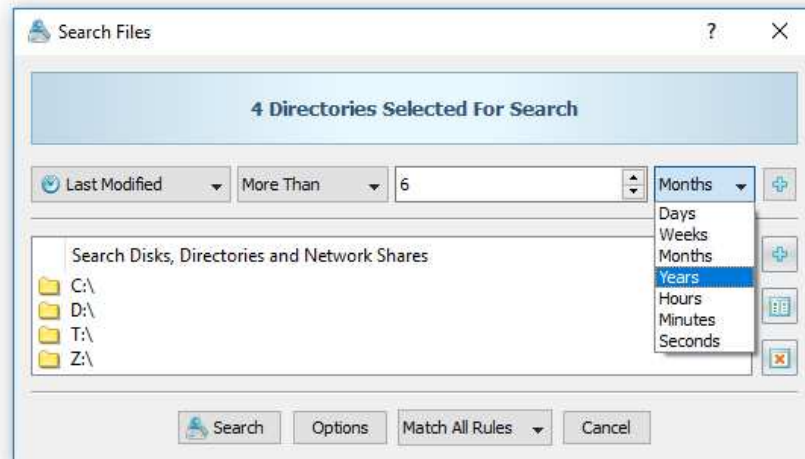
The relative time-based rules are useful when the user needs stable periods of time not changing and keeping valid as the time passes by. For example, a file matching rule searching files that were modified during the last 7 days is always valid disregarding of the current date.
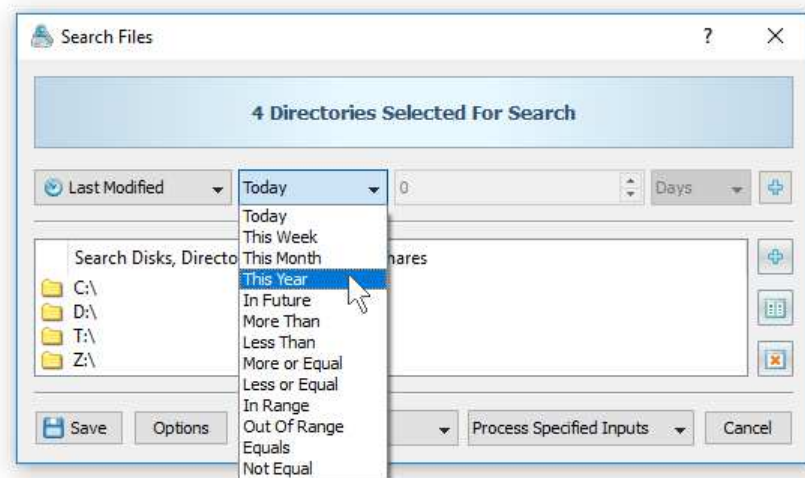
The time-based file matching rules provide a number of pre-configured operators allowing one to search files that were created, last modified or last accessed today, during this week, during this month or during this year. In addition, there are a number of standard comparison operators and time range operators. Finally, the user is provided with the ability to search files with the creation, last modification or last access timestamps set to a future time.

6.8   Searching Files by Text Patterns

In order to search files by a text string inside of files, open the search operation dialog, press the 'Add' button, select the 'Search Files Containing Text' rule, select an appropriate text comparison operator and enter a text pattern string to search inside of files.
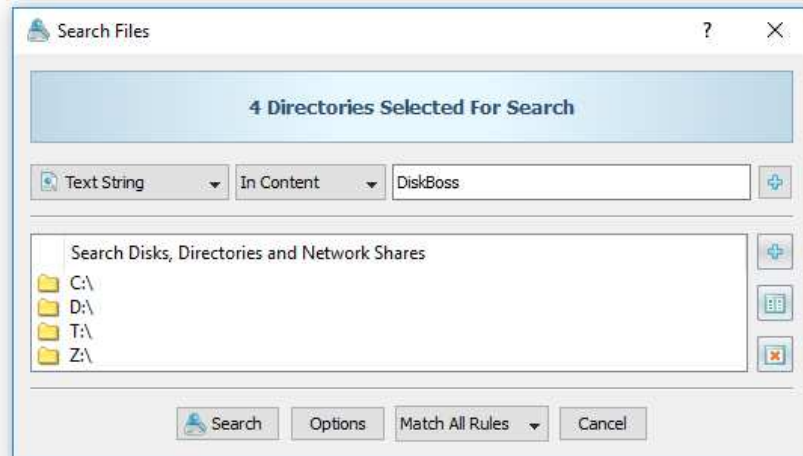
The text pattern comparison operator allows one to find files containing or not containing the specified text pattern. Text searches are case insensitive and the entered text pattern string will match both low case and upper case letters.

6.9   Searching Files by Binary Patterns

DiskBoss is capable of searching files by binary patterns located or not located at specific positions inside of files. In order to add a binary pattern search rule, press the 'Add' button, select the 'Search Files Containing HEX Pattern' rule, select an appropriate comparison operator, enter the HEX pattern to search for and specify an absolute position inside of files the pattern should be located on.
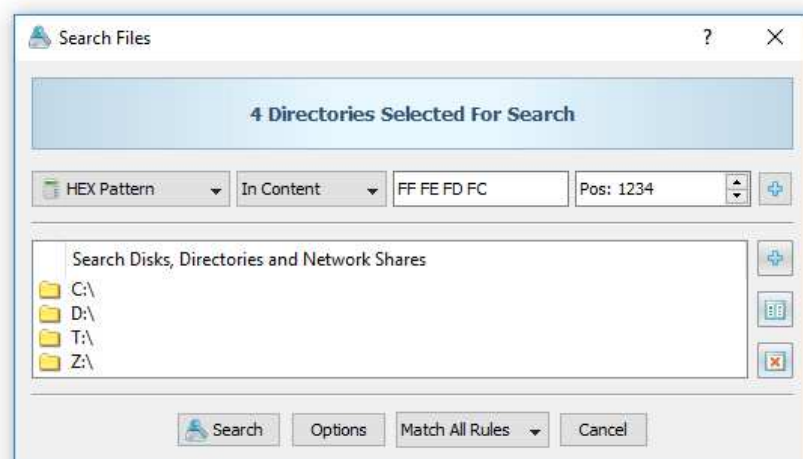
The HEX pattern should be specified as a string of upper case HEX numbers delimited by the space character with each number representing a single byte of the pattern. Users needed to match multiple binary patterns located at different places in each file may use multiple binary file matching rules with each one configured to match a single pattern. Moreover, multiple hierarchical binary file matching rules may be combined with logical operators allowing one to compose sophisticated, multi-level file search queries capable of finding the exact files the user is looking for.

6.10   Searching Files Using Regular Expressions

Regular expressions provide a flexible and powerful way to match text patterns in file names and directories. DiskBoss provides RegEx pattern matching operators for the file name search rule and the file path search rule.
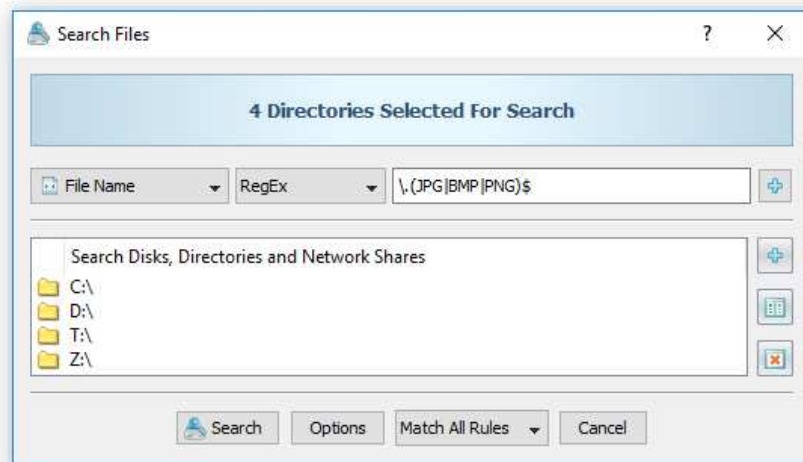
In order to search files using a regular expression, select the 'File Name' file matching rule, select the 'RegEx' pattern matching operator and enter a regular expression that should be matched. For example, the '\.(JPG|BMP|PNG)$' regular expression will match all JPG, BMP and PNG image files.
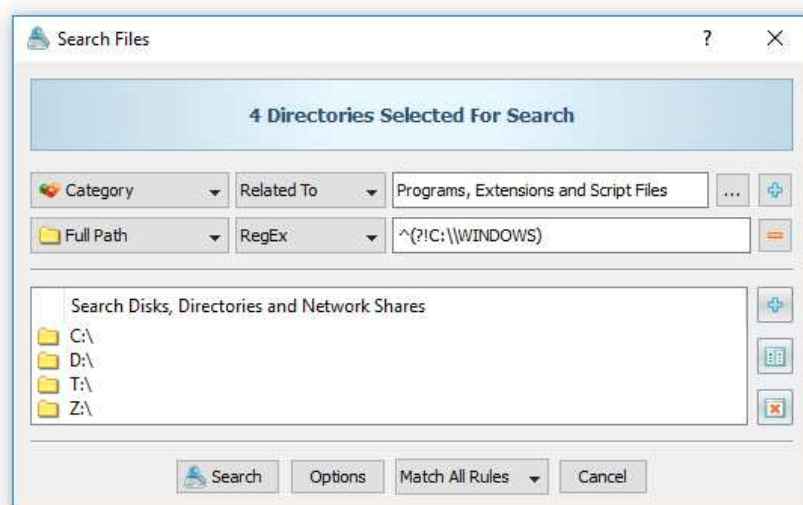
Regular expressions may be combined with other types of file matching rules allowing one to match a very specific set of files. In addition to the ability to match files using regular expressions, DiskBoss allows one to exclude files using regular expressions. For example, in order to search all programs and executable files while excluding files located in the Windows directory, use the regular expression '^(?!C:\\WINDOWS)' applied to the 'Full Path' file matching rule.

6.11   Searching Files by File Size

DiskBoss provides the ability to search files by the file size. In order to add a file search rule capable of matching files by the file size, press the 'Add' button, select the 'Search Files with File Size' rule, select an appropriate size comparison operator and enter the file size value.
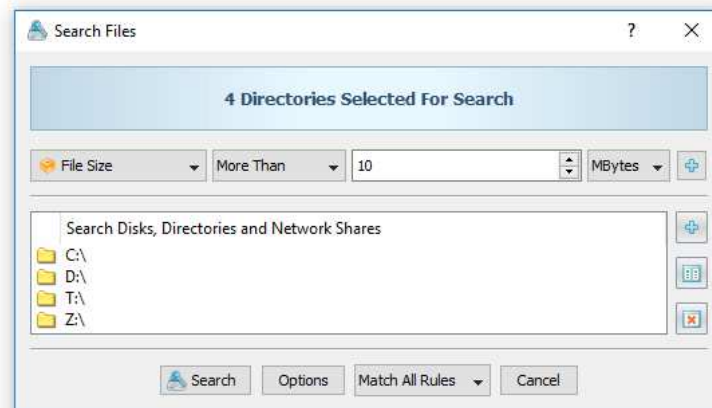
6.12   Searching Files by File Attributes

Sometimes, it may be required to find files by file attributes such as read-only, hidden, system, etc. In order to add a file search rule capable of matching files by file attributes, press the 'Add' button, select the 'Search Files with File Attributes' rule, select an appropriate comparison operator and press the 'Select' button to select the file attributes to look for.

On the select dialog, check the required file attributes and press the 'Ok' button. When the rule is set to find files having the selected attributes, DiskBoss will match files having any of the selected file attributes. Otherwise, when the rule is set to find files hot having the selected attributes, DiskBoss will match files having none of the selected attributes

6.13   Searching Files by User Name

DiskBoss is capable of searching files by the user name. In order to add the user name file matching rule, press the 'Add' button, select the 'Search Files with the User Name' rule, select an appropriate user name comparison operator and enter the user name pattern string.
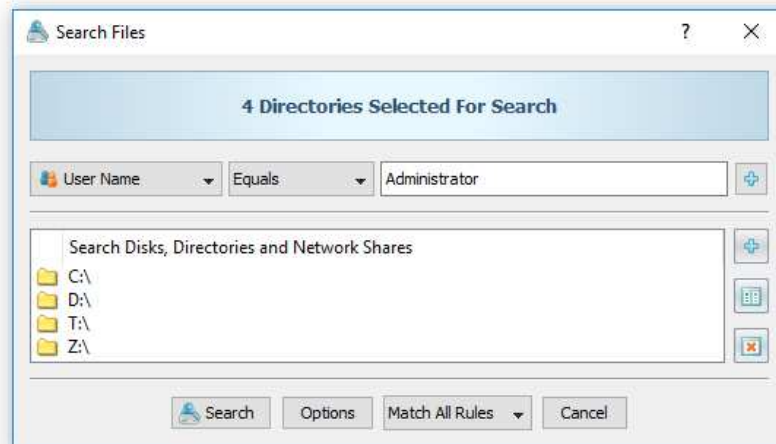
The user name comparison operator allows one to find user names matching, beginning with, ending with or containing the specified string pattern. In addition, negative comparison operators are provided as well. User name searches are case insensitive and the entered user name pattern string will match both low case and upper case letters.

6.14   Searching JPEG Images by EXIF Tags

DiskBoss provides a JPEG EXIF tags file matching rule allowing one to search JPEG images by standard and/or custom JPEG EXIF tags. In order to add a JPEG EXIF tags matching rule, press the 'Add' button, select the 'Search JPEG Images with EXIF Tag' rule, select the JPEG EXIF tag to match, select an appropriate comparison operator and enter the string value to search for.
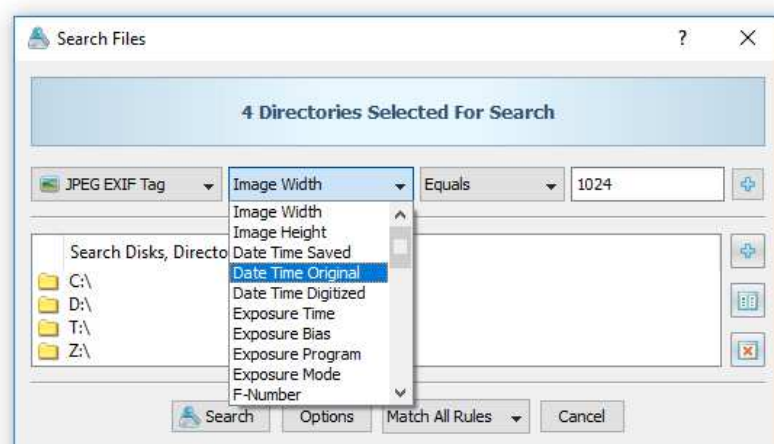
In addition to the ability to search for standard EXIF tags, users can customize the list of supported EXIF tags adding user-specific custom tags to the product configuration. In order to customize supported EXIF tags, select a JPEG image in the DiskBoss' file navigator, press the right mouse button and select the 'EXIF Viewer' menu item. On the EXIF viewer dialog, press the 'Customize' button and use the 'Add', 'Edit', 'Delete' buttons to customize the supported JPEG EXIF tags.

6.15   Integrating DiskBoss Search With External Tools

DiskBoss allows one to integrate external tools in the file search operations. The user is provided with the ability to specify which external tools, commands or script files to execute for which file extensions and then configure one or more text patterns to search in the output generated by the configured external tools.
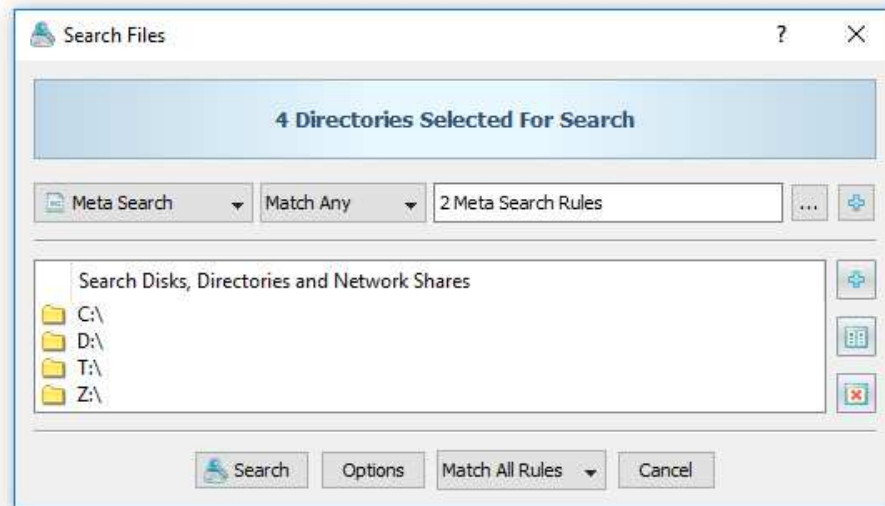
In order to configure a search operation to use an external tool, open the search dialog, select the 'Meta Search' rule type and press the 'Edit Rule' button. On the 'Meta Search' rule dialog, press the 'Add' button in the top view and specify one or more file extensions to process and a custom command to execute for each file with the specified extensions.
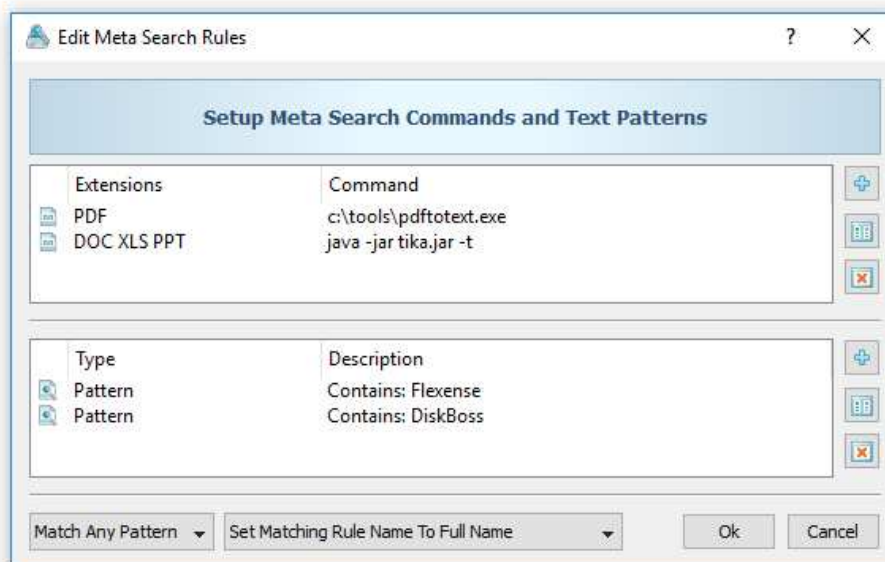
Once finished configuring file extensions and custom commands, press the 'Add' button in the bottom view and specify one or more text patterns to search in the output generated by the configured custom commands. During runtime, DiskBoss will scan the specified input directories, process all the existing files, execute the configured commands for each file with the specified file extensions and search for the user-specified text patterns in the output generated by the executed custom commands.

6.16   Using Hierarchical File Matching Rules

Nested, hierarchical file matching rules may be very useful when the user needs to find files related to multiple file categories and one or more additional criteria such as a specific file size or modification date.

In order to create a nested rule list, press the right mouse button over the top level rule list and select the 'Add Nested Rule List' menu item. On the nested rules dialog, add all the required file matching rules, select an appropriate logical operator and press the 'Ok' button. There are no limits on the number of nested levels and the user can create as many nested levels as required.
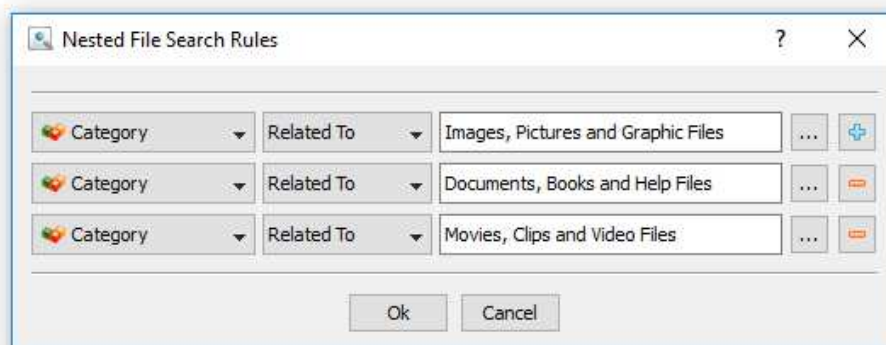
DiskBoss provides the ability to configure sophisticated file search queries with multiple levels of hierarchical file matching rules allowing one to precisely search files matching user-specific needs and then generate reports and/or perform file management operations on files matching the user-specified rules.

6.17   Saving File Search Reports

DiskBoss allows one to save file search reports into a number of standard formats including HTML, PDF, Excel, XML, text and CSV. In the simplest case, perform a file search operation and press the 'Save' button located on the file search results dialog. On the save report dialog, select an appropriate report format, enter a report file name and press the 'Save' button.
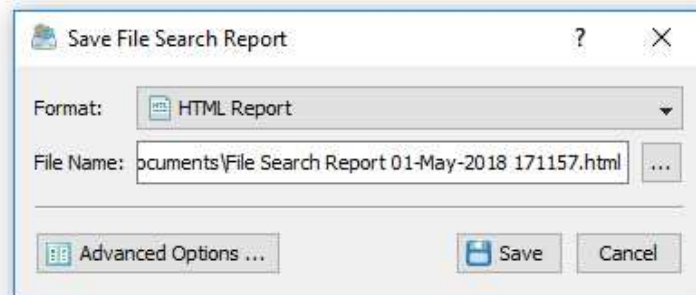
For the HTML, PDF, Excel, text, CSV and XML report formats, the user is provided with the ability to save short summary reports or longer detailed reports, which may be very long for large reports containing many thousands of files. By default, DiskBoss will save a short, summary file search report in the HTML report format, which will include a list of the first 20 file search results and a list of tables showing the disk space usage and the number of file search results per file extension, file type, top-level directory, user name, etc.
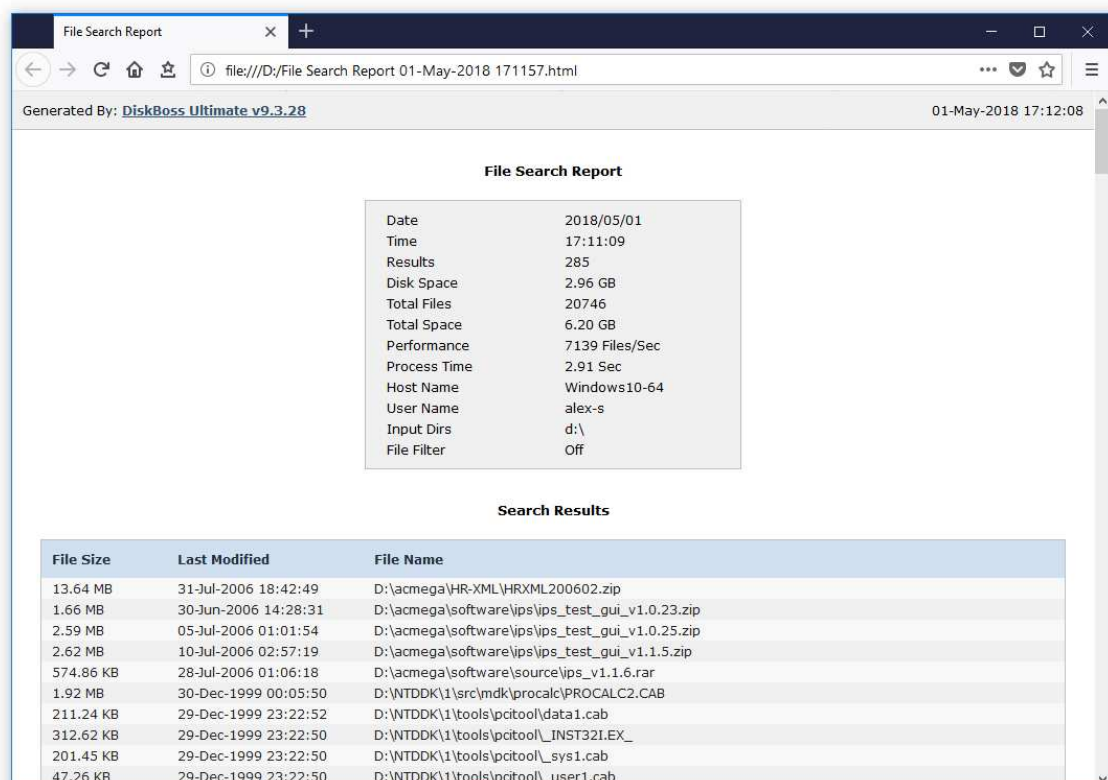
In addition, the user is provided with the ability to save file search results to the DiskBoss native report format, which preserves all information related to each specific file search operation and may be loaded at any time just by clicking on a report file in the DiskBoss file navigator.

Sometimes, it may be required to perform additional analysis of file search results using external tools such as Microsoft Excel. In order to export file search results to the Excel report format, perform a file search operation, press the 'Save' button located on the file search results dialog, select the 'Excel Summary' report format for a short summary report or the 'Excel Report' format for a detailed file search report.
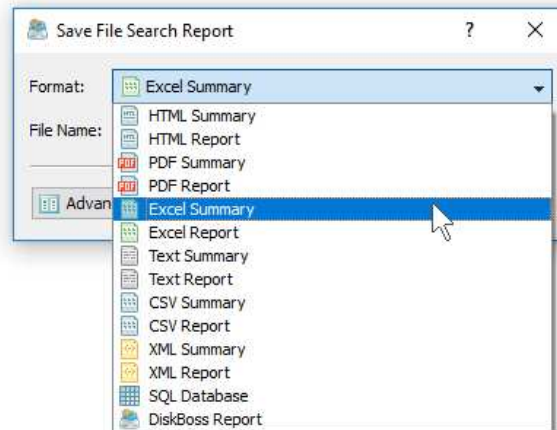
A summary Excel report will include a list of the first 20 file search results and a number of tables showing the used disk space and the number of file search results per file extension, file category, top-level directory, file creation time, last modification time, user name, etc.
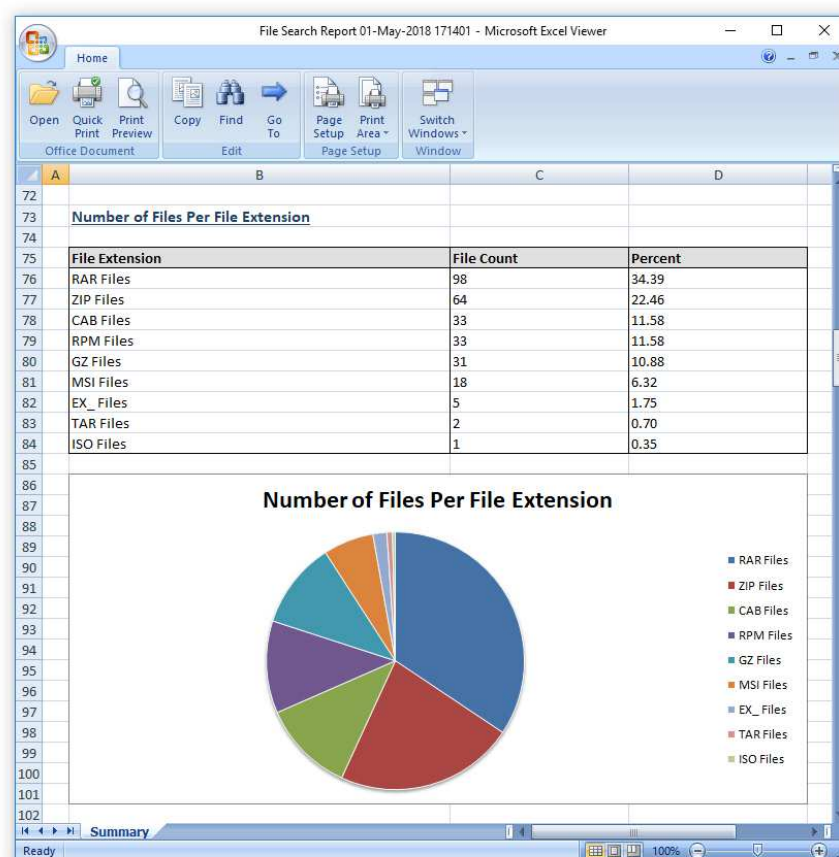
A detailed Excel report will include a list of file categories according to the currently selected file categorization mode and a full list of file search results, which may be very long for large reports containing many thousands of files. In order to control how many files are exported in the detailed report, press the 'Advanced Options' button located on the 'Save Report' dialog and customize the file search report for your specific needs.

One of the most useful ways to export file search results is to use the PDF summary or the PDF report formats. Both of these report formats include various types of graphical pie charts showing disk space usage and the number of file search results per file extension, file category, creation time, last modification time, top-level directory name, user name, etc. In order to save file search results to a PDF report file, press the 'Save' button located on the file search results dialog and select the 'PDF Summary' report format for a short, summary report or the 'PDF Report' format for a detailed file search report.
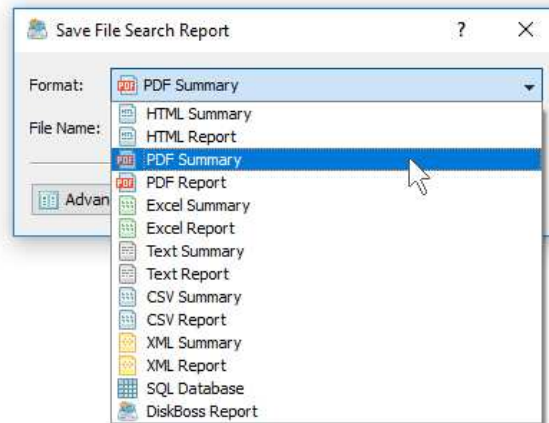
A summary PDF report will include a list of the first 20 file search results and followed by a number of pie charts showing the disk space usage and the number of file search results per file extension, file category, file creation time, last modification time, top-level directory name, user name, etc. A detailed PDF report will include a full list of file search results, which may be very long for large reports containing many thousands of files.
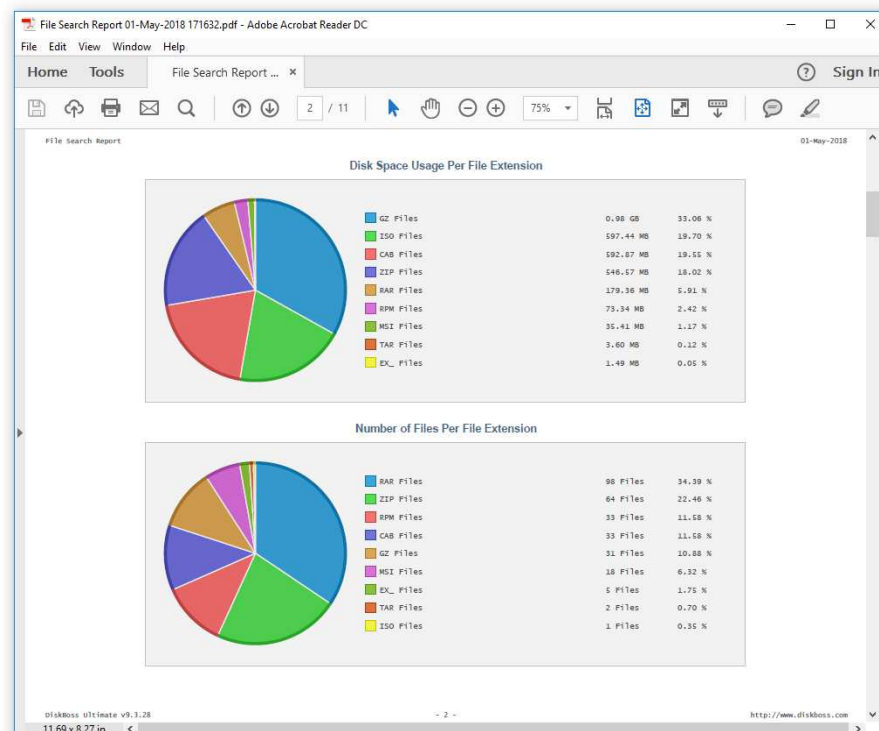
In addition to the list of file search results, detailed PDF reports include pie charts showing the disk space usage per file category and the number of file search results per file category according to the currently selected file categorization mode. For example, if the second-level file categories mode is set to categorize file search results by the file extension, the PDF report will display pie charts showing the used disk space and the number of files per file extension.

6.18   Exporting Reports to an SQL Database

DiskBoss Ultimate and DiskBoss Server allow one to save file search reports into an SQL database. A long-term history of file search reports from multiple servers and desktop computers may be submitted to a centralized SQL database and used to analyze file search results across the entire enterprise.
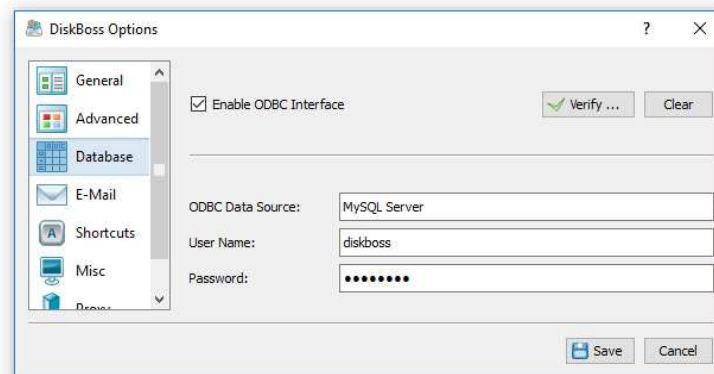
In order to be able to export reports to an SQL database, open the 'Options' dialog, enable the ODBC database interface and specify the name of the data source, database user name and password to use to connect to the SQL database.
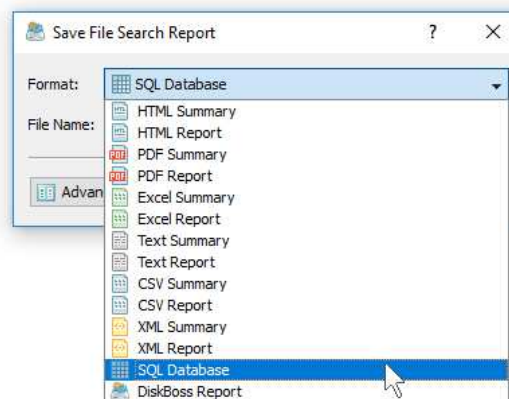
In order to export a file search report to an SQL database, press the 'Save' button located on the file search results dialog and select the 'SQL Database' report format. Optionally, press the 'Advanced Options' button and specify the number of file search results to be exported to the SQL database.
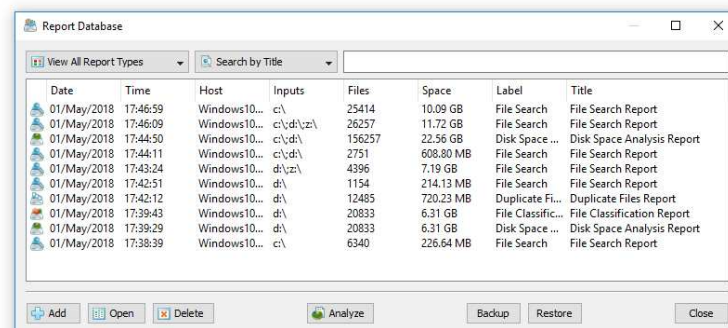
In order to open a previously saved report, press the 'Database' button located on the main toolbar and click on the required report item on the database reports dialog. For each report in the database, DiskBoss displays the report date and time, the host name, the input directories, the number of file search results, the total disk space and the report title.

6.19 Searching Files in Network Servers and NAS Storage Devices

DiskBoss allows one to scan the network, discover network servers and NAS storage devices, automatically detect all accessible network shares and search files in hundreds of network servers and NAS storage devices. In addition, the user is provided with the ability to export the list of detected servers and NAS storage devices (including lists of network shares for each server) into HTML, PDF, text and Excel CSV reports.
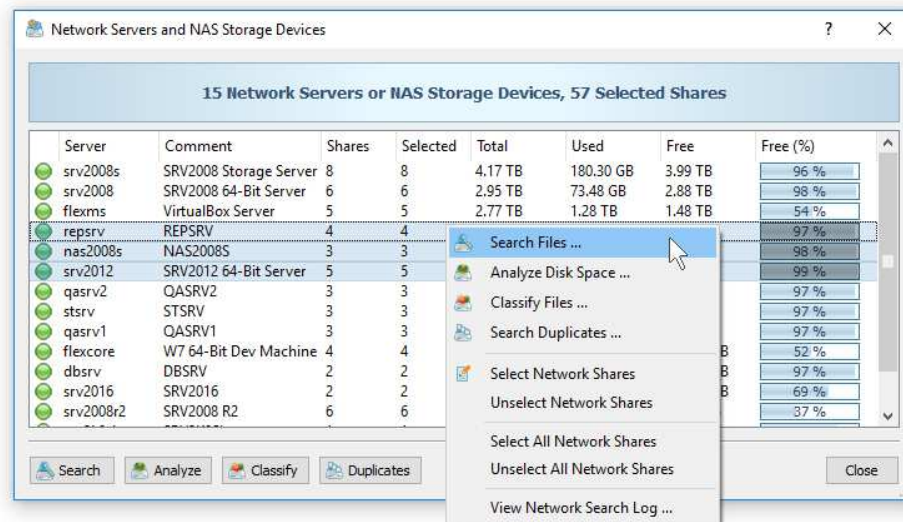
In order to search all network servers and NAS storage devices on the network, press the 'Network' button located on the main toolbar and wait while DiskBoss will scan the network and show a list of detected network servers and NAS storage devices. In order to search files in one or more servers or NAS storage devices, select the required servers and NAS storage devices and press the 'Search' button.
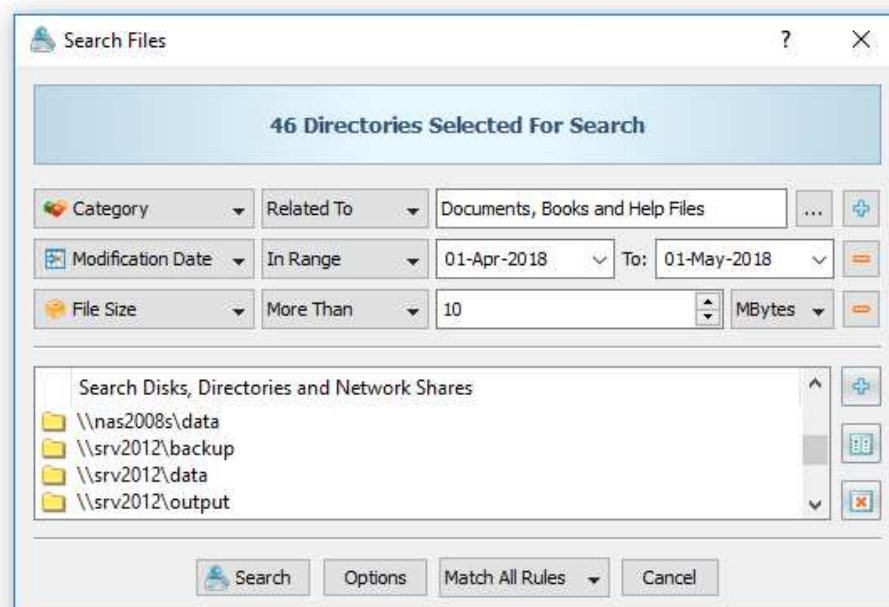
DiskBoss will show all accessible network shares hosted on the selected servers and NAS storage devices allowing one to search files and save various types of file search reports. In addition, the user is provided with the ability to customize a large number of advanced files search options allowing one to tune file search operations for user specific needs and hardware configurations.

6.20   Batch File Search Operations

DiskBoss Server and DiskBoss Enterprise provide the ability to execute one or more pre-configured file search commands on all network servers and NAS storage devices on the network and generate an individual file search report for each server and NAS storage device. In order to be able to use batch file search operations, the user needs to pre-configure one or more file search commands customized to generate file search reports according to user-specific needs and requirements.
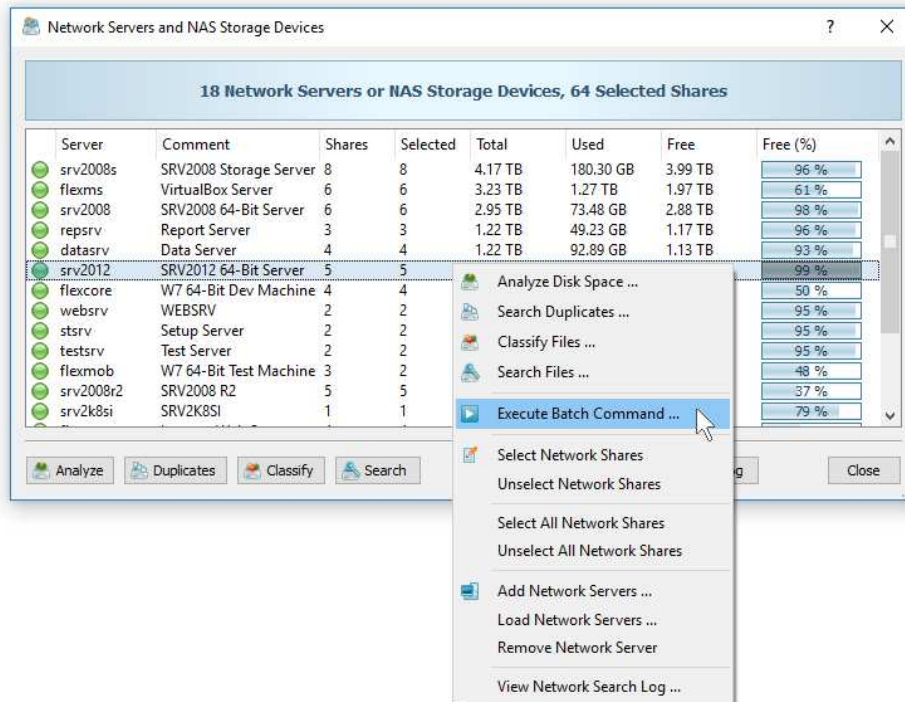
In order to start a batch file search operation, press the 'Network' button located on the main toolbar, search all servers and NAS storage devices on the network, select one or more servers and NAS storage devices, press the right mouse button and select the 'Execute Batch Command' menu item.
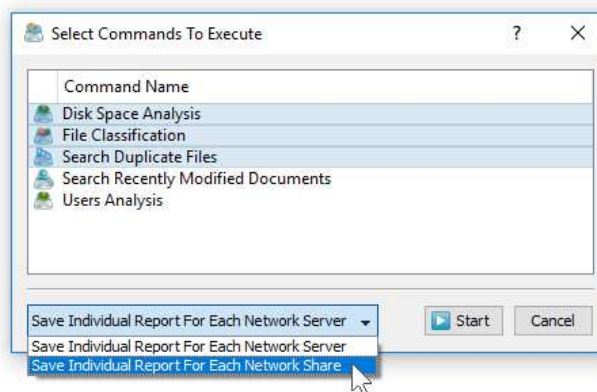
DiskBoss will display a list of preconfigured file search commands allowing one to select one or more commands to be executed on all selected servers and NAS storage devices. In addition, the user is provided with the ability to select how to save file search reports - for each server or for each network share. By default, all file search reports will be saved in the DiskBoss internal reports database allowing one to open each report, review results, generate various types of pie charts and export reports into a number of standard formats including HTML, PDF, text, Excel CSV and XML.

6.21 Excluding Subdirectories From File Search Process

Sometimes, it may be required to exclude one or more subdirectories from the file search process. For example, if you need to search files in a disk excluding one or two special directories, you may specify the whole disk as an input directory and add the directories that should be skipped to the exclude list.
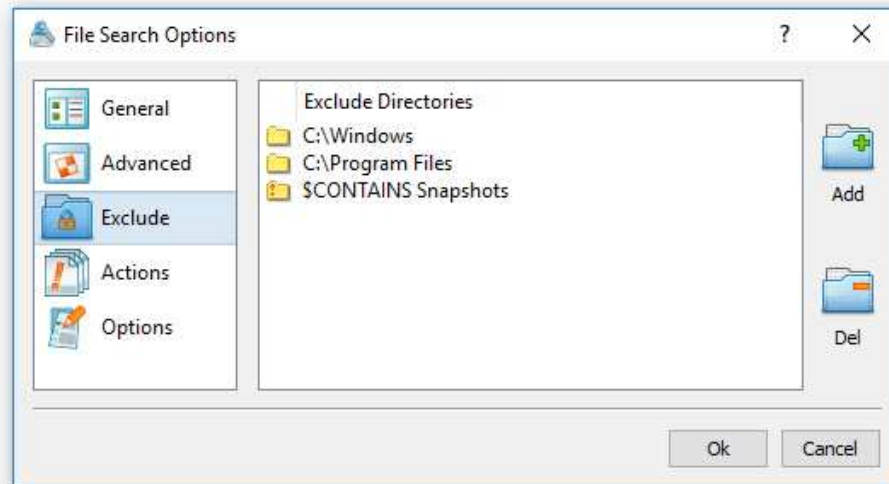
In order to add one or more directories to the exclude list, open the file search command dialog, press the 'Options' button, select the 'Exclude' tab and press the 'Add' button. All files and subdirectories located in the specified exclude directory will be excluded from the file search process. In addition, advanced users are provided with a number of exclude directories macro commands allowing one to exclude multiple directories using a single macro command.

DiskBoss provides the following exclude directories macro commands:

- **$BEGINS <Text String>** - this macro command excludes all directories beginning with the specified text string.
- **$CONTAINS <Text String>** - this macro command excludes all directories containing the specified text string.
- **$ENDS <Text String>** - this macro command excludes all directories ending with the specified text string.
- **$REGEX <Regular Expression>** - this macro command excludes directories matching the specified regular expression.
- **$DIRLIST <File Name>** - this macro command excludes all directories listed in the user-specified text file.
- **$FILELIST <File Name>** - this macro command excludes all files listed in the user-specified text file.

For example, the exclude macro command '$CONTAINS Temporary Files' will exclude all directories with 'Temporary Files' in the full directory path and the exclude macro command '$REGEX \.(TMP|TEMP)$' will exclude directories ending with '.TMP' or '.TEMP'.

6.22   Conditional File Search Actions, Commands and Notifications

DiskBoss Server and DiskBoss Enterprise provide the ability to automatically save reports, send e-mail notifications, trigger pre-configured file management commands or execute custom commands when a file search command finds a user-specified number of files. In order to configure one or more conditional file search actions, open the file search operation, press the 'Options' button, select the 'Actions' tab and press the 'Add' button.
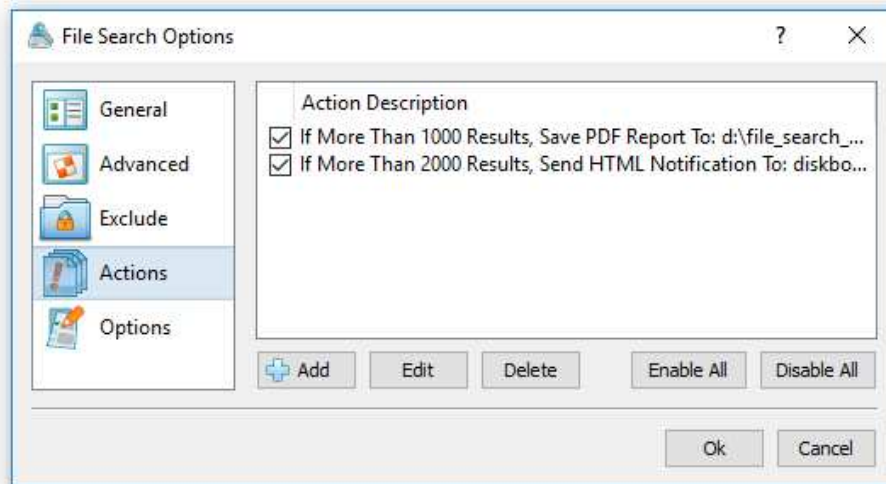
On the conditional file search action dialog, enter the number search results to trigger the action, select an appropriate action type and specify all the required parameters. For automatic reports generation actions, the user needs to specify an existing directory to save file search reports in. In order to be able to save file search reports to an SQL database, the user needs to open the main options dialog and configure an ODBC database to use to save report to the database. For e-mail notification actions, the user needs to specify an e-mail address to send e-mail notifications to and also configure an E-Mail account to use to send notifications on the main options dialog.
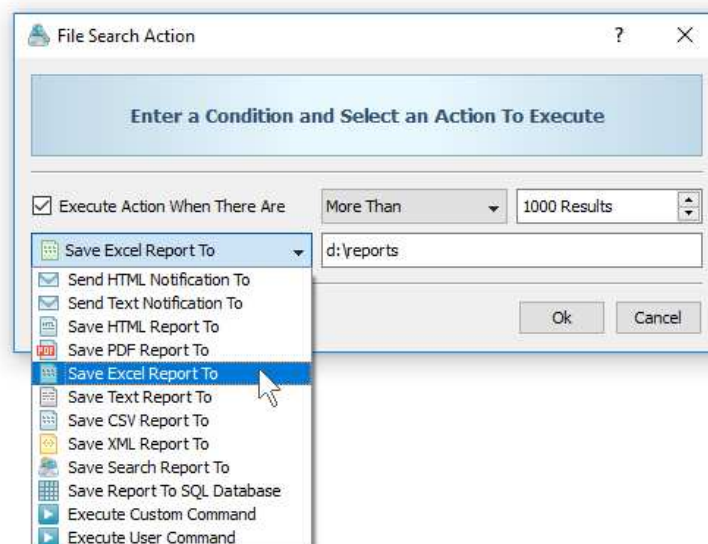
In addition, the user is provided with the ability to execute a pre-configured file management operation or a custom command. In this case, the user needs to specify the name of the command to execute. For example, the user may execute a pre-configured file delete command when there are too many specific files in a disk or directory, automatically delete old files and recover the free disk space.

6.23   Advanced File Search Options

DiskBoss provides a large number of advanced file search options allowing one to customize and tune file search operations for user-specific needs. The 'General, tab allows one to set the default report title, set the maximum number of search results to display and enable the display of files user names. The 'Advanced' tab provides a number of performance tuning options allowing one to intentionally slow-down file search operations in order to minimize the potential impact on running production systems. The 'Exclude' tab allows one to exclude one or more subdirectories from the file search process.
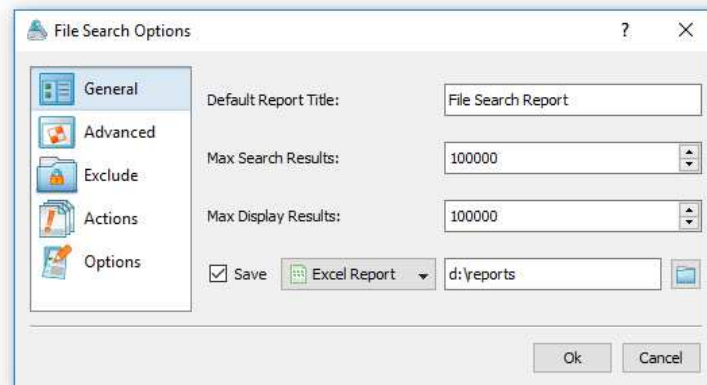
The 'Actions' tab provides the ability to configure one or more conditional file search actions allowing one to automatically save reports, send e-mail notifications, trigger pre-configured file management operations or execute custom commands when a file search operation finds a user-specified number of results.

6.24   Pre-Configured File Search Commands

One of the most powerful and flexible capabilities of DiskBoss is the ability to pre-configure custom file search operations as user-defined commands and execute such commands in a single mouse click using the DiskBoss GUI application or direct desktop shortcuts.
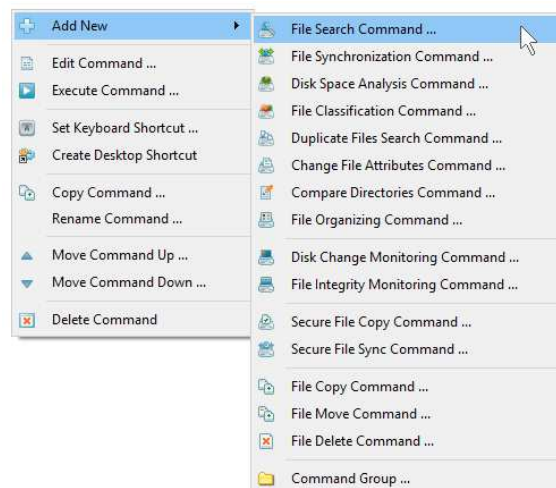
User-defined commands may be managed and executed through the commands dialog or the commands tool pane. In order to add a new command through the commands pane, press the right mouse button over the pane and select the 'Add New - File Search Command' menu item. In order to execute a previously saved command, just click on the command item in the commands tool pane or create a direct desktop shortcut on the Windows desktop.

6.25   Multi-Threaded File Search Performance

DiskBoss is optimized for modern multi-core and multi-CPU systems and is capable of searching files stored on multiple disks, directories or network shares in parallel using all CPUs installed in the computer. DiskBoss provides a number of different performance optimization options allowing one to tune the file search operations for user-specific hardware and storage configurations.
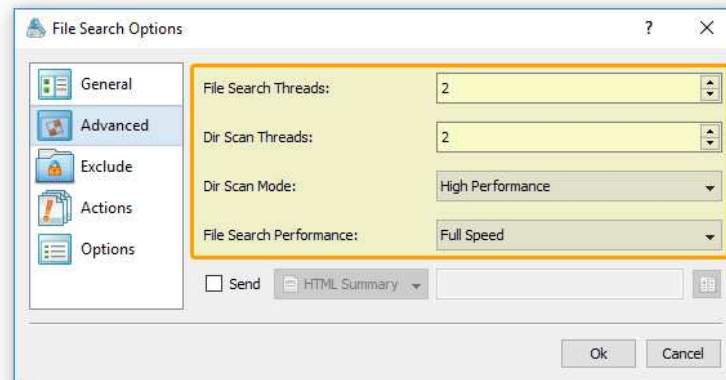
In order to customize the file search performance optimization options, open the file search operation dialog, press the 'Options' button and select the 'Advanced' tab. The 'File Search Threads' option controls how many parallel threads are used to search files. The 'Directories Scanning Threads' option controls how many parallel threads are used to scan input disks, directories and network shares. In the 'Fault-Tolerant' directory scanning mode, DiskBoss uses an individual processing thread for each input disk, directory or network share, but limits the maximum number of parallel scanning threads to the specified value. In the high-performance directory scanning mode, DiskBoss always uses the specified number of parallel directory scanning threads even when processing a single input disk, directory or network share.
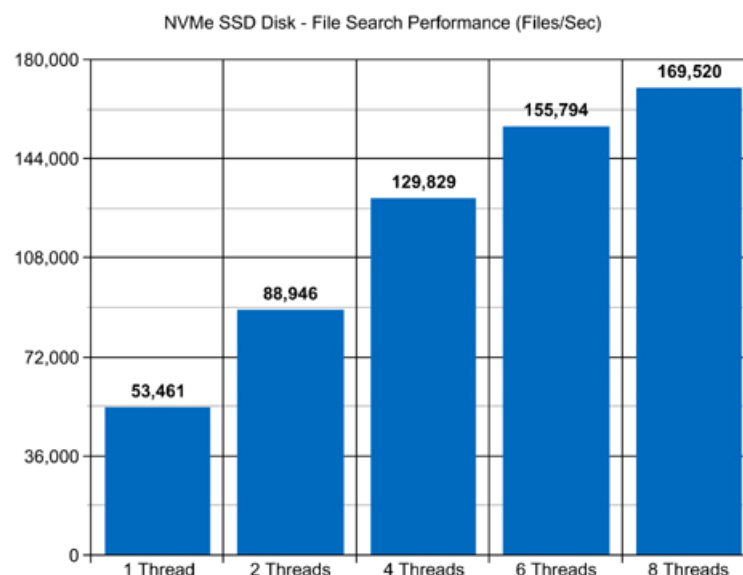
For example, when searching files stored on a high-speed NVMe SSD disk, DiskBoss reaches up to 53,000 files/sec using a single search thread. With two parallel search threads, the performance scales up to 88,000 files/sec and with four parallel search threads, the performance increases up to 129,000 files/sec showing a very good level of multi-threaded performance scalability. With six processing threads the file search performance reaches up to 155,000 files/sec and with eight processing threads the file search performance increases up to 169,000 files/sec allowing one to quickly search huge numbers of files.

When searching files stored on regular SATA SSD drives, which are significantly slower than NVMe SSD drives, the performance of the file search process reaches up to 25,000 files/sec using a single process thread and scales up to 62,000 files/sec with four parallel file search threads. With eight parallel file search threads, the performance reaches up to 72,000 files/sec, which allows to search large numbers of files very fast.
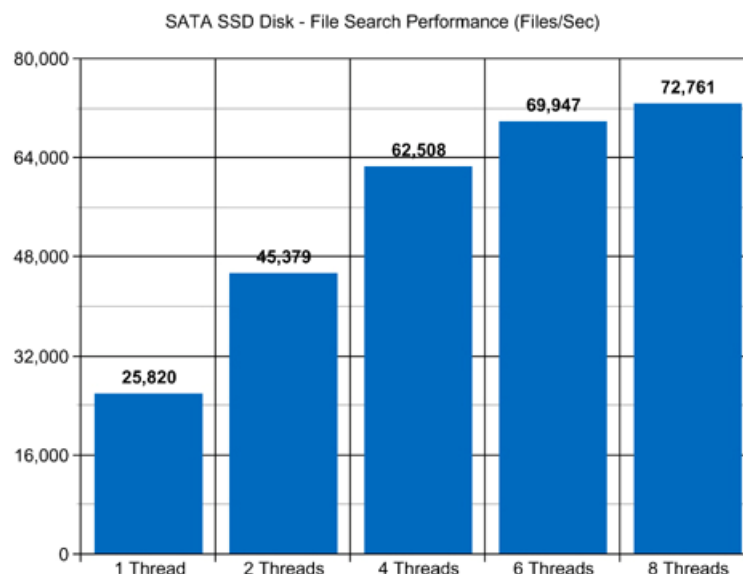
Searching file stored on a NAS storage device via a network is a more complicated task because the user needs to take into account the speed and the latency of the network. If the computer, on which DiskBoss is installed, is connected to the NAS storage device via a high-speed, low-latency network, the performance of the file search operations may reach up to 7,300 files/sec with one file search thread, scale up to 22,400 files/sec with four parallel file search threads and increase up to 32,100 files/sec with eight parallel search threads.
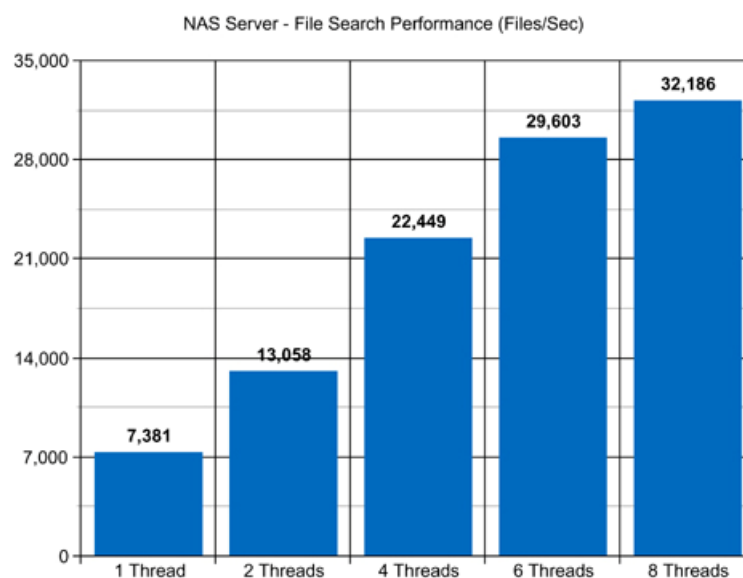
On the other hand, if DiskBoss will need to access network shares via the Internet or via a long-distance, high-latency network, the performance of the file search operations will be relatively slow. One of the options to increase the performance of the file search operations in such configurations is to set the 'High-Performance' directory scanning mode and increase the number of parallel file search threads to 16 or even 32 disregarding how many CPUs are actually installed on the computer.

Modern USB flash drives provide plenty of the storage space and are reasonably fast allowing one to store vast amounts of data for backup purposes. When searching files stored on a USB flash drive, DiskBoss can reach up to 9,500 files/sec with a single search thread. With two parallel search threads, the performance increases up to 10,700 files/sec, with four parallel threads the performance increases up to 12,900 files/sec and with six parallel file search threads the performance scales up to 13,500 files/sec.
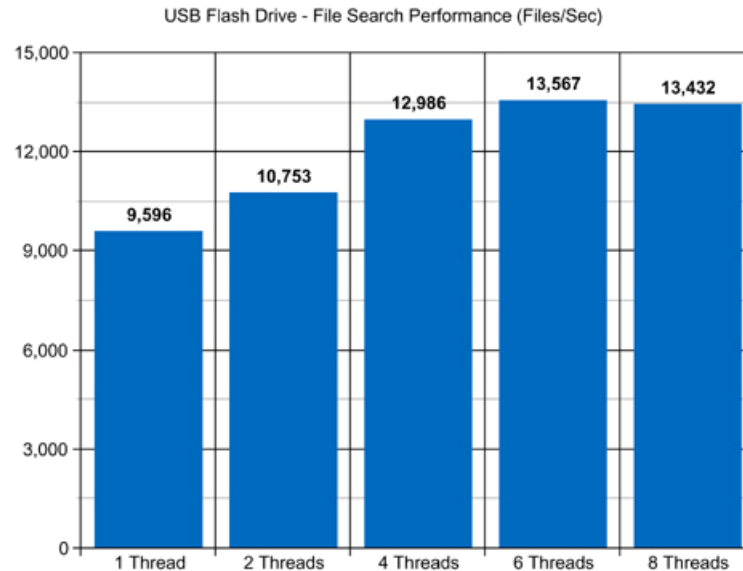
Today, modern IT environments widely deploy virtual servers and/or virtual workstations. Most of the popular virtualization platforms provide a high level of performance, but depending on the target hardware and software platforms, significant performance degradations are inevitable when a file search operation is executed on a guest virtual machine compared to the same file search operation executed directly on the host computer.
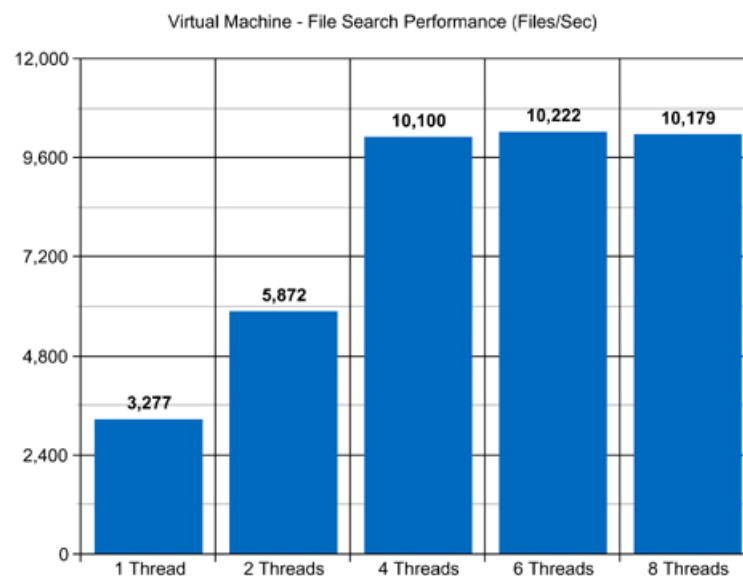
For example, when a virtual machine with 4 virtual CPUs is stored on an SSD disk and searching files stored on a virtual local disk drive, which is physically stored on the same SSD disk, the performance of the file search operations reaches up to 3,200 files/sec using a single search thread. With two parallel search threads, the performance of the file search operations scales up to 5,800 files/sec and with four parallel search threads, the performance of the file search operations increases up to 10,100 files/sec.

6.26   Searching Files Using the DiskBoss Command Line Utility

In addition to the DiskBoss GUI application, DiskBoss Ultimate and DiskBoss Server provide power computer users and IT administrators with the ability to execute user-defined file search operations from batch files and shell scripts using the DiskBoss command line utility, which is located in the '**ProductDir\bin**' directory.

Command Line Syntax:

diskboss –execute <Search Command Name>

This command executes a user-defined file search operation pre-configured using the DiskBoss GUI application or imported from an XML file.

diskboss -search –rules <XML File Name> -dir <Dir 1> … [<Dir X>] [<Options>]

This command executes XML search queries defined according to the DiskBoss XML-Based format using input directories and files specified in the command line. For detailed information about the XML format refer to the DiskBoss XML format specification.

Parameters:

-**dir** <Input Directory 1> [… <Input Directory X> -file <File 1> … <File X>]

This parameter specifies the list of input directories to process.

Options:

-**save_html_report** [ReportFileName]

This optional parameter instructs DiskBoss to save a summary report and the list of all search results to an external HTML file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_search_[date]_[time].html where [date] and [time] will be substituted by current date and time accordingly.

-**save_csv_report** [ReportFileName]

This optional parameter instructs DiskBoss to save a summary report and the list of all search results to an Excel CSV file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_search_[date]_[time].csv – just like with the HTML-formatted file.

-save_text_report [ReportFileName]

This optional parameter instructs DiskBoss to save a summary report and the list of all search results to a text report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template: diskboss_search_[date]_[time].txt

-**file_scanner** <sequential or parallel>

Specifies the file scanning mode: sequential or parallel. Use the parallel scanning mode when processing multiple input directories.

-**v**

This command shows DiskBoss' major version, minor version and revision.

–help

This command shows the command line usage information.

7   Rule-Based File Organizing

7.1   Organizing Files in a Disk or Directory

DiskBoss Ultimate and DiskBoss Server provide the ability to automatically organize and manage files according to user-specified rules and policies. DiskBoss allows one to configure one or more conditional file management operations such as the file copy, move, delete, link, compress or a user-custom command and execute these file management operations on files matching user-specified rules based on the file name, extension, type, category, size, user name, creation, last access or last modification date, text or binary patterns, etc.

For each file organizing command, the user is provided with the ability to specify a number of disks, directories and network shares to process, configure an unlimited number of conditional file management actions with each one performing a specific file management operation on files matching one or more user-specified rules. During runtime, DiskBoss will scan the specified disks, directories and network shares, evaluate all files using the user-specified rules and execute configured actions on files matching the rules.

By default, DiskBoss organizes files with a preview display allowing one to review and manually confirm each specific file organizing action before execution. Once a file organizing operation is fully tested and verified, the file organizing command may be configured to be executed without the preview display in a fully automatic mode. In addition to the ability to execute file organizing operations manually, DiskBoss Server provides the ability to schedule periodic file organizing operations and/or real-time file organizing operations triggered automatically after each X disk changes according to user-specific needs and requirements.

7.2   Configuring File Organizing Commands

In order to add a new file organizing command, press the right mouse button over the commands view and select the 'Add New - File Organizing Command' menu item. On the command name dialog, enter a unique command name and press the 'Ok' button. A number of different file organizing commands may be added to the DiskBoss configuration pre-configured to process different disks and directories and perform various file management operations.
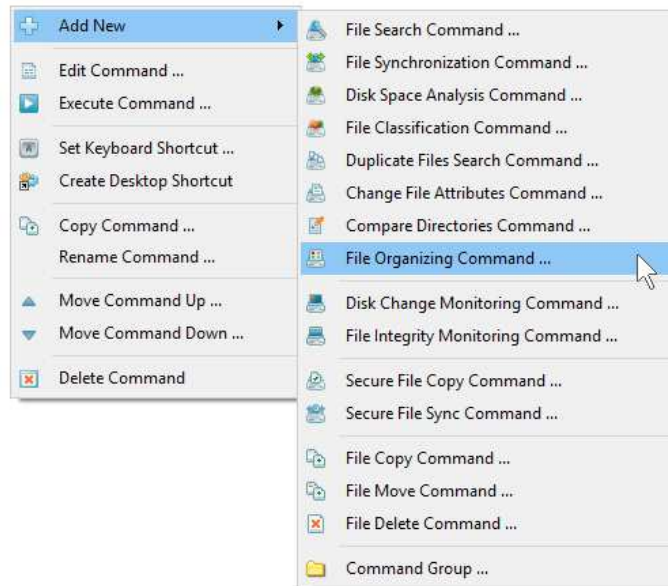
On the file organizing command inputs dialog, add one or more disks, directories or network shares to process. During the file organizing process, DiskBoss will scan the specified disks and directories, evaluate the user-specified file matching rules and execute configured actions on files matching the rules.
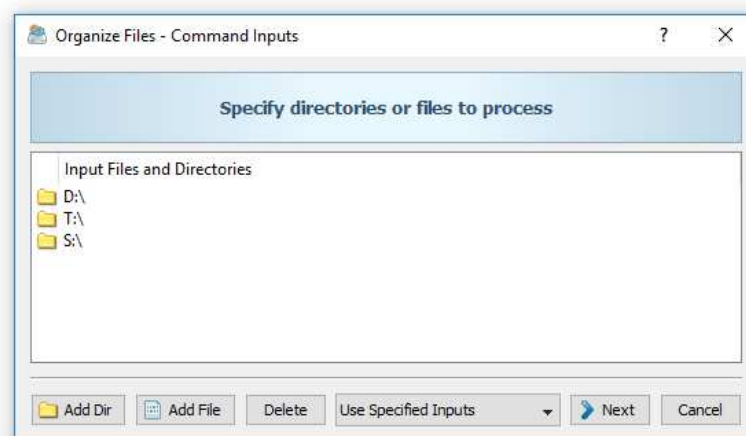
By default, DiskBoss will scan the specified disks and directories sequentially. But, for huge file systems containing a large number of directories and millions of files, DiskBoss provides the ability to perform parallel directory scanning and file management operations using a number of parallel threads. In order to configure parallel directory scanning and file management operations, open the file organizing options dialog, select the 'General' tab and specify how many parallel threads to use to scan directories and how many parallel threads to use to perform file management operations. Once finished configuring input disks and directories, press the 'Next' button.

The file organizing actions dialog, provides the ability to add a number of file organizing actions with each one configured to perform a specific file management operation on files matching one or more user-specified rules. in addition, the file organizing actions dialog, allows one to edit previously configured file management actions and customize advanced file organizing options.
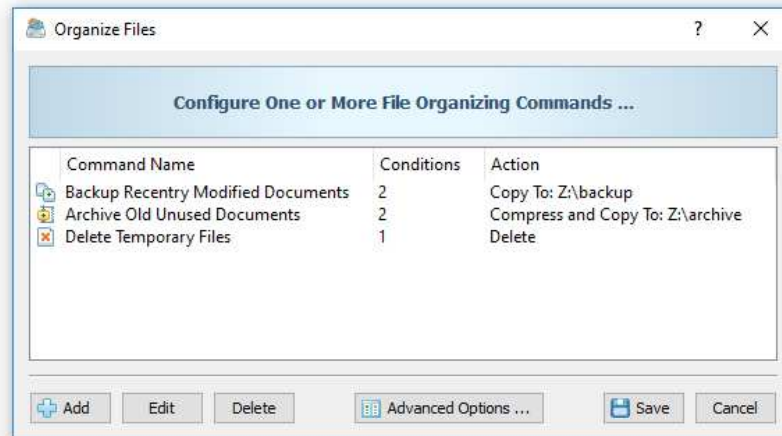
In order to add a conditional file management action, press the 'Add' button, select the file management operation to perform and add one or more file matching rules specifying on which files to perform the selected file management operation. During runtime, DiskBoss will evaluate files using the specified file matching rules in the same order as file organizing actions are configured in the file organizing command. When a file is matched by a conditional file organizing action, DiskBoss will execute the associated file management operation on the file and skip evaluation of remaining conditional file organizing actions.
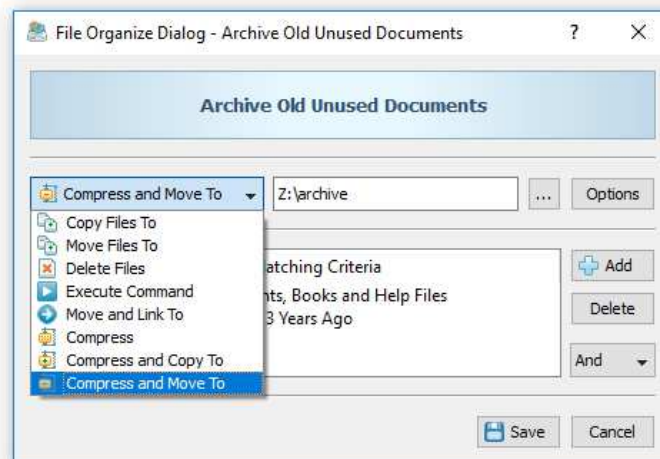
DiskBoss provides the following conditional file organizing actions:

- **Copy Files To** – copies matching files to the specified destination directory
- **Move Files To** – moves matching files to the specified destination directory
- **Delete Files** – deletes matching files, optionally wipes data from the disk
- **Execute Command** – executes the specified custom command on matching files
- **Move and Link To** – moves files and creates links pointing to the new location
- **Compress** – compresses matching files in-place
- **Compress and Copy To** – copies compressed files to the destination directory
- **Compress and Move To** – moves compressed files to the destination directory

7.3   Using File Matching Rules

DiskBoss provides a large number of different types of file matching rules allowing one to select files by the file name, extension, type, category, size, file attributes, text or binary patterns, JPEG EXIF tags, creation, last access and modification dates, etc. The user is provided with the ability to combine multiple types of file matching rules and apply logical AND/OR operators. Moreover, power users can define hierarchical file matching rules capable of precisely selecting the exact file type or groups of files according to user-specific needs.
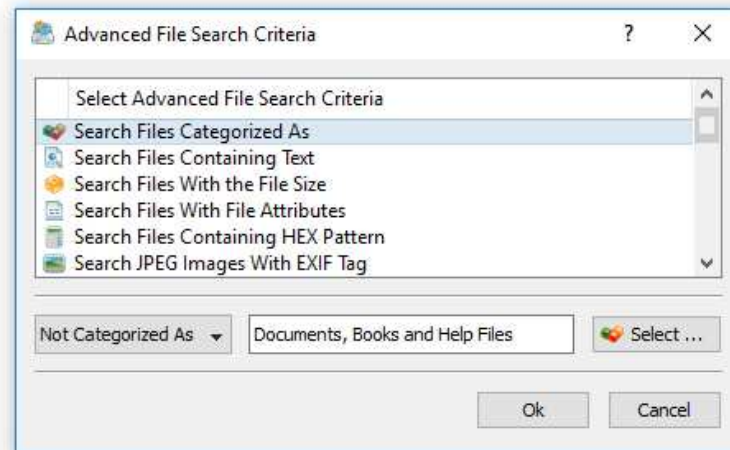
One of the most useful types of file matching rules is the 'File Category' rule, which is capable of selecting files by the file category or file type. DiskBoss includes a number of built-in file classification plug-ins capable of recognizing more than 3,500 types and categories of files allowing one to easily select specific types of files to perform file management operations on.
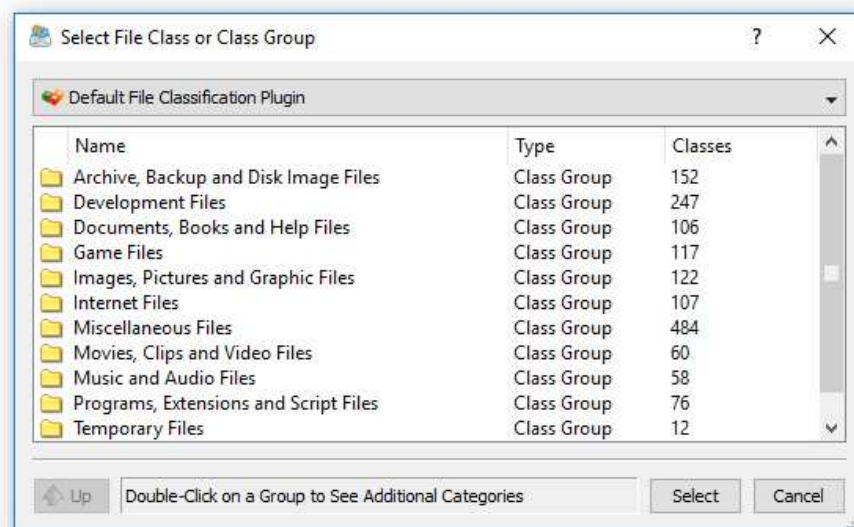
In order to add a file category rule, press the 'Add Rule' button, select the 'Search Files Categorized As' rule type, press the 'Select' button and select a file category or file type. In addition to positive file matching rules, allowing one to select which files to process, DiskBoss provides negative file matching rules capable of excluding specific types of files from the file organizing process. In order to add a negative, file matching rule, set the file category rule operator to 'Not Categorized As'. All files matching the specified negative rule, will be excluded from the file organizing process.

Another option to select files by the file type is to match files by the file extension. This option is especially useful for users required to process user-specific files not supported by the DiskBoss built-in file classification plug-ins. In order to add a file extension rule, press the 'Add Rule' button, select the 'Search Files With the File Extension', select an appropriate rule operator and enter one or more file extensions to match.
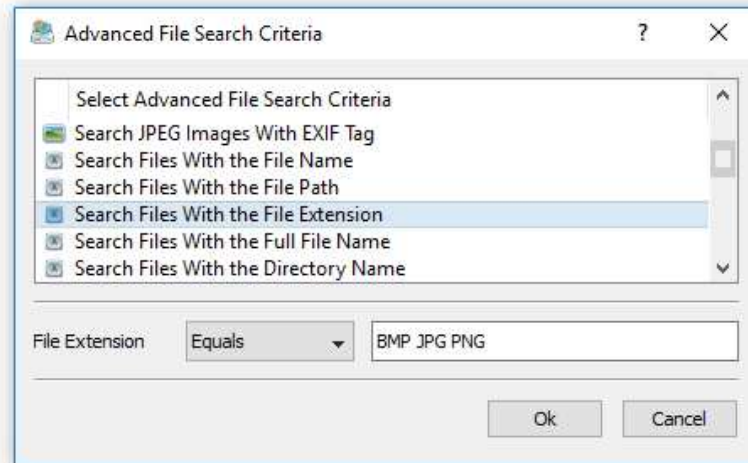
For positive file matching rules, if more than one file extension is specified, DiskBoss will match files with any of the specified file extensions. For negative file matching rules, if more than one file extension is specified, DiskBoss will exclude files with all of the specified file extensions. In a similar way, the user can match files by the file name, directory, file size, file attributes, creation, last access and last modification dates, etc.
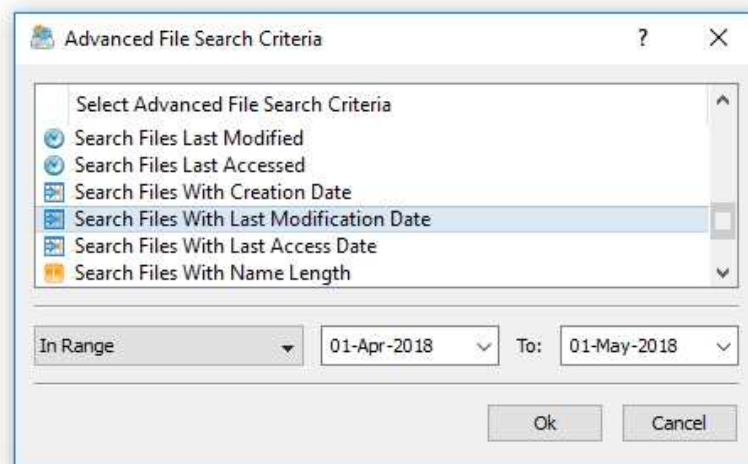
For users required to select files by the creation, last access or last modification dates, DiskBoss provides two different sets of file matching rules: the first one is capable of matching files by relative periods of time and the second one is capable of matching files using absolute dates. For example, a rule capable of matching files that were created or modified today is a relative rule, which will always properly match files disregarding of the current date. On the other hand, a rule matching files by a hard-coded range of dates is an absolute rule, which will produce different results as the time goes by and less files will match an old rule configured a long time ago.

7.4   Organizing Files With Preview

DiskBoss is capable of organizing files using two different modes: with preview and without preview. When the preview mode is enabled, DiskBoss scans the specified disks and directories, evaluates the configured file matching rules and displays a preview dialog showing a list of file management actions that should be performed allowing one to review and manually confirm each specific file management action.
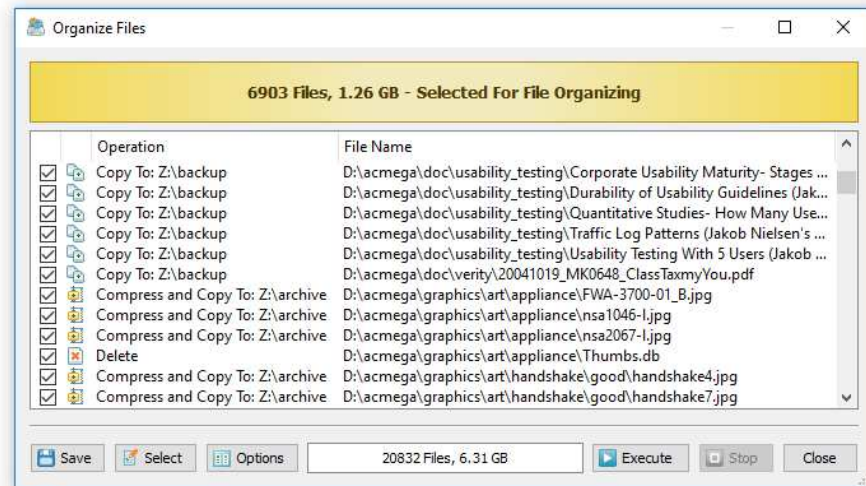
In addition, the user is provided with the ability export the list of file management actions to the HTML, text and Excel CSV report formats. Once finished reviewing file management actions, select actions that should be performed and press the 'Execute' button.

7.5   Organizing Files Without Preview

The preview mode is very useful for testing purposes, but sometimes it may be required to execute file organizing operations fully automatically without showing the preview dialog. For example, scheduled, periodic file organizing operations may be silently performed using DiskBoss Server, which runs in the background as a service and can execute file organizing operations in a fully-automatic, unattended mode.
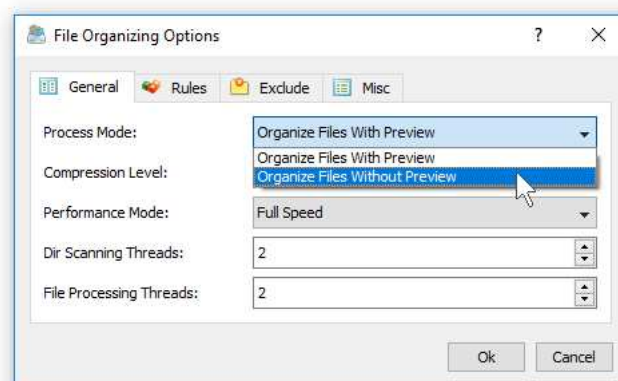
In order to disable the preview dialog for a file organizing command, open the file organizing command dialog, press the 'Options' button, select the 'General' tab and set the process mode to 'Organize Files Without Preview'. When the preview dialog is disabled, DiskBoss will scan the specified disks and directories, evaluate file matching rules and execute file management actions on-the-fly using a minimal amount of system memory, which is very important when processing huge file systems containing millions of files.

7.6   Saving File Organizing Logs

DiskBoss provides a number of different types of file organizing logs allowing one to keep track of executed file organizing tasks, performed file management actions and file management errors. In order to configure file organizing logs, open the file organizing command dialog, press the 'Options' button and select the 'Misc' tab.
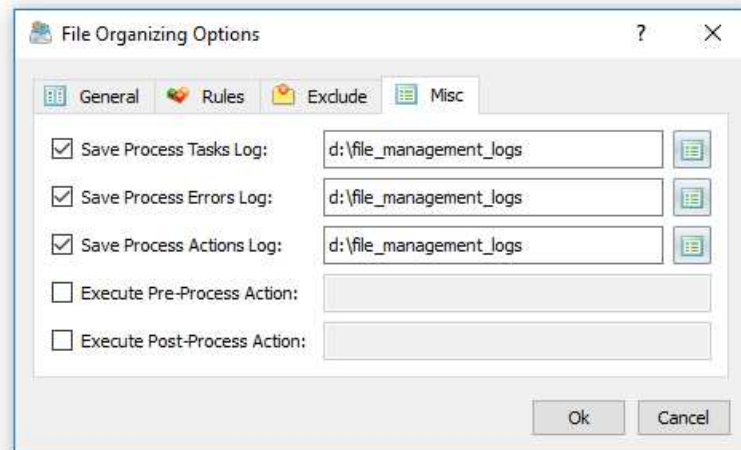
DiskBoss provides the following types of file organizing logs:

- **Process Tasks Log** - this log shows summary information about each executed file organizing task including the total number of scanned files, the amount of scanned disk space, the number of files processed by the configured file management actions, the amount of disk space processed by the configured file management actions, the number of file management errors and the file organizing task process time.
- **Process Errors Log** - this log shows file management errors for each file organizing task including the date and time of each error, error description and the full file name.
- **Process Actions Log** - this log shows all file management actions that were performed by a file organizing task. This log may be very useful for testing purposes, but for large file systems containing millions of files, this log may generate large log files containing very long lists of performed file management actions.

For each log, DiskBoss provides the ability to control the directory where to save all log files, the log file mode, the log file format and the number of history log files to keep in the log files directory. The user is provided with three different log files modes allowing one to save an individual log file for each file organizing task, a consolidated hourly log file, a consolidated daily log file or a consolidated monthly log file.
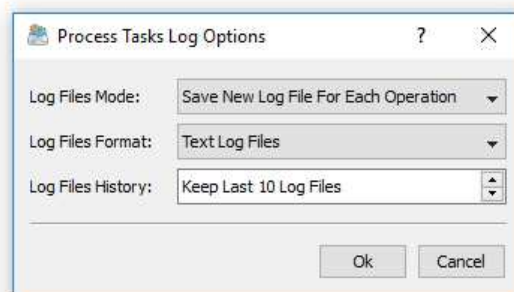
By default, DiskBoss will save log files in the plain text format, but also the user is provided with the ability to save log files in the Excel CSV format. Finally, DiskBoss allows one to control how many log files to keep in the log files directory.

7.7   Excluding Subdirectories From the File Organizing Process

Sometimes, it may be required to exclude one or more subdirectories from the file organizing process. For example, if you need to organize files in a disk excluding one or two special directories, you may specify the whole disk as an input directory and add the directories that should be skipped to the exclude list.
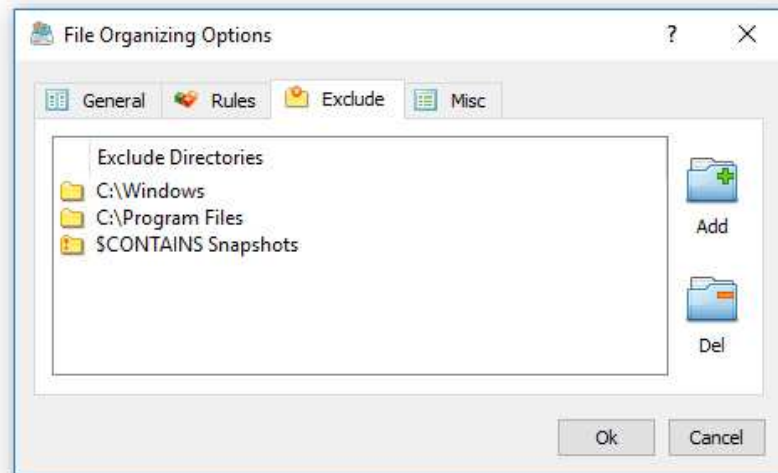
In order to add one or more directories to the exclude list, open the file organizing command dialog, press the 'Options' button, select the 'Exclude' tab and press the 'Add' button. All files and subdirectories located in the specified exclude directory will be excluded from the file organizing process. In addition, advanced users are provided with a number of exclude directories macro commands allowing one to exclude multiple directories using a single macro command.

DiskBoss provides the following exclude directories macro commands:

- **$BEGINS <Text String>** - this macro command excludes all directories beginning with the specified text string.
- **$CONTAINS <Text String>** - this macro command excludes all directories containing the specified text string.
- **$ENDS <Text String>** - this macro command excludes all directories ending with the specified text string.
- **$REGEX <Regular Expression>** - this macro command excludes directories matching the specified regular expression. **$DIRLIST <File Name>** - this macro command excludes all directories listed in the user-specified text file.
- **$FILELIST <File Name>** - this macro command excludes all files listed in the user-specified text file.

For example, the exclude macro command '$CONTAINS Temporary Files' will exclude all directories with 'Temporary Files' in the full directory path and the exclude macro command '$REGEX \.(TMP|TEMP)$' will exclude directories ending with '.TMP' or '.TEMP'.

7.8   Pre-Configured File Organizing Commands

One of the most powerful and flexible capabilities of DiskBoss is the ability to pre-configure custom file organizing operations as user-defined commands and execute such commands in a single mouse click using the DiskBoss GUI application or direct desktop shortcuts.
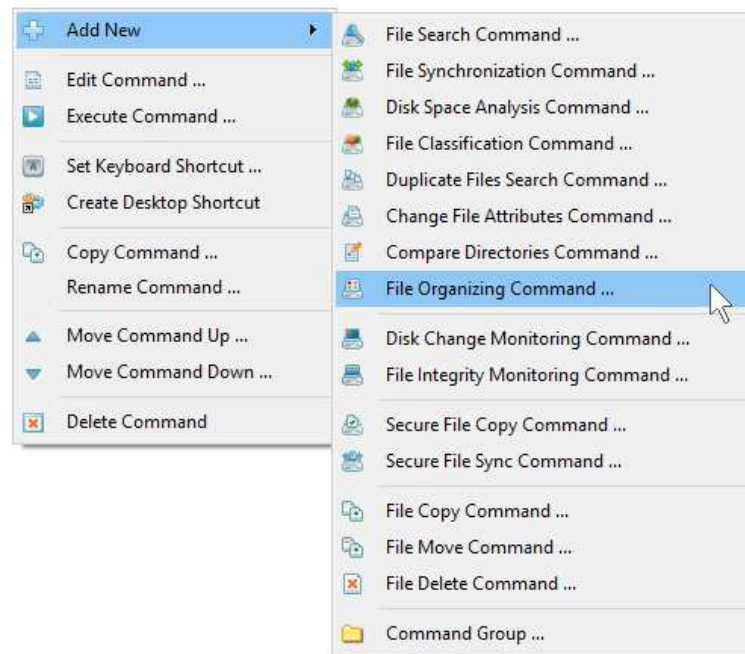
User-defined commands may be managed and executed through the commands dialog or the commands tool pane. In order to add a new command through the commands pane, press the right mouse button over the pane and select the 'Add New - File Organizing Command' menu item. In order to execute a previously saved command, just click on the command item in the commands view or create a direct desktop shortcut on the Windows desktop.

7.9   Organizing Files Using the DiskBoss Command Line Utility

In addition to the DiskBoss GUI application, power users and IT administrators are provided with the ability to execute pre-configured file organizing commands from batch files and shell scripts using the DiskBoss command line utility, which is located in the '**ProductDir\bin**' directory.

In order to execute a pre-configured file organizing command using the DiskBoss command line utility, open the command prompt window in the '**ProductDir\bin**' directory and type the following command:

diskboss –execute <File Organizing Command Name>

DiskBoss will execute the specified file organizing command and display the total number of files and the amount of disk space in the specified disks and directories and the number of files that were actually processed by the configured file management actions.

7.10   Fully Automated File Organizing Using DiskBoss Server

DiskBoss Server is a server-based version of DiskBoss, which runs in the background as a service and is capable of executing file organizing commands periodically at user-specified time intervals or automatically, triggered by real-time disk activities in one or more disks or directories. DiskBoss Server may be managed and configured locally or remotely through the network using a client GUI application or the DiskBoss command line utility.
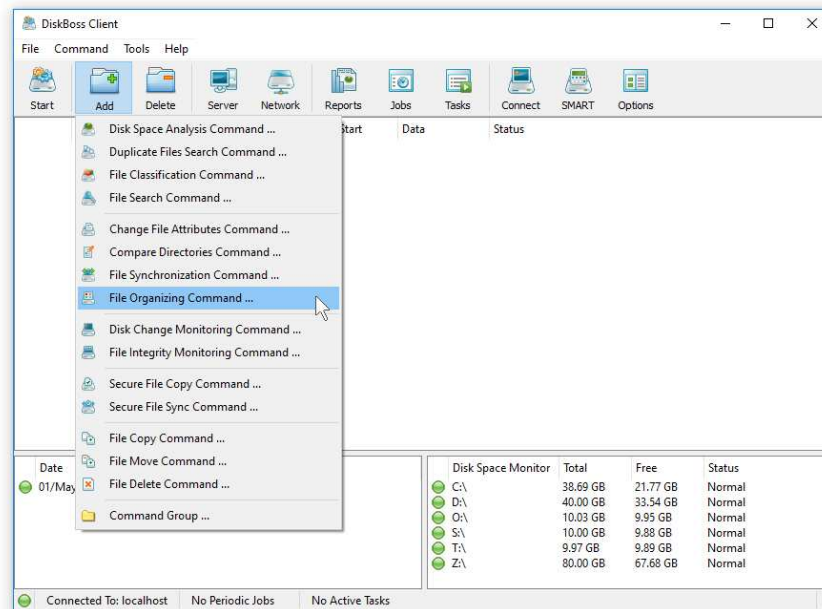
In order to create a file organizing command in DiskBoss Server, connect to the server using the DiskBoss client GUI application, press the 'Add' button located on the main toolbar and select the 'File Organizing Command' menu item. On the command name dialog, enter a unique command name and press the 'Ok' button. On the 'Command Inputs' dialog, specify disks and directories that should be processed and add one or more file organizing actions that should be executed.
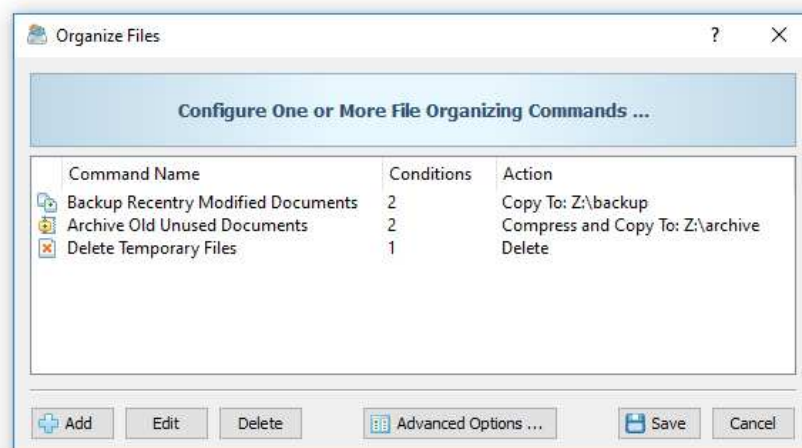
In the simplest case, create a new periodic job, configure the time interval the job should be executed at and set the periodic job to trigger the newly created file organizing command. In order to be able to execute the command fully automatically, set the command to execute without the preview dialog. Alternatively, create a disk change monitoring command and configure the disk change monitoring command to execute the file organizing command after each X file system changes.

7.11   Periodic Execution of File Organizing Commands

Sometimes, it may be required to execute one or more file organizing operations periodically at specific time intervals or according to a user-specified schedule. DiskBoss Server, which runs in the background as a service, provides the ability to periodically execute file organizing operations in a fully automatic, unattended mode.
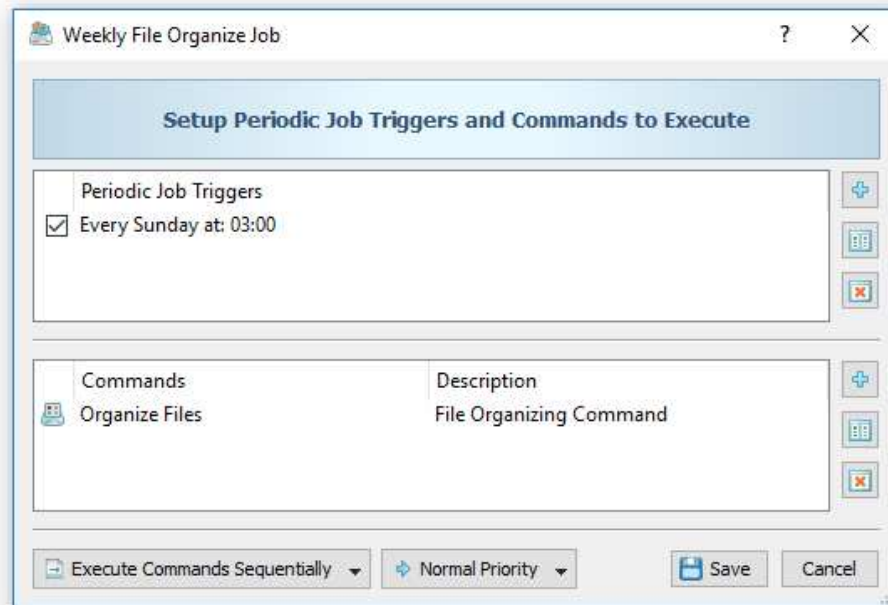
In order to schedule periodic execution of one or more file organizing commands, open the DiskBoss client GUI application, press the 'Jobs' button located on the main toolbar and press the 'Add' button to add a scheduled, periodic job. On the periodic job dialog, add one or more job triggers and select one or more file organizing commands to be executed.
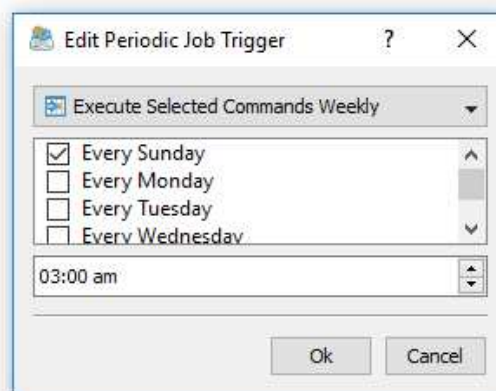
DiskBoss Server provides the ability to configure multiple triggers for each periodic job allowing one to precisely specify when the selected file organizing operations should be executed. For example, the user can configure simple periodic jobs to be executed every X minutes or hours, daily jobs to be executed every day at a specific time, weekly jobs to be executed on specific week days and monthly periodic jobs. In addition, DiskBoss allows one to combine multiple different types of periodic job triggers allowing one to apply different scheduled for different days of the week or days of the month.

7.12   Real-Time Execution of File Organizing Commands

DiskBoss Server provides the ability to monitor one or more disks or directories, detect all added and modified files and automatically trigger a file organizing operation after each X disk changes. In order to create a disk change monitoring command, open the DiskBoss client GUI application, press the 'Add' button and select the 'Disk Change Monitoring Command' menu item. Select the 'Command Inputs' dialog and specify disks and/or directories to monitor.
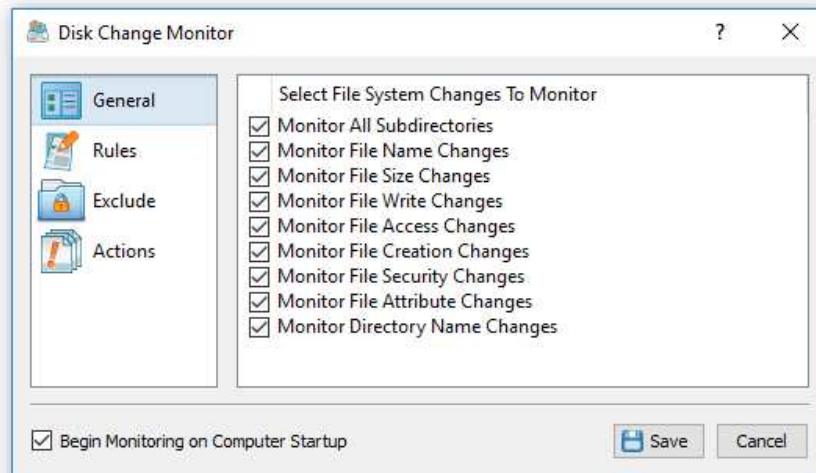
Select the 'Actions' tab, enable disk change monitoring actions, specify the number of changes to trigger the disk change monitoring actions, select the 'Execute DiskBoss Command' action and specify the name of the file organizing command to execute after each X disk changes.
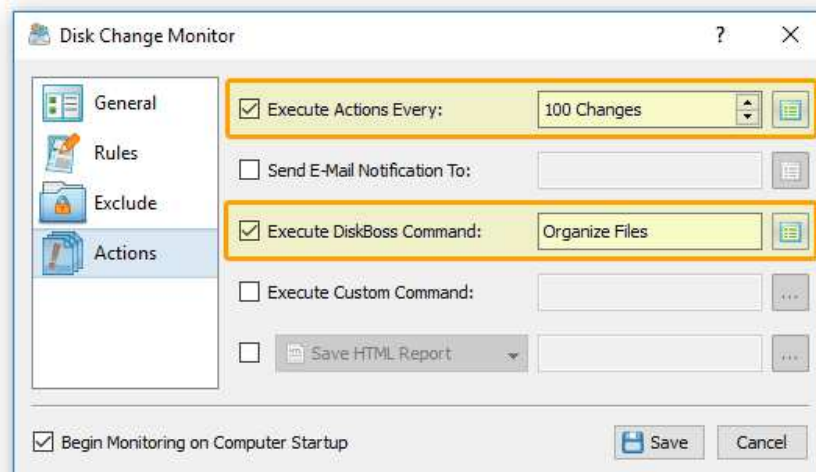
During runtime, DiskBoss will monitor the specified disks and directories, detect all added and modified files, trigger the selected file organizing command after each X disk changes, scan all existing directories and files, evaluate file matching rules and execute the configured file management actions on files matching the rules.

8   File Synchronization

8.1   Synchronizing Disks, Directories or Network Shares

DiskBoss provides advanced file synchronization capabilities allowing one to synchronize files between local disks, directories, network shares, NAS storage devices and enterprise storage systems. The DiskBoss file synchronization engine is capable of synchronizing files using multiple one-way and two-way file synchronization modes, provides performance tuning options, periodic and real-time file synchronization capabilities and allows one to synchronize specific file types and categories.

In order to synchronize a pair of directories, press the 'Sync' button located on the main toolbar, enter the source and destination directories and press the 'Preview' button. DiskBoss will scan the specified source and destination directories, compare files between the source and destination directories and show a list of file synchronization actions that should be performed.
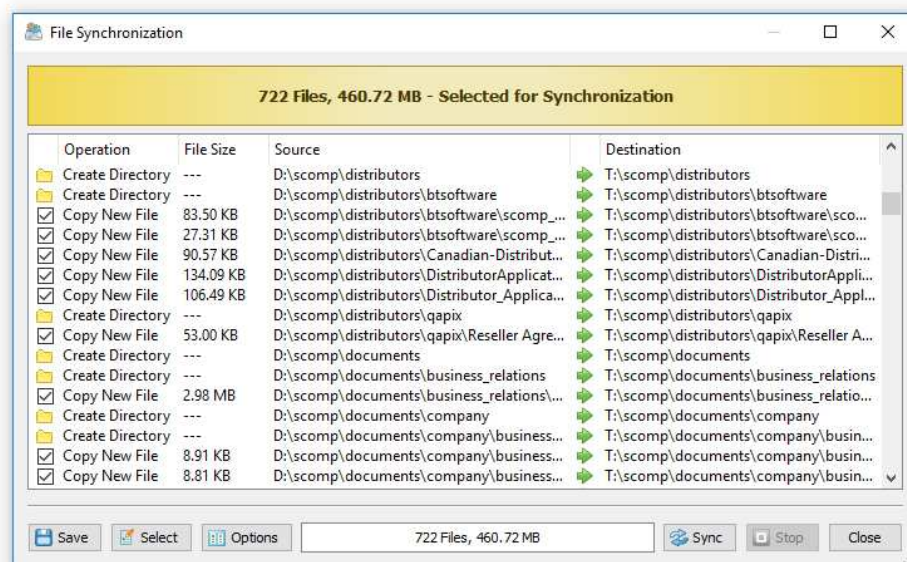
On the file synchronization preview dialog, review sync actions, select/unselect actions that should be performed and press the 'Sync' button to execute the selected file synchronization actions. Optionally, press the 'Options' button to control advanced file synchronization options or press the 'Export' button to save file synchronization actions to an HTML, XML, text or Excel CSV report. The DiskBoss file synchronization engine is especially optimized for modern hardware and storage devices and is capable of effectively utilizing RAID storage devices, multi-core/multi-CPU systems and Gigabit networks delivering maximum possible performance.

8.2   Selecting File Synchronization Mode

Depending on specific needs, it may be required to perform different types of file synchronization operations. For example, sometimes users may be interested in keeping all files in the destination directory even when some of them were deleted from the source directory. Another option is to perform two-way accumulation and update keeping both directories completely identical. DiskBoss provides eight different one-way and two-way file synchronization modes allowing one to perform different types of file synchronization operations according to user-specific needs and requirements.
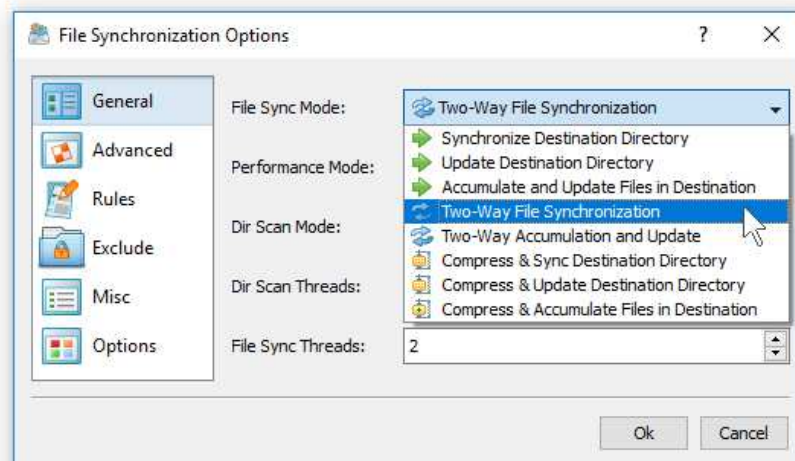
In order to change the file synchronization mode for a file synchronization command, open the file synchronization command dialog, select the 'General' tab and select one of the following file synchronization modes:

- **Synchronize Destination Directory** (one-way) - All changes made in the source directory will be propagated to the destination directory. Files deleted from the source directory will be deleted from the destination directory. All files changed or deleted in the destination directory will be restored using files from the source directory. No changes will be made in the source directory. After the file synchronization process is complete both locations will be identical.

- **Update Destination Directory** (one-way) - Newly created and modified source files will be copied to the destination directory. Files deleted from the source directory will be deleted from the destination directory. Files deleted from the destination directory will be restored using files from the source directory. Newly created and modified destination files will be kept in place. No changes will be made in the source directory.

- **Accumulate and Update Files in Destination** (one-way) - Newly created and modified source files will be copied to the destination directory. Files deleted from the destination directory will be restored using files from the source directory. Newly created and modified destination files will be kept in place. No files will be deleted from the destination directory. No changes will be made in the source directory.

- **Two-Way File Synchronization** - Newly created and modified files will be synchronized in both directions. Files deleted from the source directory will be deleted from the destination directory. Files deleted from the destination directory will be restored from the source directory. Changes may be made in both locations. After the file synchronization process is complete both locations will be identical.

- **Two-Way Accumulation and Update** - Newly created and modified files will be updated in both directions. Files deleted from one location will be restored from the second location. Changes may be made in both locations. After the file synchronization process is complete both locations will be identical.

8.3   Synchronizing Files with Preview

File synchronization with preview is very useful providing the user with a clear picture about what files will be synchronized. By default, DiskBoss synchronizes directories with preview, but the user is provided with the ability to disable the preview mode and synchronize all the required files on-the-fly without showing the preview dialog.
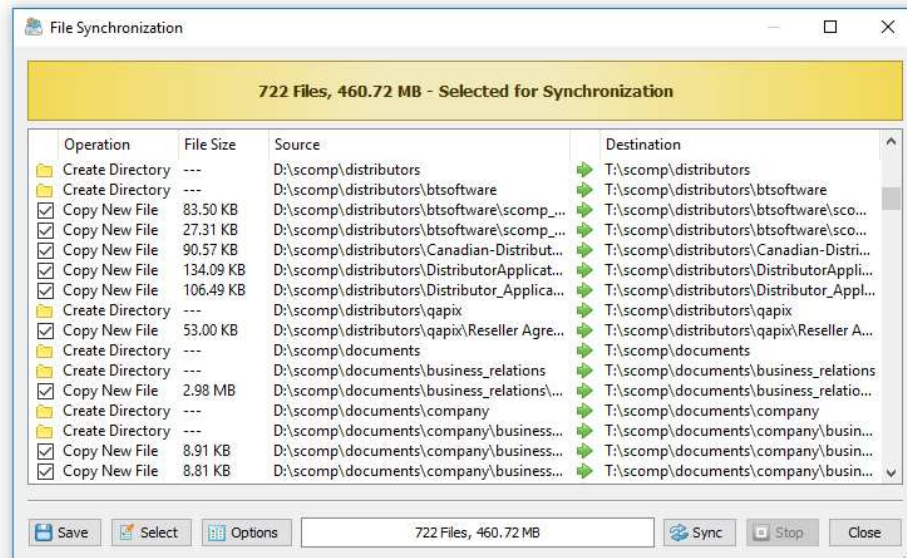
8.4   Synchronizing Files Without Preview

Sometimes, when the user needs to synchronize large directories or disks containing many thousands of files, file synchronization with preview may be ineffective or completely inappropriate especially due to the fact that none will have the time to review lists of file synchronization actions containing huge amounts of items. Moreover, unattended file synchronization operations performed periodically at specific time intervals or triggered by a disk change monitor, should be performed fully automatically without requiring any user intervention.

In order to disable the preview dialog for a file synchronization operation, open the operation dialog and set the process mode combo box to 'Sync Without Preview'. The stream file synchronization more is especially designed for file systems containing huge amounts of files and is capable of synchronizing large directories, disks and NAS storage devices very fast and effectively. In addition, the stream file synchronization mode is ideal for automated, periodic file synchronization operations performed in the background without any user intervention.

8.5   Synchronizing Specific File Types or Categories of Files

DiskBoss provides the ability to synchronize specific types of files or file groups using one or more user-specified file matching rules. For example, the user can synchronize all types of documents, images and music files, while skipping all other types of files from the file synchronization process. In order to add one or more file matching rules to a file synchronization command, open the file synchronization options dialog, select the 'Rules' tab and press the 'Add' button. On the 'Rules' dialog select an appropriate rule type and specify all the required parameters.
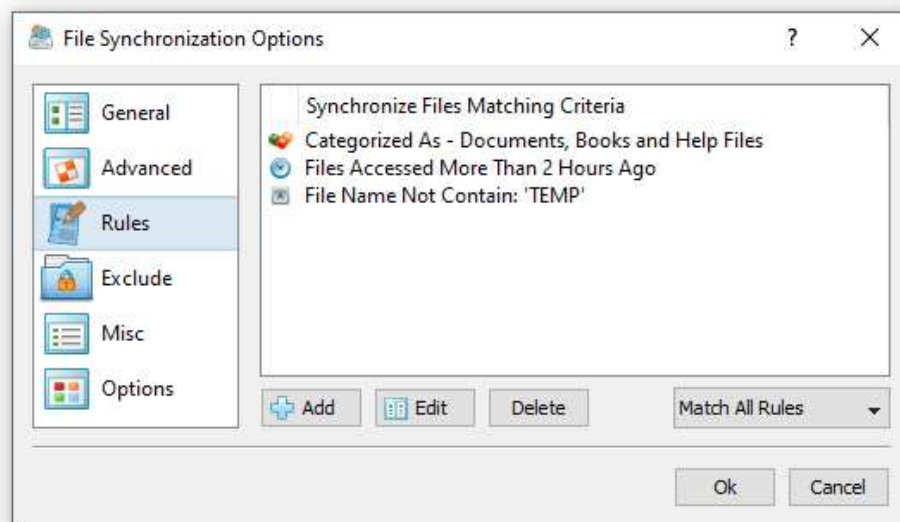
During the file synchronization process, DiskBoss will scan the source and destination directories and apply the specified file matching rules to all processed files. Files not matching the specified rules will be skipped from the file synchronization process effectively limiting the file synchronization operation to the user-specified files only.
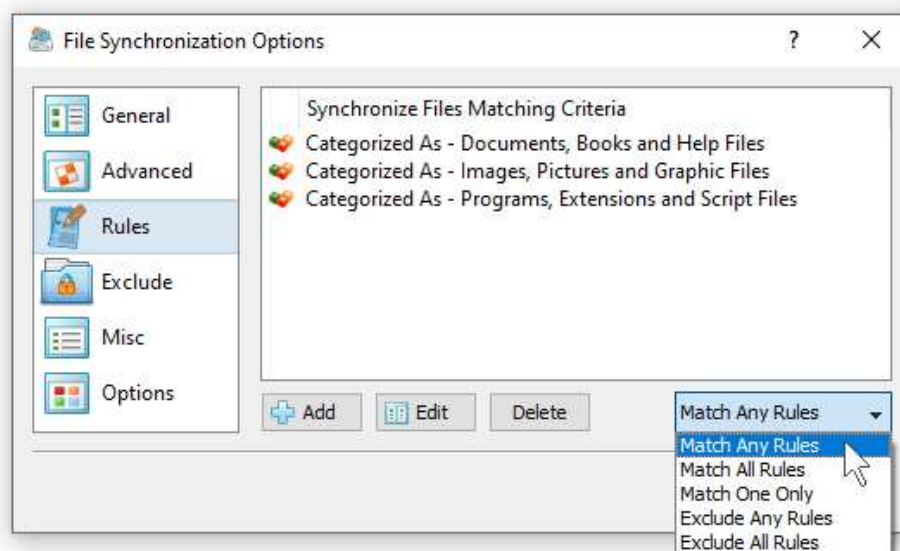
Sometimes, it may be required to synchronize a number of different types of files and skip all the other files. In this case, the user can add multiple file matching rules with each one selecting a specific type of files and then set the rules logic to 'Match Any Rules'.

Another option to specify which types of files to synchronize is to use the file extension rule, which provides the ability to select files by one or more file extensions. Press the 'Add' button on the 'Rules' tab, select the 'File Extension' rule type, set the rule operator to 'Equals' and enter up to 6 file extensions per rule to match.
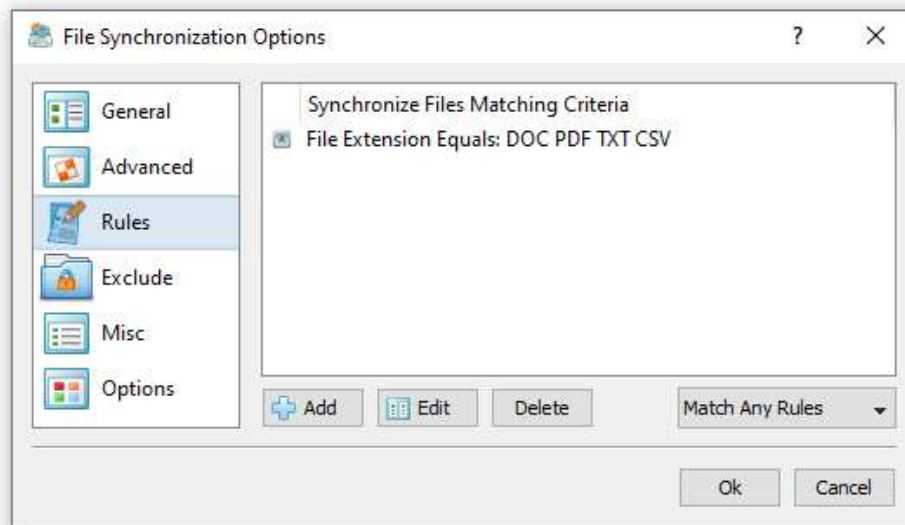
In addition to the positive file matching rules, which are good to synchronize user-selected types of files, DiskBoss provides negative file matching rules allowing one to exclude specific types of files from the file synchronization process.
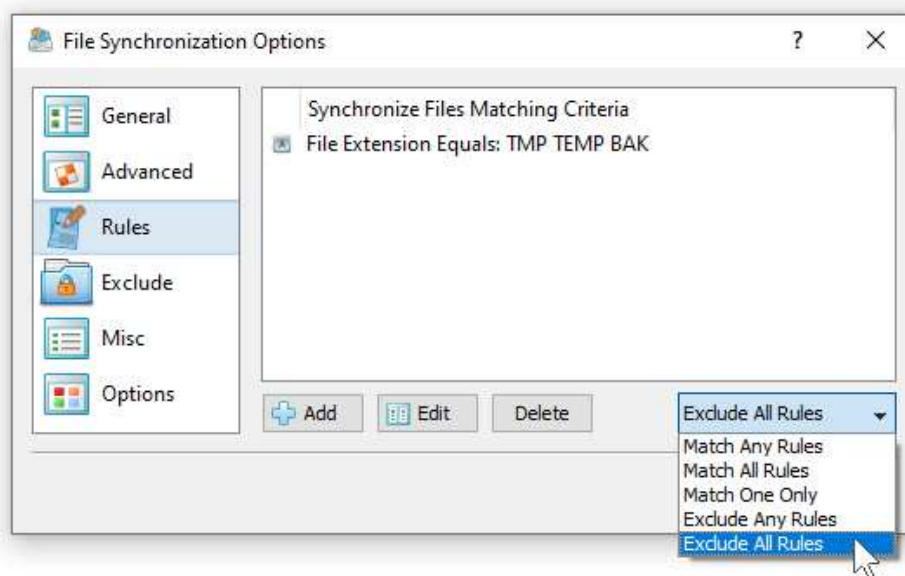
In general, all types of file matching rules provide negative operators allowing one to exclude files by the file name, extension, file type, location, size, file attributes, file creation and modification dates, etc. For example, in order to exclude temporary and backup files by the file extension, add the file extension rule, set the rule operator to 'Equals', set the list of file extensions to 'TMP TEMP BAK' and then set the rules logic to 'Exclude Any Rules'.

8.6   Exclude Directories From File Synchronization

Sometimes, it may be required to exclude one or more subdirectories from the file synchronization process. For example, if you need to synchronize two directories excluding one or two special subdirectories, you may specify the top level directories as the source and destination directories and add the subdirectories that should be skipped to the exclude list.
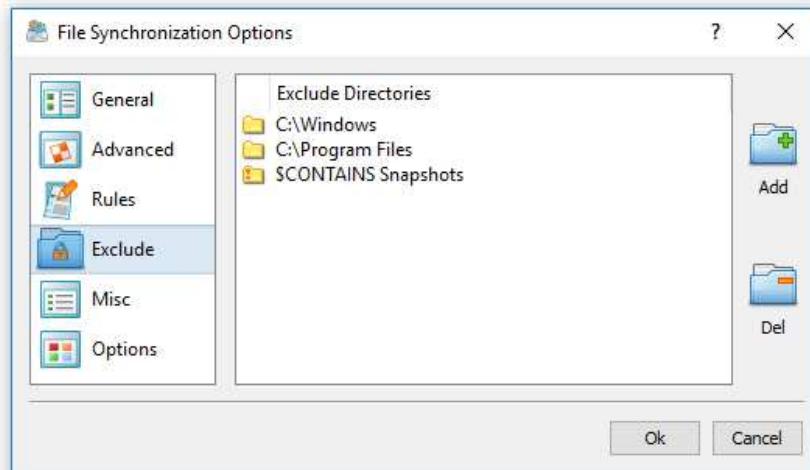
In order to add one or more directories to the exclude list, open the file synchronization command dialog, press the 'Options' button, select the 'Exclude' tab and press the 'Add' button. Keep in mind that exclude directories are case sensitive and should be specified with the same case as stored on the disk. All files and subdirectories located in the specified exclude directories will be excluded from the file synchronization process. Select an exclude directory and press the 'Delete' button, to remove the selected directory from the exclude list.

In addition, advanced users are provided with a number of exclude directories macro commands allowing one to exclude multiple directories using a single macro command.

DiskBoss provides the following exclude directories macro commands:

- **$BEGINS <Text String>** - this macro command excludes all directories beginning with the specified text string.
- **$CONTAINS <Text String>** - this macro command excludes all directories containing the specified text string.
- **$ENDS <Text String>** - this macro command excludes all directories ending with the specified text string.
- **$REGEX <Regular Expression>** - this macro command excludes directories matching the specified regular expression.
- **$DIRLIST <File Name>** - this macro command excludes all directories listed in the user-specified text file.
- **$FILELIST <File Name>** - this macro command excludes all files listed in the user-specified text file.

For example, the exclude macro command '$CONTAINS Temporary Files' will exclude all directories with 'Temporary Files' in the full directory path and the exclude macro command '$REGEX \.(TMP|TEMP)$' will exclude directories ending with '.TMP' or '.TEMP'.

8.7   Advanced File Synchronization Options

DiskBoss provides a large number of advanced files synchronization options allowing one to tune the performance of file synchronization operations, control the file copy recovery and fault tolerance options, select which file meta data to copy, etc. In order to access the performance tuning options, open the file sync command dialog, press the '**Options**' button and select the '**General**' tab.
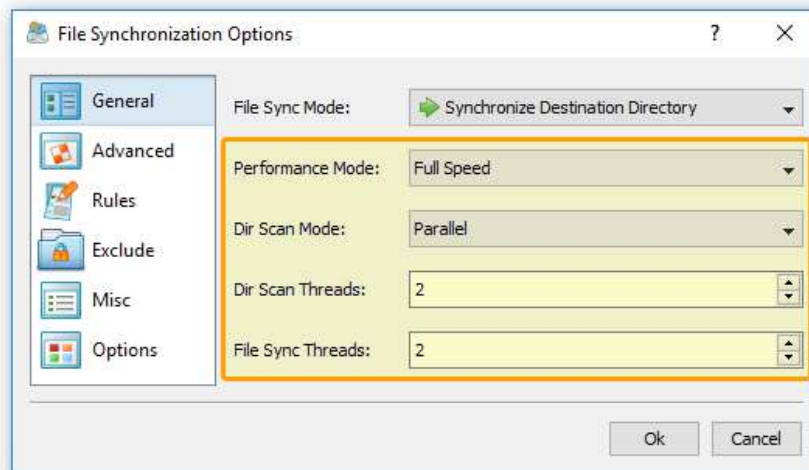
- **Performance Mode** - the performance mode allows one to select one of the following modes: Full Speed, Medium Speed and Low Speed. The performance mode provides the ability to intentionally slow down the performance of the file sync operation in order to minimize the potential impact on the running production applications.
- **Dir Scan Mode** - the directory scanning mode allows one to select one of the following directory scanning modes: Sequential or Parallel. In the Sequential directory scanning mode, DiskBoss scans directories one-after-one using a single processing thread. In the Parallel directory scanning mode, DiskBoss scans directories in parallel using a number of processing threads according to the 'Dir Scan Threads' option, which significantly improves the performance of the file synchronization operation when synchronizing large numbers of files via a slow, high-latency network.
- **Dir Scan Threads** - this option specified the number of parallel directory scanning threads to use in the **Parallel** directory scanning mode.
- **File Sync Threads** - this option specifies the number of parallel file synchronization threads to use during the file synchronization process. Multi-Stream file synchronization significantly improves the file synchronization performance when synchronizing a large number of files between multiple disks, NAS storage devices or enterprise storage systems.

The '**Advanced**' file synchronization options tab provides a number of different file copy modes optimized for different hardware configurations and user-specific needs:
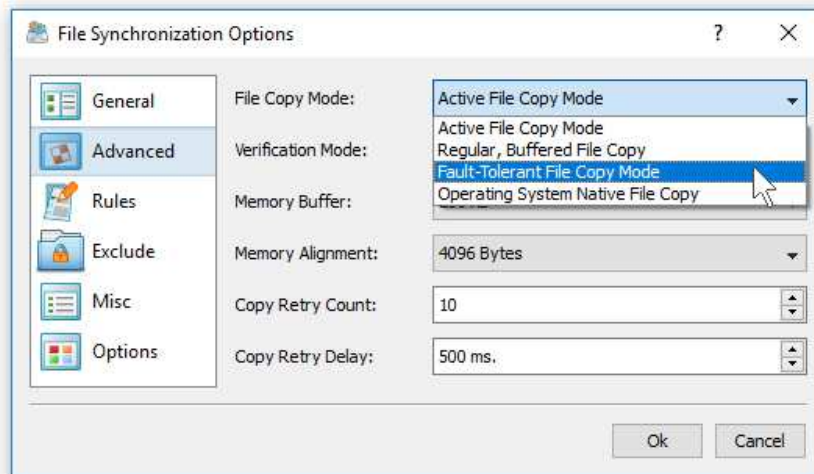
- **Active File Copy Mode** - in this file copy mode DiskBoss automatically switches between different file copy modes depending on the size and the type of each file. Small files are transferred using a regular, buffered file copy mode, while large files are transferred using a non-buffered file copy mode and optionally, when the hardware platform supports it, allows to enable the write-through I/O mode.
- **Regular, Buffered File Copy Mode** - in this file copy mode DiskBoss performs regular, buffered file copy operations according to the specified file I/O block size and memory alignment.
- **Fault-Tolerant File Copy Mode** - in this file copy mode DiskBoss creates a temporary file for each file that should be copied and only after a successful file copy operation replaces the original file with the new one. If a network failure will occur during a file copy operation, original files will remain in place without any changes.
- **Operating System Native File Copy Mode** - this file copy mode is optimized for modern operating systems such as Windows Server 2012 and newer. This file copy mode supports SMB direct, direct RDMA file transfers, multi-channel and write-through file I/O operations. In order to take full advantage of all performance optimizations when synchronizing files via the network, Windows Server 2012 or newer should be installed on both sides.

In addition, the '**Advanced**' file synchronization options tab provides a number of performance, fault tolerance and recovery options:

- **Verification Mode** - the file copy verification mode specifies how to verify files copied to the destination directory. By default, verification of copied files is disabled and in order to enable verification of copied files the user needs to select an appropriate verification mode and then enable verification on the 'Options' tab.
- **Memory Buffer** - this option specifies the size of the file copy memory buffer used for each file copy thread.
- **Memory Alignment** - this option specifies the alignment of the file copy memory buffer, which is critical for fast, non-buffered file copy operations. By default, the memory alignment is set to 4096 bytes, which is appropriate for modern file systems and storage devices.
- **Copy Retry Count** - this option specifies how many times to retry a failed file copy operation. Sometimes, a file may be temporary locked by an application and this option allows one to retry a failed file copy operation after a user specified delay.
- **Copy Retry Delay** - this option specifies the time delay (in milliseconds) between failed file copy retries.

The '**Options**' tab provides the ability to control which file meta data is copied and allows one to enable/disable various security and verification options.
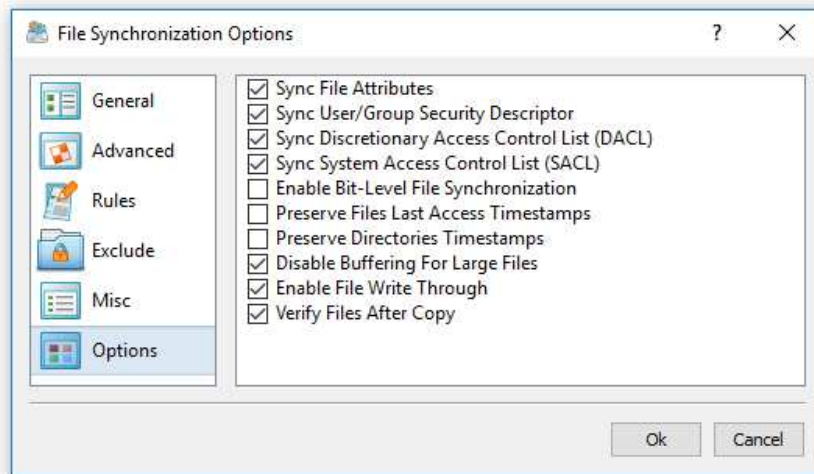
- **Sync File Attributes** - when this option is enabled, DiskBoss will copy file attributes for each copied file. By default, this option is disabled and files are created in the destination directory with normal file attributes.
- **Sync User/Group Security Descriptor** - when this option is enabled, DiskBoss will copy the file ownership information for each copied file. By default, this option is disabled and files are created in the destination directory with the user account running the DiskBoss application. In addition, in order to be able to use this option, the user needs to have administrative permissions. Finally, when synchronizing files to a remote destination directory located on a NAS device, the NAS device should provide support for the NTFS security capabilities.
- **Sync Discretionary Access Control List (DACL)** - when this option is enabled, DiskBoss will copy the DACL security information for each copied file. By default, this option is disabled and files are created in the destination directory with permissions inherited from the parent directory. In addition, in order to be able to use this option, the user needs to have administrative permissions. Finally, when synchronizing files to a remote destination directory located on a NAS device, the NAS device should provide support for the NTFS security capabilities.
- **Sync System Access Control List (DACL)** - when this option is enabled, DiskBoss will copy the SACL security information for each copied file. By default, this option is disabled and files are created in the destination directory with permissions inherited from the parent directory. In addition, in order to be able to use this option, the user needs to have administrative permissions. Finally, when synchronizing files to a remote destination directory located on a NAS device, the NAS device should provide support for the NTFS security capabilities.
- **Enable-Bit Level File Synchronization** - when this option is enabled, DiskBoss will check which data blocks have changed in each new file and write to the destination file only the changed data blocks.
- **Enable File Write Trough** - when this option is enabled and DiskBoss is running on a newer operating system such as Windows Server 2012 or newer, files will be copied using the operating system native RDMA mode.
- **Verify Files After Copy** - when this option is enabled, DiskBoss will verify the integrity of each copied file using the file verification mode selected on the 'Advanced' tab.

8.8   File Synchronization Logs

DiskBoss provides the ability to save different types of file synchronization logs allowing one to keep track of performed file synchronization operations and record file synchronization errors. In order to enable file synchronization logs for a file synchronization command, open the file synchronization options dialog, select the 'Misc' tab, enable one or more file synchronization logs and specify directories where to save the log files.
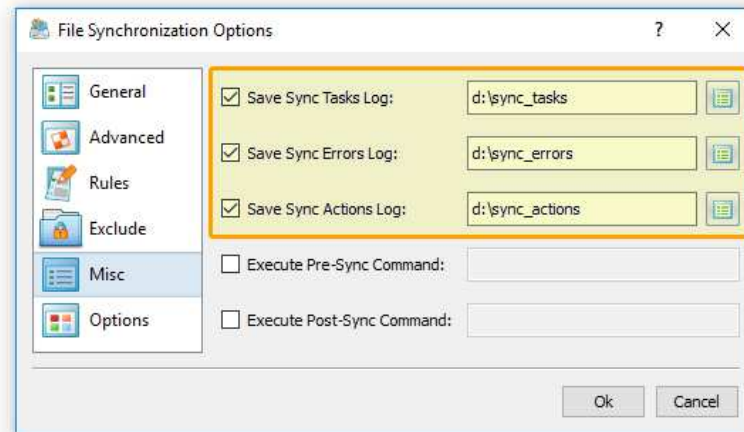
For each log file, the user is provided with the ability to specify the log file format (plain text or Excel CSV), the log file mode and the log files history. By default, DiskBoss will save an individual log file for each file synchronization operation, but the user can switch to consolidated hourly, daily or monthly logs files, which will be kept in the file synchronization logs directory according to the user-specified number of days.

8.9   Pre-Configured File Synchronization Commands

DiskBoss provides the user with the ability to pre-configure custom file synchronization operations as user-defined commands and execute such commands in a single mouse click using the DiskBoss GUI application or direct desktop shortcuts.
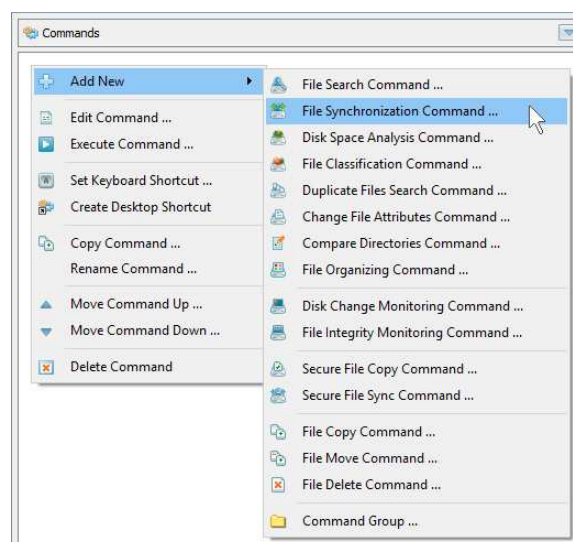
User-defined commands may be managed and executed through the commands dialog or the commands tool pane. In order to add a new command through the commands pane, press the right mouse button over the pane and select the 'Add New - File Synchronization Command' menu item. In order to execute a previously saved command, just click on the command item in the commands tool pane or create a direct desktop shortcut on the desktop.

8.10   Periodic File Synchronization

Sometimes, it may be required to execute a file synchronization operation periodically at specific time intervals. The first option to do that is to configure a periodic job in the DiskBoss GUI application and select the required file synchronization command to be executed periodically. Another option is to use DiskBoss Server, which runs as a service in the background and may be used to periodically execute file synchronization operations in a fully automatic, unattended mode.
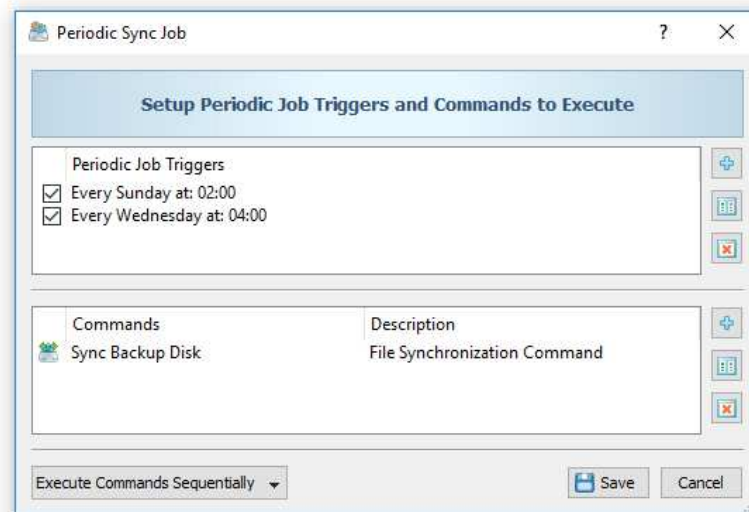
In order to add a new periodic job, select the 'Tools – Manage Periodic Jobs' menu item and press the 'Add' button. On the periodic job dialog, select the file synchronization command that should be executed and specify the time period.

8.11   Real-Time File Synchronization

DiskBoss Ultimate and DiskBoss Server provide the ability to monitor one or more disks or directories and automatically execute a file synchronization operation after a user-specified number of changes is detected.
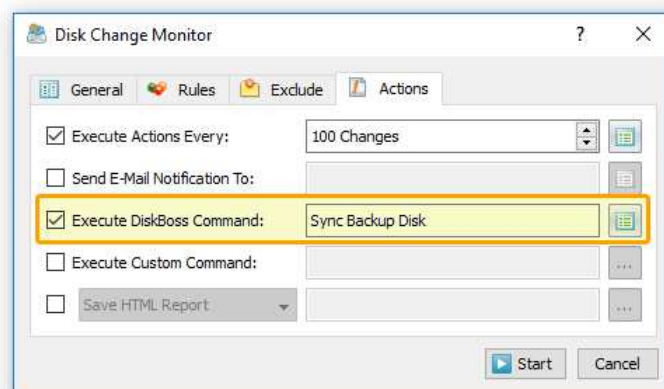
In order to execute a file synchronization command using the DiskBoss real-time disk change monitor, create a new disk change monitoring command, specify one or more disks or directories that should be monitored, select the 'Actions' tab, specify the number of disk changes that should trigger the file synchronization command and selected the name of the file synchronization command that should be executed once the disk change monitor reaches the specified number of changes.

8.12   Synchronizing Files Using the DiskBoss Command Line Utility

In addition to the GUI application, DiskBoss Ultimate and DiskBoss Server provide a command line utility allowing one to execute file synchronization commands form batch files and shell scripts. The command line utility is located in the **'<ProductDir>/bin'** directory.

Command Line Syntax:

diskboss -sync -source <Source Directory> -dest <Dest Directory>

This command synchronizes files between directories, local disks or network shares.

diskboss –execute <File Synchronization Command>

This command executes the specified user-defined file synchronization command pre-configured using the DiskBoss GUI application or imported from an XML file.

Parameters:

-source <Source Directory>

This parameter specifies the source directory for file synchronization. In order to ensure proper parsing of command line arguments, directories and file names containing space characters should be double quoted.

-dest <Destination Directory>

This parameter specifies the destination directory for file synchronization. In order to ensure proper parsing of command line arguments, directories and file names containing space characters should be double quoted.

Options:

-sync_mode <SD | SUD | SAD | STW | STA>

SD - Sets the sync-destination file synchronization mode (Default)

All changes made in the source directory will be propagated to destination. Files deleted from the source directory will be deleted from destination. All files changed or deleted in destination will be restored from source.

SUD - Sets the update-destination file synchronization mode

Newly created and modified source files will be copied to destination. Files deleted from the source directory will be deleted from destination. Files deleted from the destination directory will be restored from source.

SAD - Sets the accumulate-destination file synchronization mode

Newly created and modified source files will be copied to destination. Files deleted from the destination directory will be restored from source. Newly created and modified destination files will be kept in place.

STW - Sets the two-way file synchronization mode

Newly created and modified files will be synchronized in both directions. Files deleted from the source directory will be deleted from destination. Files deleted from the destination directory will be restored from source.

STA - Sets the two-way accumulate file synchronization mode

Newly created and modified files will be updated in both directions. Files deleted in one location will be restored from the second location. After finishing the synchronization process both locations will be identical.

–streams <StreamCount>

This parameter specifies the number of simultaneous file synchronization streams.

–file_delay <delay in milliseconds>

This parameter sets the file delay to the specified value in milliseconds. Use this option when you need to slowly synchronize files to or from a busy production system in order to minimize the potential performance degradation.

–block_delay <delay in milliseconds>

This parameter sets the block delay to the specified value in milliseconds. Use this option when you need to slowly synchronize files to or from a busy production system in order to minimize the potential performance degradation.

–copy_dacl

This parameter instructs to copy files' access control lists (DACL).

-**copy_sacl**

This parameter instructs to copy files' security control lists (SACL).

–copy_owner

This parameter instructs to copy files' user/group information.

–v

This command shows the product's major version, minor version, revision and build date.

–help

This command shows the command line usage information.

9   File Copy and Data Migration Operations

9.1   Copying Files Using DiskBoss GUI Application

DiskBoss provides a large number of advanced file copy and data migration capabilities allowing one to copy vast amounts of files fast, efficiently and reliably. DiskBoss allows one to copy files including access control lists (ACLs), security attributes, ownership information, timestamps and file attributes. In addition, the user is provided with a large number of flexible file copy performance tuning and fault tolerance options allowing one to copy data at various speeds, recover failed copy operations and minimize the potential impact on running production systems.
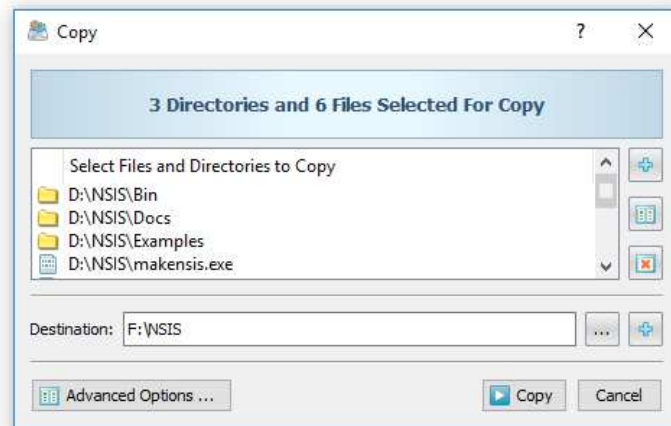
In order to start a simple file copy operation, select one or more files or directories in the DiskBoss file navigator, press the right mouse button and select the 'Copy Files To' menu item. If you wish to perform a regular copy operation using default parameters, just press the 'Copy' button and wait for the file copy operation to complete. During the file copy process, DiskBoss will display the copy progress dialog showing the total number of copied files, the total amount of copied disk space and the file copy performance.
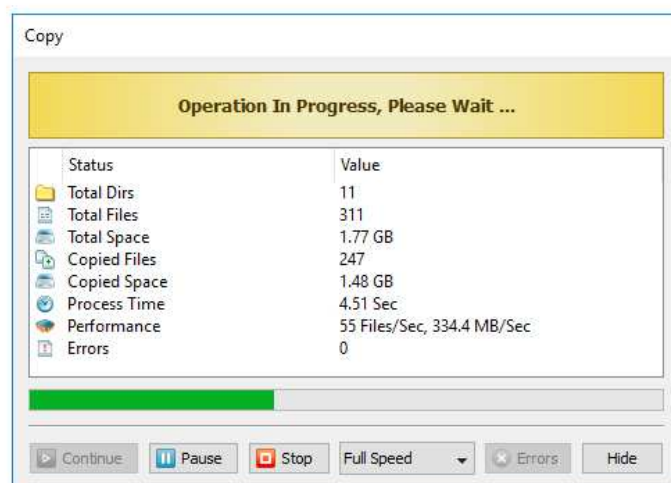
Copying vast amounts of data may require significant amounts of time. Sometimes, in order to perform an urgent operation, it may be required to temporary pause a long-running data migration operation. Press the 'Pause' button to temporary suspend an ongoing file copy operation and then press the 'Continue' button to resume the f operation. Press the 'Stop' button to cancel an ongoing file copy operation.

When copying files from/to protected operating system directories or running production systems, some copy operations may fail due to one or more files locked by the operating system or other running applications. By default, DiskBoss logs non-critical errors in the operation log, which is accessible by pressing the 'Errors' button, and continues the file copy operation. In addition, DiskBoss Professional and DiskBoss Ultimate provide the user with advanced fault-tolerance and recovery options allowing one to retry failed copy operations after a designated period of time.
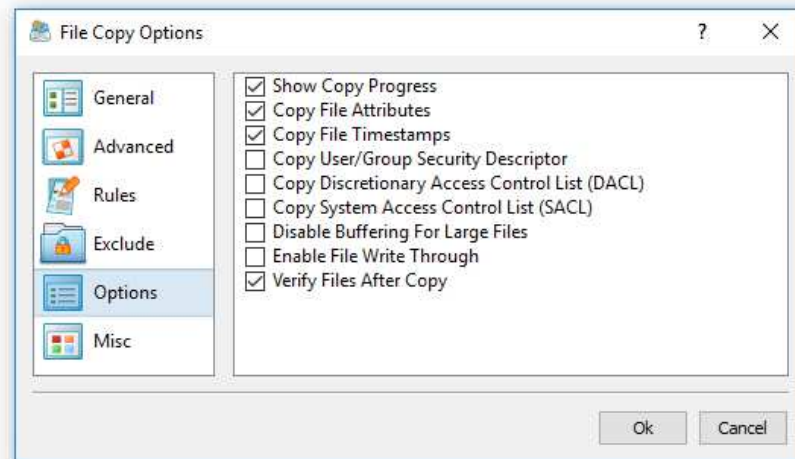
Frequently used file copy and data migration operations may be pre-configured as user-defined commands, customized for user-specific needs and executed in a single mouse click using the DiskBoss main GUI application. In addition, DiskBoss Ultimate and DiskBoss Server provide a command line utility allowing one to execute user-defined file copy commands from batch files and shell scripts or schedule periodic file copy operations using a general purpose command scheduler.
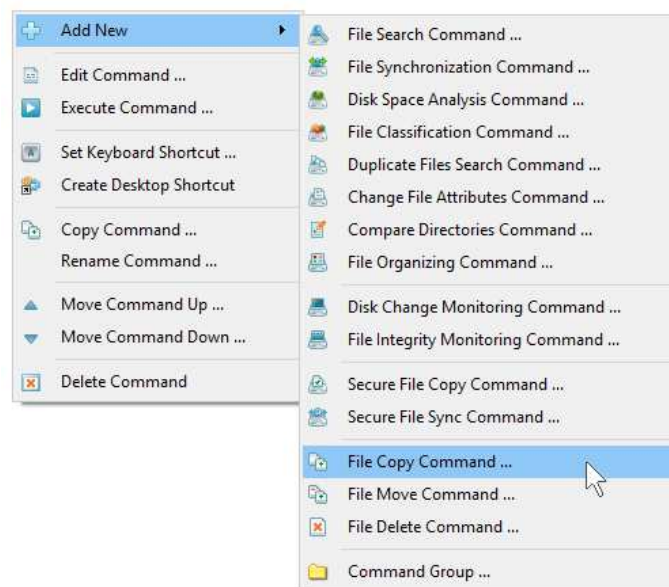

In order to pre-configure a user-defined file copy command, select the 'Commands' tool pane, press the right mouse button over the tool pane, select the 'Add New - File Copy Command' menu item and specify a command name. On the file copy command dialog, select input files or directories to be copied and specify one or more destination directories. Once finished configuring the file copy command, press the 'Save' button. Now, the pre-configured file copy command will appear in the 'Commands' tool pane. In order to execute the pre-configured file copy command, click on the command item in the 'Commands' tool pane.

## 9.2   Advanced File Copy and Data Migration Options

In order to open the advanced file copy options dialog, press the 'Advanced Options' button located on the file copy dialog. The file options dialog consists of the 'General' tab, 'Advanced' tab, 'Rules' tab, 'Exclude' tab, 'Options' tab and 'Miscellaneous' tab.

The '**General**' tab provides the user with the ability to optimize file copy and data migration operations for user-specific storage configurations and performance requirements. DiskBoss is optimized for multi-core/multi-CPU computers and advanced RAID storage systems and capable of copying files using multiple, parallel file copy threads. During runtime, DiskBoss analyzes copied files and applies different scheduling policies for different types of files thus maximizing the file copy performance and minimizing the copy time. In order to speed up the file copy process, use multiple copy threads when copying files between multiple physical hard disks or enterprise storage systems.
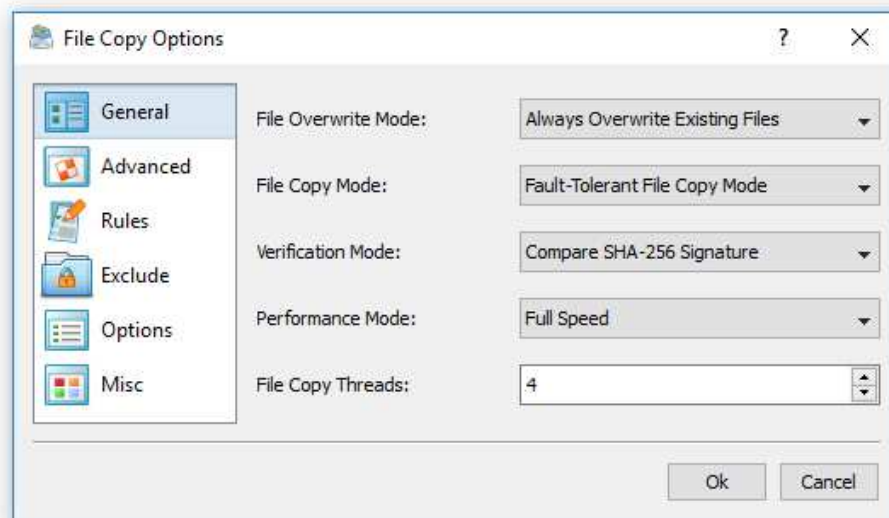
- **File Overwrite Mode** - DiskBoss provides four different file overwrite modes. By default, DiskBoss will overwrite all existing files. In addition, the user is provided with the ability to skip all existing files, overwrite existing files if the source file is newer or generate a unique file name for each existing destination file.
- **File Copy Mode** - The user is provided with four different file copy modes. In the 'Automatic' file copy mode, DiskBoss will automatically select an appropriate file copy mode depending on the file size, location and disk type. In the 'Regular' file copy mode, DiskBoss fill perform a simple, buffered file copy operation. In the 'Fault-Tolerant' file copy mode, DiskBoss will first copy the source file to the destination directory with a temporary file name and only after a successful file copy operation previously existed destination file will be overwritten. In the 'Operating System Native' file copy mode, DiskBoss will use the built-in file copy function provided by the operating system.
- **Verification Mode** - DiskBoss allows one to verify each file after completing the file copy operation. When the file copy verification option is enabled, DiskBoss will reread each copied file and verify that the destination file is identical to the source file. DiskBoss provides a number of file copy verifications modes including: MD5, SHA-1, SHA-256, BLAKE2-S, BLAKE2-B signatures and CRC-32/CRC-64 check sums.
- **Performance Mode** - Sometimes, it may be required to intentionally slow down a file copy operation in order to save resources and minimize the potential impact on running production applications. By default, DiskBoss copies files at the full speed, but the user is provided with the ability to copy files at 'Medium' and 'Low' speeds.
- **File Copy Threads** - DiskBoss is capable of performing multiple parallel file copy operations using multiple file copy threads. This can significantly increase the performance of file copy operations especially when copying large numbers of files between multiple disks, NAS storage devices or enterprise storage systems.

The '**Options**' tab allows one to control the file copy progress bar, file attributes, timestamps, security descriptors, I/O buffering and file copy verification capabilities.
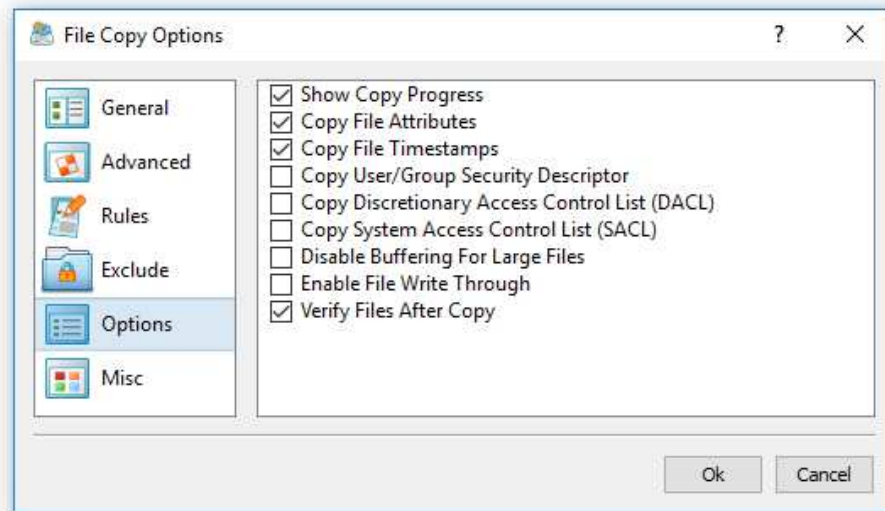
- **Show Copy Progress** – this option allows one to enable/disable the progress bar on the file copy process dialog. Disabling the progress bar when copying large amounts of files will result in better performance and significantly shorter copy times.
- **Copy File Attributes** – this option instructs DiskBoss to copy file attributes from source files to destination files. If this parameter is not set, all files will be created with default file attributes.
- **Copy File Timestamps** – this option instructs DiskBoss to copy the file creation, last modification and last access dates. If this parameter is not set, all time stamps will have the create and last modification date set to the date of the file copy operation.
- **Copy User/Group Security Descriptor** – this parameter instructs DiskBoss to copy the file ownership information from source files to destination files. This option requires the user to have the administrative privileges.
- **Copy Discretionary Access Control List (DACL)** – this parameter instructs DiskBoss to copy the discrete access control list (DACL) from source files to destination files. This option requires the user to have the administrative privileges.
- **Copy System Access Control List (SACL)** – this parameter instructs DiskBoss to copy the security control list (SACL) from source files to destination files. This option requires the user to have the administrative privileges.
- **Disable Buffering For Large Files** - this option allows one to copy files directly from the source file to the destination file without copying data to the operating system I/O buffers. This option should improve the performance of file copy operations when copying large files, but it is not supported on older operating systems such as Windows XP and Server 2003.
- **Enable File Write Through** - this option allows one to copy files using the RDMA protocol. This option should improve the performance of file copy operations when copying large files, but it is not supported on older operating systems such as Windows XP and Server 2003.
- **Verify Files After Copy** – this parameter instructs DiskBoss to verify each file after completing the file copy operation. When this parameter is set, DiskBoss will reread each copied file and verify that the destination file is identical to the source file. DiskBoss provides a number of file copy verification modes including: MD5, SHA-1, SHA-256, BLAKE2-S, BLAKE2-B signatures and CRC-32/CRC-64 check sums.

9.3   Copying Specific Types or Categories of Files

Sometimes, it may be required to copy specific types or categories of files according to one or more user-specific criteria. For example, for backup purposes, the user may need to copy all types of image files that were modified during the last month. DiskBoss Ultimate and DiskBoss Server provide the ability to configure one or more file matching rules allowing one to select files by the file name, directory, file type, category, file size, file attributes, creation, last modification and last access dates, user name, etc. During the file copy process, DiskBoss will evaluate all files using the specified file matching rules, copy files matching the rules and skip all other files.
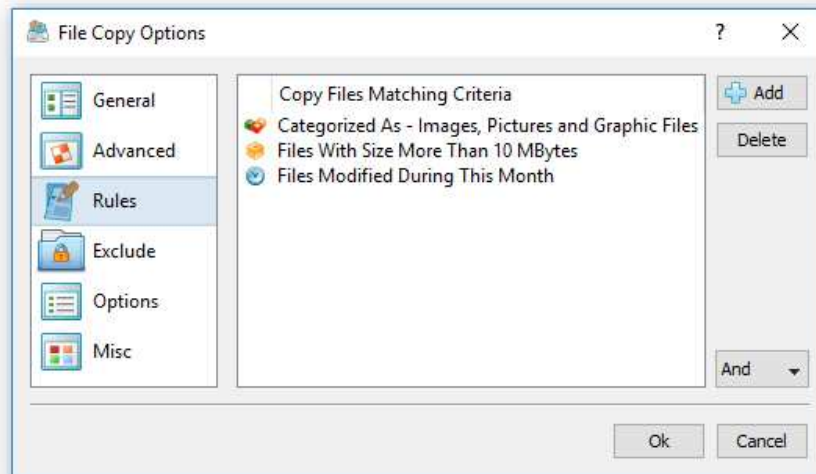

In order to add one or more file matching rules, open the file copy command dialog, press the 'Advanced Options' button, select the 'Rules' tab and press the 'Add' button. Select an appropriate rule type and specify all the required parameters. The user is provided with the ability to combine multiple different types of file matching rules allowing one to precisely select which files to copy and which files to skip from the file copy process.
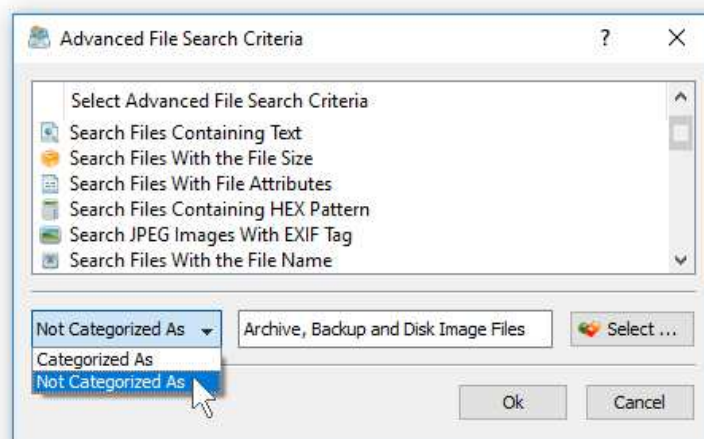

In addition to positive file matching rules allowing one to select which types of files to copy, the user is provided with negative file matching rules capable of excluding specific types of files from the file copy process. For example, in order to exclude all types of archive and backup files from the file copy process, add a file category rule, select the 'Archive and Backup Files' file category and then select the negative 'Not Categorized' rule operator. In general, almost all types of file matching rules provide positive and negative operators allowing one to easily construct sophisticated file matching rules capable of precisely select which files to copy and which files to exclude from the file copy operation.

9.4   Controlling the Speed of File Copy Operations

When copying a large number of files, the file copy operation make take a very considerable amount of time. If the user needs to quickly perform another operation, it may be very useful to temporary slow down the running file copy operation, perform the urgent task and then resume the file copy operation at the full speed. DiskBoss provides the ability to dynamically change the speed of running file copy operations.
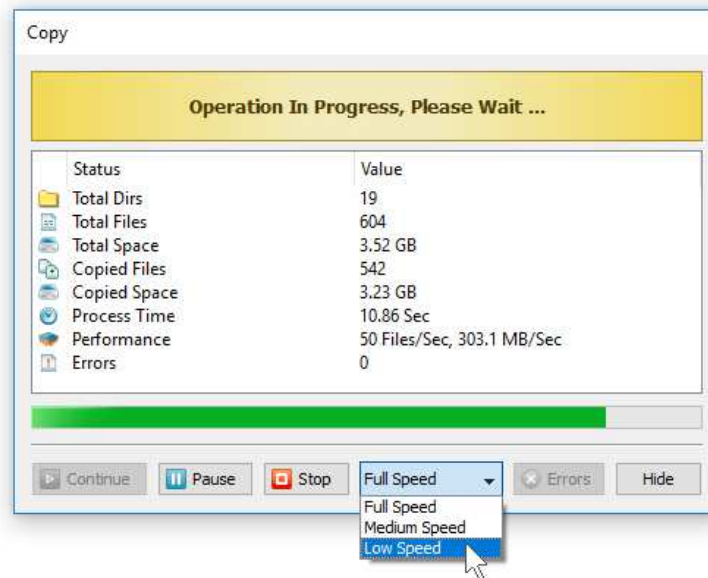

In order to change the speed of a running file copy operation, open the file copy process dialog, click on the 'Speed' combo box and select an appropriate file copy performance mode. The 'Full Speed' mode uses all the available disk speed. The 'Medium' speed mode tries to use approximately 50% of the available disk speed. The 'Low' speed mode tries to use approximately 20% of the available disk speed.
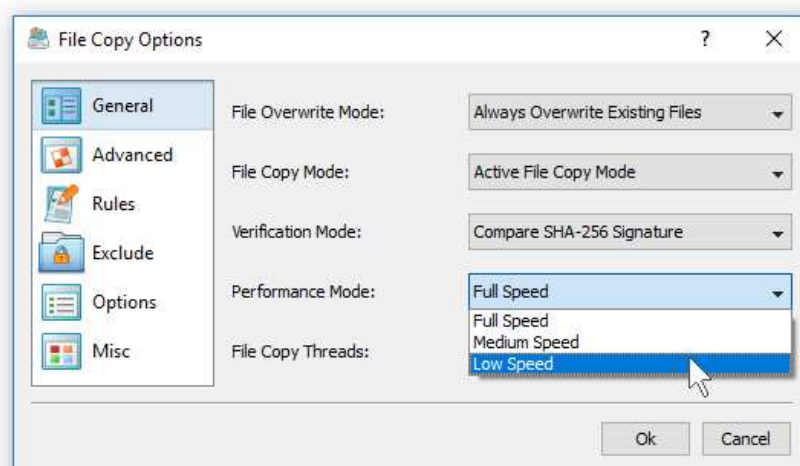
When files should be copied to/from a running production system, it may be necessary to pre-configure a file copy command to intentionally slow down all file copy operations. In order to set the default performance mode for a pre-configured file copy operation, open the file copy command dialog, press the 'Advanced Options' button, select the 'Advanced' tab and select an appropriate file copy performance mode.

9.5   Excluding Subdirectories from the File Copy Process

Sometimes, it may be required to exclude one or more subdirectories from the file copy process. For example, if you need to copy all files from a disk excluding one or two special directories, you may specify the whole disk as an input directory and add the directories that should be skipped to the exclude list.
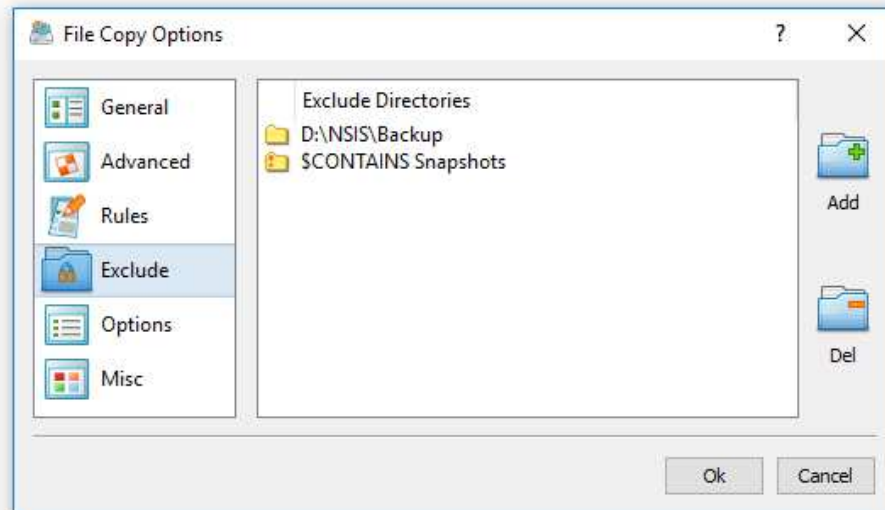
In order to add one or more directories to the exclude list, open the file copy command dialog, press the 'Advanced Options' button, select the 'Exclude' tab and press the 'Add' button. All files and subdirectories located in the specified exclude directory will be excluded from the file copy process. In addition, advanced users are provided with a number of exclude directories macro commands allowing one to exclude multiple directories using a single macro command.

DiskBoss provides the following exclude directories macro commands:

- **$BEGINS <Text String>** - this macro command excludes all directories beginning with the specified text string.
- **$CONTAINS <Text String>** - this macro command excludes all directories containing the specified text string.
- **$ENDS <Text String>** - this macro command excludes all directories ending with the specified text string.
- **$REGEX <Regular Expression>** - this macro command excludes directories matching the specified regular expression.
- **$DIRLIST <File Name>** - this macro command excludes all directories listed in the user-specified text file.
- **$FILELIST <File Name>** - this macro command excludes all files listed in the user-specified text file.

For example, the exclude macro command '$CONTAINS Temporary Files' will exclude all directories with 'Temporary Files' in the full directory path and the exclude macro command '$REGEX \.(TMP|TEMP)$' will exclude directories ending with '.TMP' or '.TEMP'.

9.6   Copying Files to Multiple Destination Directories

DiskBoss provides the ability to copy files to a number of destination disks, directories or network shares allowing one to easily distribute files to a large number of servers or virtual machines through the network. In the simplest case, open the file copy command dialog and press the 'Add' button located on the right side of the destination directory entry.
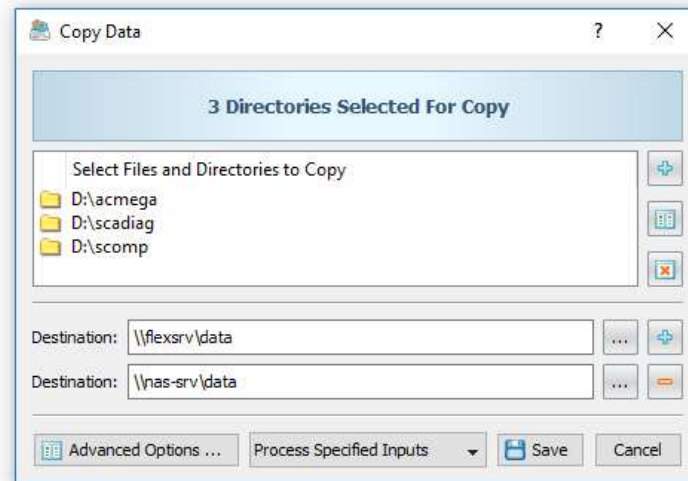
DiskBoss will create an additional entry allowing one to specify a second destination directory. Press the 'Add Destination Directory' button again and DiskBoss will create one more destination directory entry. Press the 'Delete' button located on the right size of a destination directory entry, to remove the destination directory.
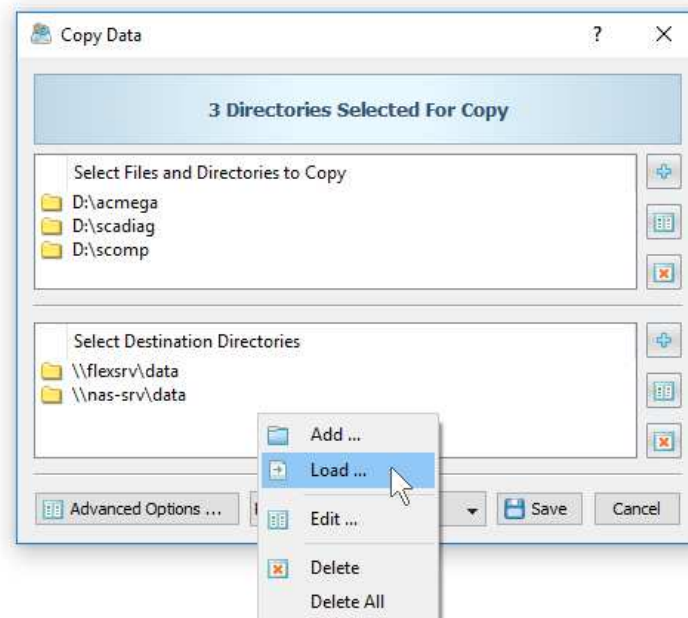
If the user needs to distribute files to tens or hundreds of servers or virtual machines, it may be more effective to load a list of destination directories from a text file. In order to load destination directories from a text file, press the 'Add Destination Directory' button three times until the individual directory entries will be replaced with a list of destination directories, press the right mouse button over the list of destination directories, select the 'Load' menu item and specify the name of the text file to load destination directories from. The text file should include a list of destination directories in the plain text format with one directory per line.

9.7   Schedule Periodic File Copy Operations

In addition to the ability to perform manual file copy operations using the DiskBoss GUI application, the user is provided with a server-based product version, named DiskBoss Server, which runs in the background as a service and allows one to schedule periodic file copy operations. First of all, start the DiskBoss Server client GUI application, press the 'Add' button located on the main toolbar and select the 'Add - File Copy Command' menu item.
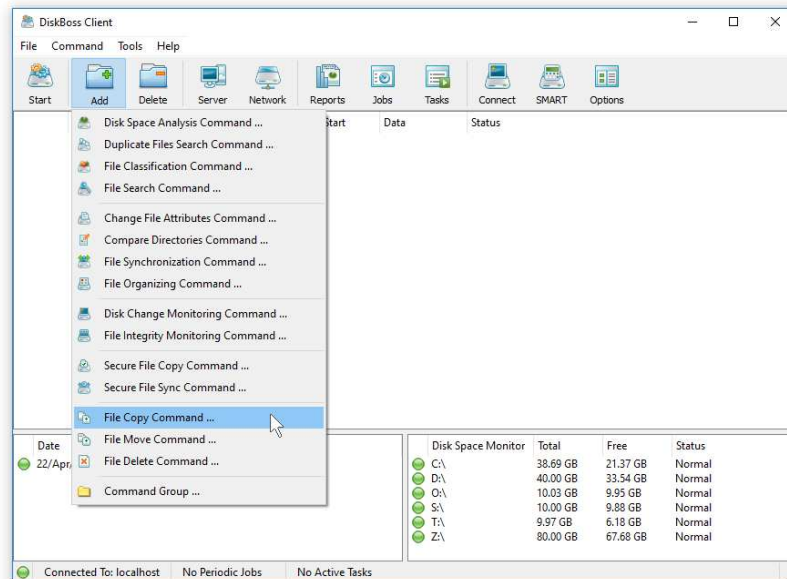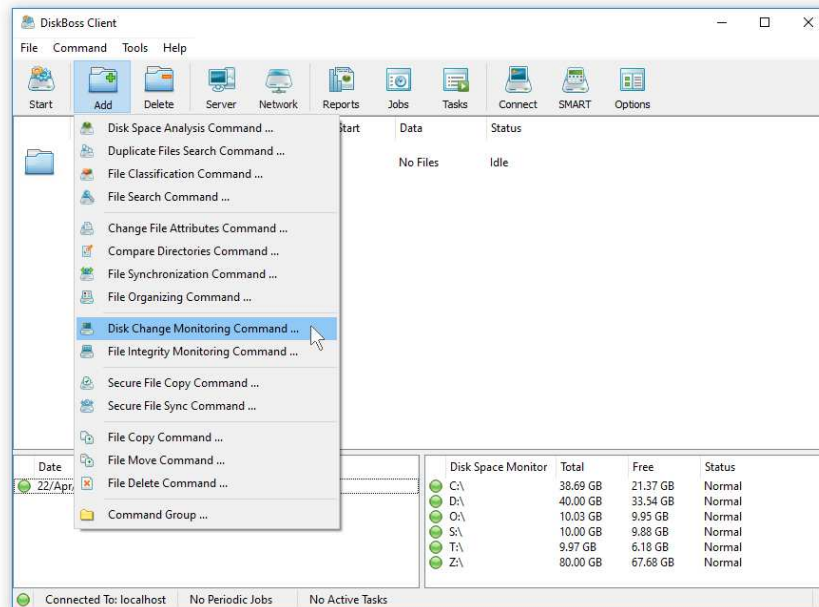

Enter a command name, specify a number of input files or directories that should be copied, specify one or more destination directories and press the 'Save' button. Now, press the 'Jobs' button located on the main toolbar and press the 'Add' button to add a new periodic job. The periodic job dialog allows one to define one or more periodic schedules and one or more pre-configured analysis or file management commands to execute.
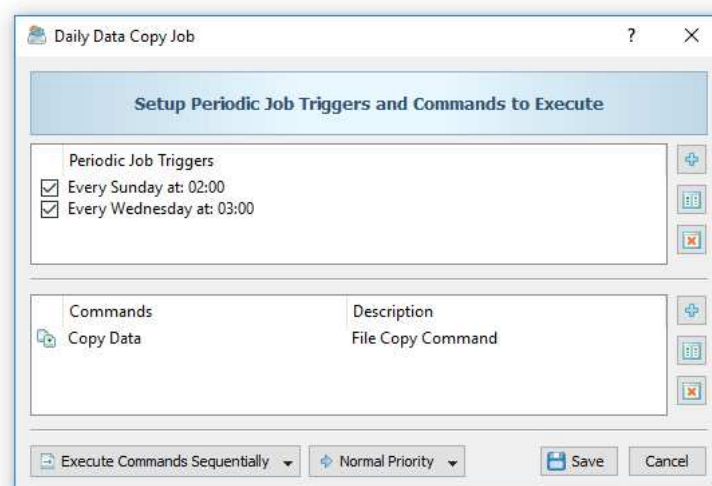

Press the 'Add' button located on the right side of the top view to add a periodic job trigger. The user is provided with a number of hourly, daily and weekly periodic scheduling options allowing one to easily define the desired schedule. Once finished configuring periodic job triggers, press the 'Add Command' button located on the right side of the bottom view to add one or more pre-configured DiskBoss commands to be executed according to the specified schedule. DiskBoss allows one to execute multiple file copy commands in each periodic job and provides the ability to specify how to execute these commands: sequentially or in parallel.

9.8   Monitor Disk Changes and Copy Files in Real-Time

DiskBoss Server provides the ability to monitor a disk or directory and automatically copy newly created files to one or more destination directories. The user can just drag-and-drop files into the monitored directory and all files will be automatically copied to the required destination directories. In order to setup a disk change monitoring command, open the DiskBoss Server client GUI application, press the 'Add' button located on the main toolbar and select the 'Disk Change Monitoring Command' menu item.

Enter a command name and specify a disk or directory to monitor. On the disk monitor options dialog, select the 'Actions' tab, enable disk monitoring actions and specify the number of disk changes to trigger the actions. Now, enable the 'Execute DiskBoss Command' action and select the pre-configured file copy command to be executed when the user-specified number of disk changes are detected.
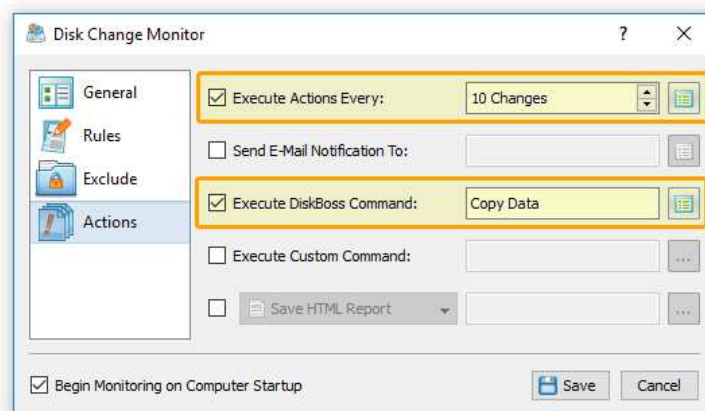
Once finished configuring the disk change monitoring command, select the command in the commands view, press the right mouse button and select the 'Start Command' menu item. DiskBoss Server will monitor changes in the specified disk and execute the selected file copy command. The DiskBoss client GUI application may be closed and the DiskBoss service will continue to run in the background, monitor the specified disk or directory and execute the selected file copy command fully automatically.

9.9   Copying Files Using the DiskBoss Command Line Utility

In addition to the DiskBoss GUI application, DiskBoss Ultimate and DiskBoss Server provide a command line utility allowing one to perform file copy operations from batch files and shell scripts. The DiskBoss command line utility is located in the **'<ProductDir>/bin'** directory.

Command Line Syntax:

diskboss -copy –dir <Source 1> [... <Source X>] –dest <Destination> [<Options>]

diskboss -move –dir <Source 1> [... <Source X>] –dest <Destination> [<Options>]

diskboss -execute <File Copy Command Name>

Parameters:

–dir <Source> -dest <Destination Directory>

At least one source file or directory and a destination directory should be specified. In order to ensure proper parsing of command line arguments, directories and file names containing space characters should be double quoted.

Options:

-**verify** - This parameter enables verification of copied files.

-**streams** <StreamCount>

This parameter specifies the number of simultaneous file copy streams.

-**overwrite_mode** <OverwriteMode>

This parameter specifies the file overwrite mode: overwrite, overwrite_if_newer or skip.

-**copy_dacl** - This parameter instructs to copy files' access control lists (DACL).

-**copy_sacl**

This parameter instructs to copy files' security control lists (SACL).

-**copy_owner**

This parameter instructs to copy files' user/group information.

-**copy_time**

This parameter instructs to copy files' last access/write/creation times.

-**copy_attr**

This parameter instructs to copy files' read-only/system/hidden attributes.

-**copy_all**

This parameter instructs to copy files' ACL, ownership, times and attributes.

-**v**

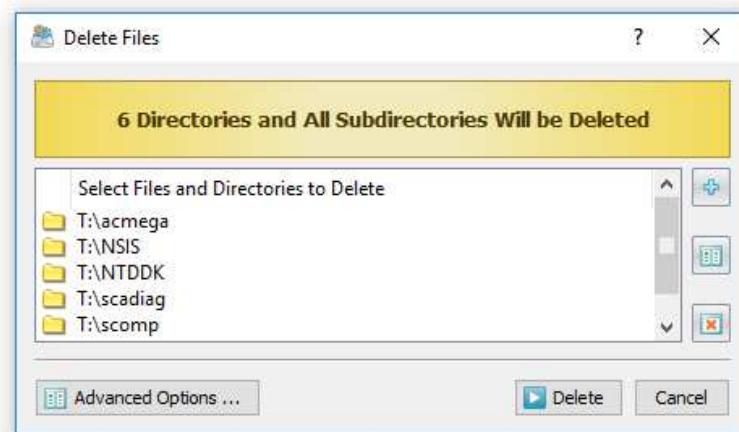This command shows the product's major version, minor version, revision and build date.

-**help**

This command shows the command line usage information.

10 File Delete and Data Wiping Operations

10.1   Deleting Files Using DiskBoss GUI application

DiskBoss provides advanced bulk file delete and data wiping operations allowing one to securely wipe confidential information, schedule periodic file delete operations or automatically trigger policy-based file delete operations according to user-specified rules while saving file delete logs or exporting lists of deleted files to an SQL database.

Users required to securely wipe confidential information are provided with a large number of different data wiping algorithms ranging from a simple, single-pass wipe to a powerful 7-pass, DOD 5220.22-M compliant data wiping algorithm. In addition, DiskBoss provides the ability to apply different types of delete operations for different types of files. For example, all types of documents and image files may be securely wiped while all other types of files just deleted.
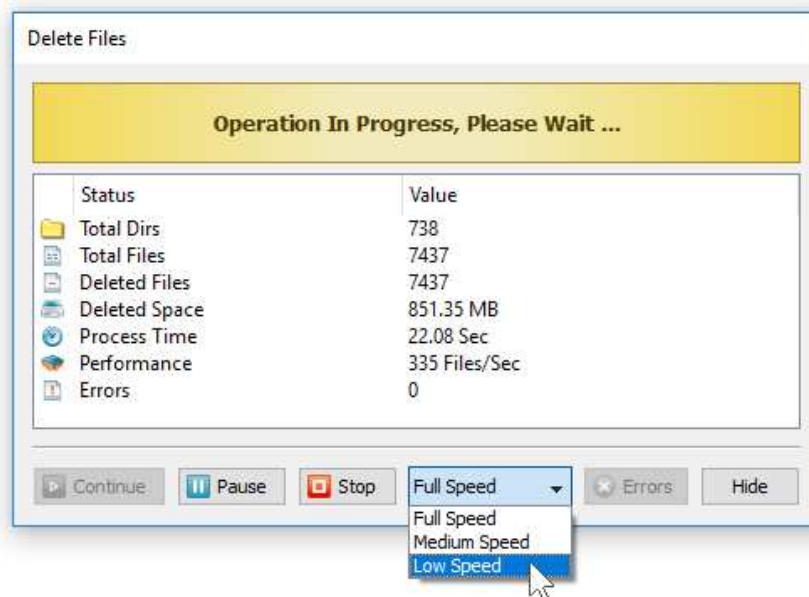
Enterprise customers and IT professions are provided with the ability to implement fully automated file retention policies using rule-based periodic file delete operations preconfigured to delete files based on file creation, last modification and/or last access dates. Finally, DiskBoss Server can be used to automatically enforce PCI and HIPPA compliance policies and perform file management operations on specific types of files and directories matching user-specified rules.

10.2   File Delete and Data Wiping Options

In order to open the advanced file delete and data wiping options dialog, press the 'Advanced Options' button located on the file delete dialog. The delete options dialog consists of the 'General' tab, 'Advanced' tab, 'Rules' tab and the 'Exclude' tab.

The **'General'** tab provides the ability to control the file scanning mode, the performance mode, the number of processing threads and a number of additional advanced file delete options explained later in this document.
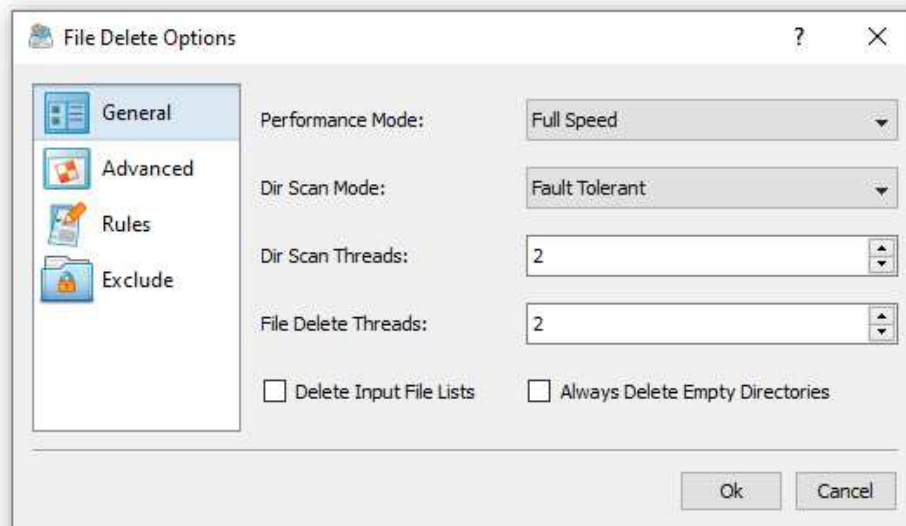
- **Performance Mode** – Sometimes, in order to minimize a potential performance impact on running applications, it may be required to intentionally slow down a long running file delete or data wiping operation. The 'Performance Mode' option allows one to set an appropriate performance level for the file delete operation.
- **Dir Scan Mode** – DiskBoss is capable of deleting files located in multiple directories/disks in parallel thus improving the speed of the file delete process on multi-CPU/multi-core systems. Select the 'High Speed' file scanning mode if you wish to delete files in all input directories simultaneously.
- **Dir Scan Threads** – this option sets the number of parallel directory scanning threads for the file delete operation.
- **File Delete Threads** - DiskBoss is optimized for multi-core and multi-CPU servers and can use a number of CPUs to effectively delete millions of files located on one or more servers or storage systems. The 'Processing Threads' option allows one to set the number of CPUs or CPU-cores to use for the file delete operation.
- **Delete Input File Lists** - DiskBoss can delete files listed in user-specified text files with a full file name (including a full path) per line. In order to configure a file delete operation to delete files listed in one or more text files, set the 'Read Inputs From Files' mode on the delete command inputs dialog. In this mode, DiskBoss will read the specified text files and delete files listed in the user-provided text files. Select this option, in order to automatically delete the input text files after each delete operation.
- **Always Delete Empty Directories** - DiskBoss provides the ability to perform rule-based file delete operations and delete files matching one or more user-specified rules and policies. In the rule-based file delete mode, DiskBoss will delete only files matching user-specified rules while keeping all directories in place. Select this option, in order to always delete empty directories in the rule-based file delete mode.

The **'Advanced'** tab provides the ability to control a number of advanced file delete options including the data wiping mode, delete file logs, delete file logs mode, delete files logs history, and delete files logs directory.
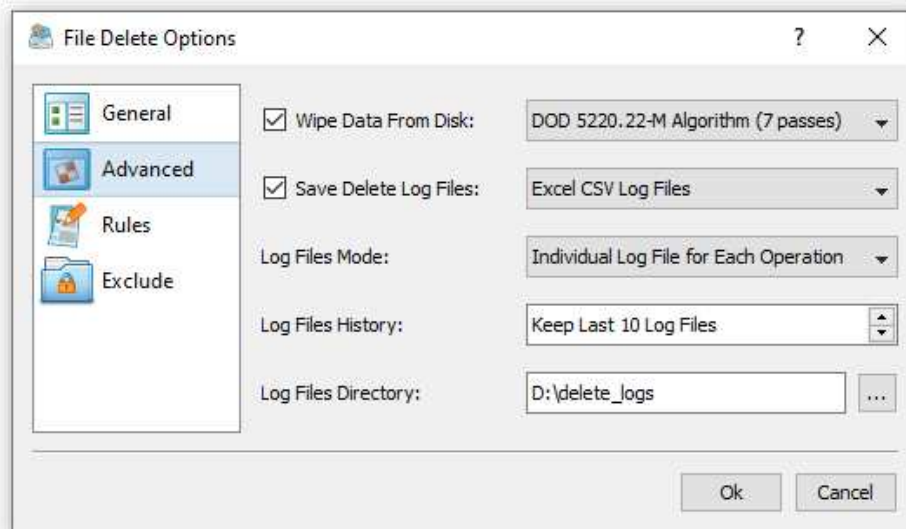
- **Wipe Data From Disk** - DiskBoss allows one to securely wipe confidential information from the disk using a large number of different data wiping algorithms ranging from a simple, single-pass data wipe to a sophisticated 7-pass DOD compliant 5220.22-M data wiping algorithm. In order to enable data wiping for a file delete operation, select this option and select an appropriate data wiping algorithm.
- **Save Delete Log Files** - DiskBoss provides the ability to save full file delete logs to plain text files, Excel CSV files or an SQL database via the ODBC database interface. In order to enable delete file logs, select this option, select an appropriate delete log format (text, CSV or SQL database) and specify a log files directory or an SQL database table name prefix for the SQL database logs format. In addition, for the SQL database delete file logs, the user needs to configure the ODBC database interface to use to save file delete logs to the SQL database.
- **Log Files Mode** - Use this option to save an individual log for each file delete operation, consolidated hourly logs, consolidated daily logs or consolidated monthly logs for all executed file delete operations.
- **Log Files History** - Use this option to specify the number of delete files logs to keep in the log files directory or in the SQL database. For example, if the log files mode is set to 'Consolidated Daily Log Files' and the logs history is set to 10, DiskBoss will keep in the logs directory delete file logs for the last 10 days. For the SQL database delete logs, DiskBoss will keep in the database delete log tables for the last 10 days.
- **Log Files Directory** - Use this option to specify a directory to save delete log files. For each log file, DiskBoss will generate a unique file name with the date and time of each file delete operation.
- **SQL Table Prefix** - This option is displayed when the delete file logs format is set to the SQL database. Use this option to specify an SQL table name prefix to save file delete logs to the SQL database. For each SQL database table, DiskBoss will generate a unique table name, which will include the specified table name prefix and the date and time of each file delete operation.

## 10.3   Deleting Specific File Types or File Categories

The '**Rules**' tab provides the ability to delete files matching one or more user-specified rules. For example, in order to delete all types of documents that were last accessed more than 3 years ago, select the 'Rules' tab, press the 'Add' button and add a rule matching files categorized as 'Documents, Books and Help Files' and then press the 'Add' button again and add a rule matching files that were last accessed more than 3 years ago.
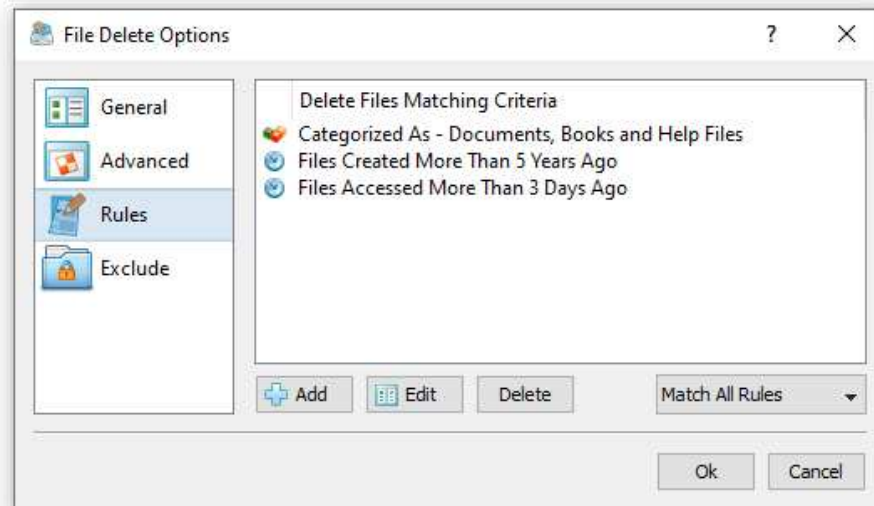
DiskBoss provides a large number of different types of file matching rules allowing one to precisely select which files to delete. In addition, DiskBoss Server, which runs in the background as a service, may be used to schedule periodic rule-based file delete operations to be executed at user-specified time intervals or at a specific time of day on selected days of week allowing one to implement automatic, rule-based retention policies required for Sarbanes–Oxley, HIPPA and PCI compliance purposes.

10.4   Excluding Directories From File Delete Operations

Sometimes, it may be required to exclude one or more subdirectories from a rule-based file delete operation. In order to exclude a directory from a file delete operation, open the advanced file delete options dialog, select the 'Exclude' tab and add one or more directories to be excluded from the file delete process.
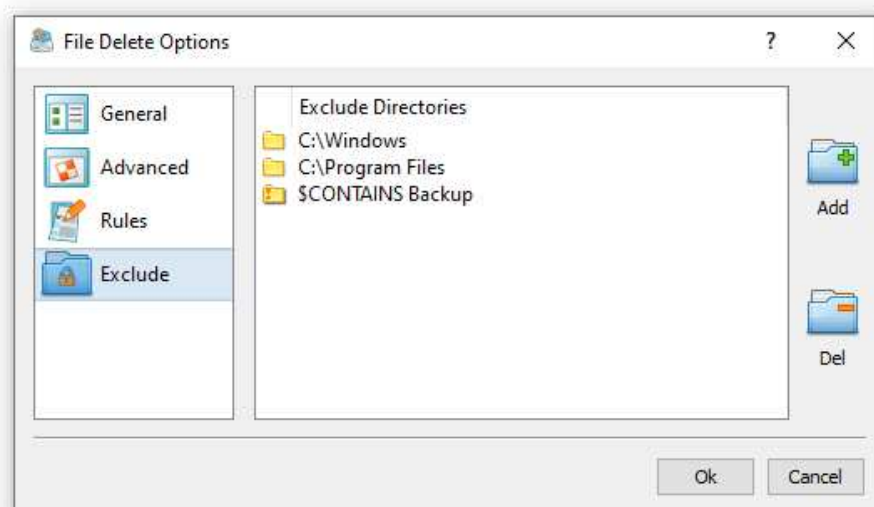
10.5   User-Defined File Delete and Data Wiping Operations

One of the most powerful capabilities of DiskBoss is the ability to pre-configure advanced file delete operations as user-defined commands and then execute these commands in a single mouse click using the DiskBoss CUI application. In addition, the user is provided with the ability to execute pre-configured file delete operations using the DiskBoss command line utility or schedule periodic file delete operations using DiskBoss Server, which runs in the background as a service and allows one to implement fully automated file delete and data wiping operations.
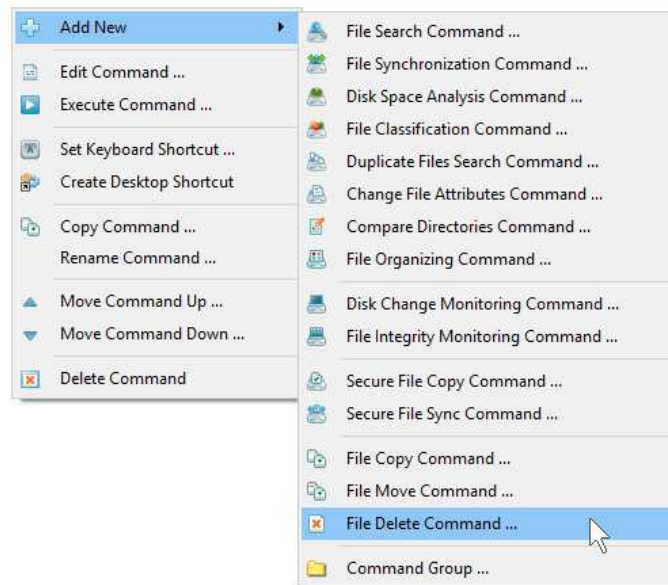
In order to add a new user-defined file delete operation, press the right mouse button over the 'Commands' pane, select the 'Add New - File Delete Command' menu item and enter a unique file delete command name. On the command inputs dialog, specify one or more directories or files to delete and press the 'Next' button.
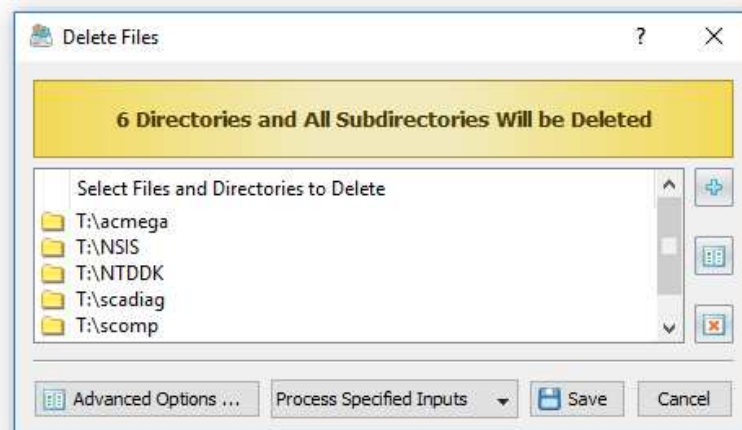
In order to execute a user-defined file delete command, just double-click on the command item in the 'Commands' pane. Another option is to create a desktop shortcut for the file delete operation and then click on the shortcut to execute the file delete operation without starting the DiskBoss GUI application. Finally, in order to execute the file delete operation using the command line utility, type the following command: **diskboss -execute <Command Name>**.

10.6 Saving Delete File Logs

DiskBoss provides the ability to save full delete file logs to the pain text format or the Excel CSV format. In order to enable logs for a file delete operation, open the advanced file delete options dialog, select the 'Advanced' tab, enable the 'Save Delete Log Files' option, select an appropriate log file format and specify a directory where to save all log files.
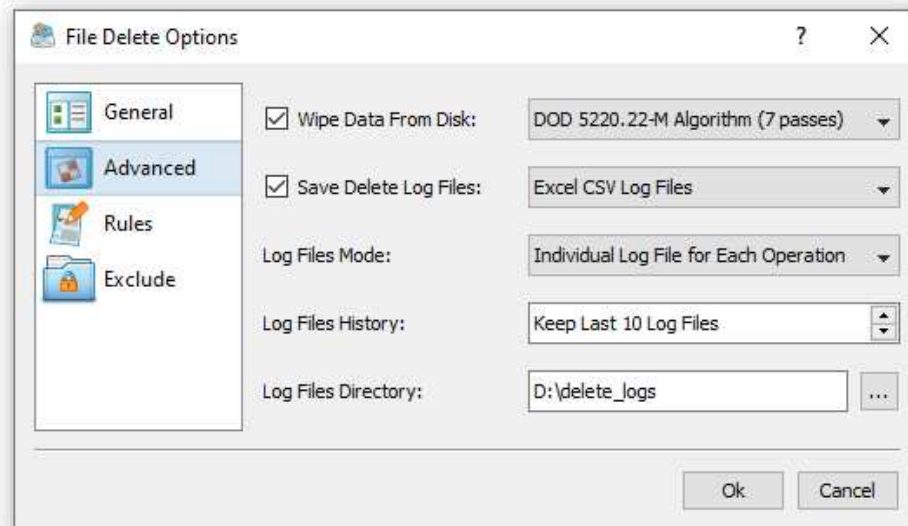
DiskBoss provides the following log file modes:

- **Individual Log File For Each Delete Operation** - in this mode DiskBoss will save an individual log file for each file delete operation with the log file name containing the exact date and time of each file delete operation.
- **Consolidated Hourly Log Files** - in this mode DiskBoss will save consolidated hourly log files for the last X hours according to the specified log files history.
- **Consolidated Daily Log Files** - in this mode DiskBoss will save consolidated daily log files for the last X days according to the specified log files history.
- **Consolidated Monthly Log Files** - in this mode DiskBoss will save consolidated monthly log files for the last X months according to the specified log files history.

According to the selected log files format, log files mode and the logs history, DiskBoss will keep a history of log files in the specified logs directory with each log file containing a date, time, status and a full file name for each deleted file.
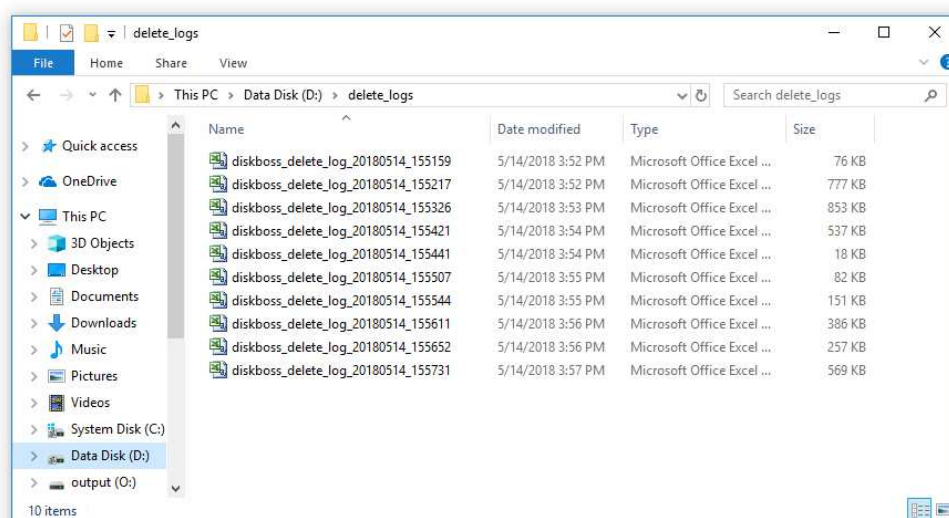
10.7   Exporting Delete File Logs to SQL Database

Corporate customers and IT professionals are provided with the ability to export full delete file logs to a centralized SQL database. In order to enable SQL database logs for a file delete operation, open the advanced file delete options dialog, select the 'Advanced' tab, enable the 'Save Delete Log Files' option, select the SQL database logs format and specify an SQL table name prefix. In addition, open the 'Options' dialog and configure an ODBC data source to use to export delete file logs to the SQL database.
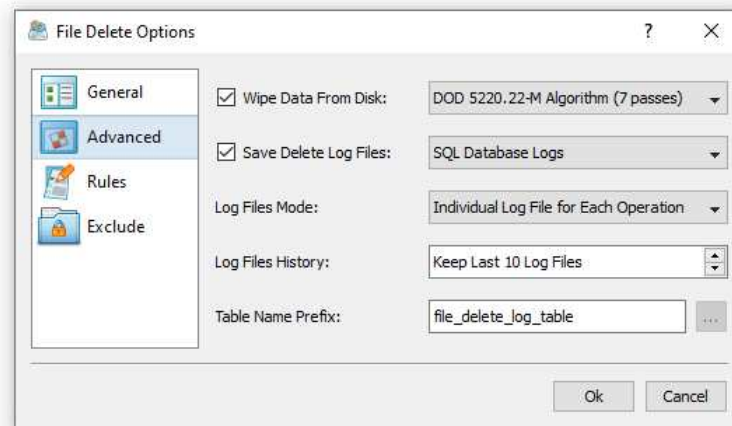
DiskBoss provides the following SQL database log modes:

- **Individual Log Table For Each Delete Operation** - in this mode DiskBoss will create an individual SQL database table for each file delete operation with the table name containing the specified table name prefix and an exact date and time of the delete operation.
- **Consolidated Hourly Database Log Tables** - in this mode DiskBoss will keep consolidated hourly SQL database tables for the last X hours according to the specified delete file logs history.
- **Consolidated Daily Database Log Tables** - in this mode DiskBoss will keep consolidated daily SQL database tables for the last X days according to the specified delete file logs history.
- **Consolidated Monthly Database Log Tables** - in this mode DiskBoss will keep consolidated monthly SQL database tables for the last X months according to the specified delete file logs history.

According to the selected delete file logs mode and the logs history, DiskBoss will keep a history of SQL database tables with each SQL database table containing a date, time, status and a full file name for each deleted file.

10.8   Deleting Files Listed in User-Specified Text Files

DiskBoss provides the ability to delete files listed in user-specified text files allowing one to perform fully automated or periodic bulk file delete operations. DiskBoss can read file names from user-specified text files and delete all files listed in one or more text files or in all text files located in a directory.
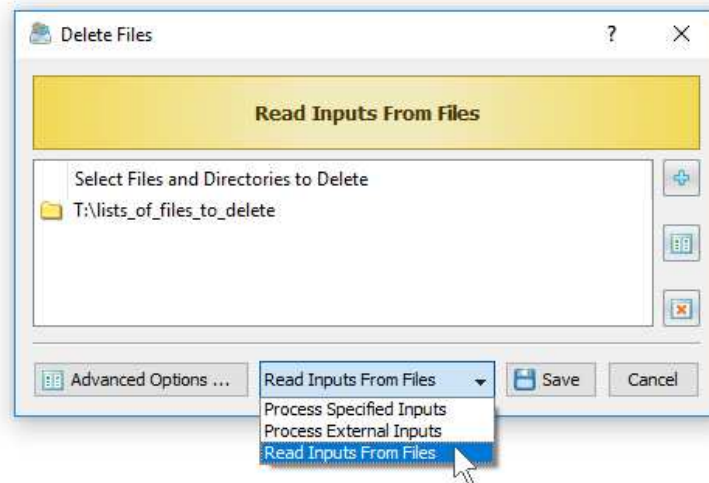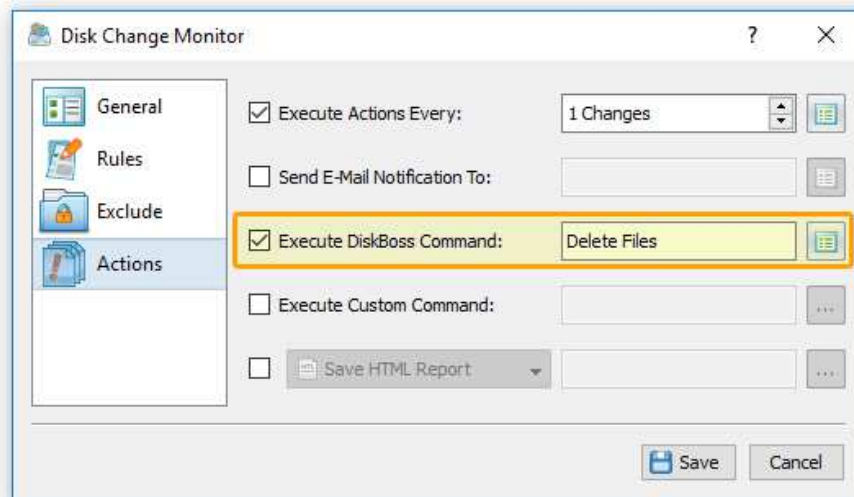

In order to configure DiskBoss to delete files listed in user-specified text files, create a user-defined file delete command, select the 'Read Inputs From Files' mode and add one or more directories or text files to the input list. The specified text files should contain full names of files or directories to be deleted with a single name per line. During runtime, DiskBoss will read the specified text files and delete all files listed in the text files.

Another option is to specify a directory which may contain a number of text files with lists of files to be deleted. In this case, DiskBoss will parse the directory, read all text files located in the directory and delete all files listed in the text files.
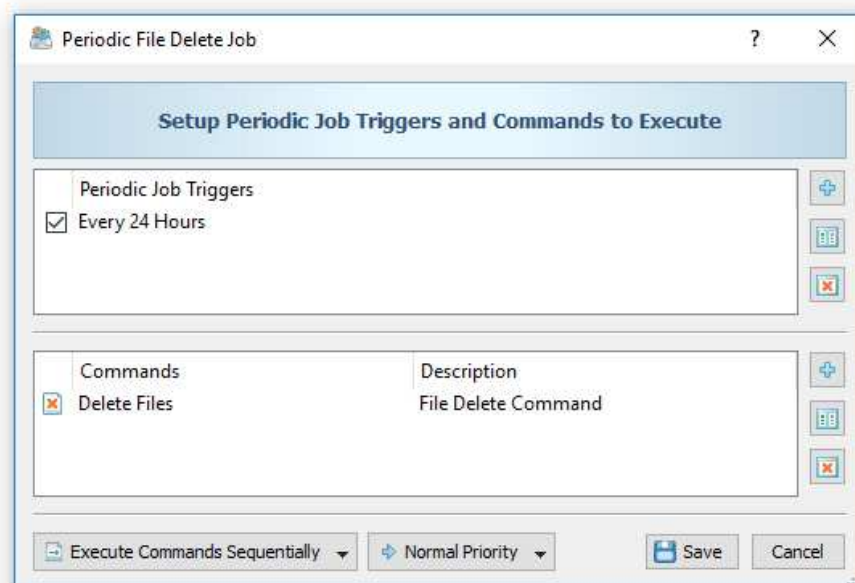
DiskBoss allows one to perform bulk file delete operations periodically according to a user-specified time interval. In order to perform a user-defined file delete operation periodically, create a new periodic job and select the user-defined file delete command to be executed according to the specified time interval.

In addition, DiskBoss provides the ability to automatically execute a user-defined file delete command when one or more text files with lists of files to be deleted are created in the specified inputs directory. In order to enable automatic execution of file deleted operations, add a disk change monitoring command, configure the real-time disk change monitor to monitor the directory with the text files listing files to be deleted, enable actions for the real-time disk change monitor and select the user-defined delete command to be executed after each newly created text file.

During runtime, DiskBoss will continuously monitor the configured directory, detect newly created text files, read file names from these files and delete all listed files. Finally, in order to automatically delete text files with lists of files after each delete operation, open the user-defined file delete command, open the 'Options' dialog, select the 'General' tab and enable the 'Delete Input File Lists' option.
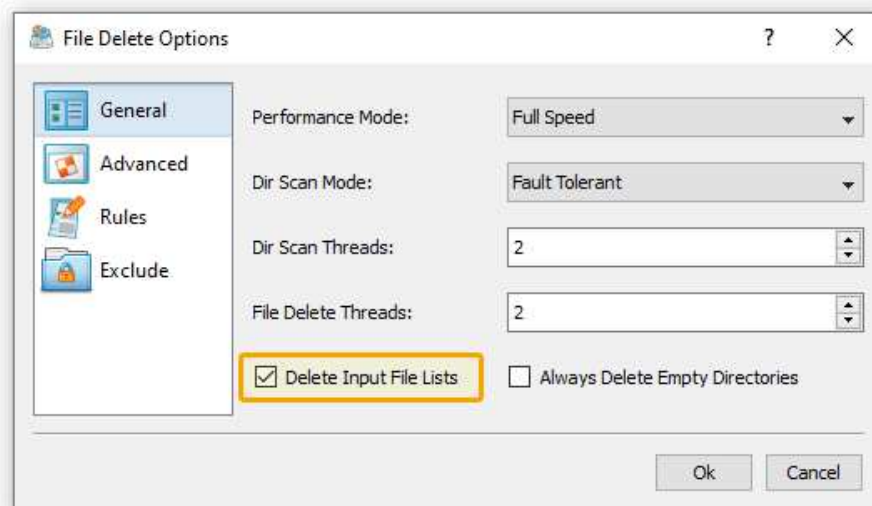
Fully automated bulk file delete operations, performed without any user intervention, may be configured using DiskBoss Server, which runs as a service in the background, and is capable of continuously monitoring a directory for newly created text files and automatically delete all files listed in the created text files. Once DiskBoss Server is fully configured, the user just needs to copy one or more text files to the specified directory and DiskBoss Server will automatically perform all file delete operations in the background.

10.9 Deleting Files Using the DiskBoss Command Line Utility

In addition to the GUI application, DiskBoss Ultimate and DiskBoss Server provide a command line tool allowing one to perform file delete operations from batch files and shell scripts. The DiskBoss command line tool is located in the **'<ProductDir>/bin'** directory.

Command Line Syntax:

diskboss -delete <Input 1> [… <Input X> <Options>]

This command deletes the specified files and directories.

diskboss –execute <User-Defined File Delete Command>

This command executes the specified user-defined file delete command.

Parameters:

–delete <File or Directory>

At least one file or directory should be specified. In order to ensure proper parsing of command line arguments, directories and file names containing space characters should be double quoted.

Options:

-**wipe**

This parameter instructs to wipe data from the disk.

-**confirm**

Explicitly confirms delete operation.

-**workers** <ThreadCount>

This parameter specifies the number of working threads.

-**v**

This parameter shows the product's major version, minor version, revision and build date.

-**help**

This parameter shows the command line usage information.

11 Bulk File Attribute Changer

11.1 Changing File Attributes Using the DiskBoss GUI Application

DiskBoss includes a bulk file attribute changer allowing one to process one or more disks or directories and change file attributes, creation dates, last modification dates and last access dates. The bulk file attributes changes provides a large number of advanced options allowing one to process specific types of files, perform multiple operations during a single scan through the file system, exclude directories from the scanning process, etc.

The bulk file attribute changer is optimized for modern multi-core and multi-CPU servers and can scan directories and process files using a number of CPU or CPU cores according to user-specific needs and requirements. In addition, the user is provided with advanced parallel directory scanning capabilities allowing one to process files and change file attributes and/or file timestamps for millions of files very effectively.
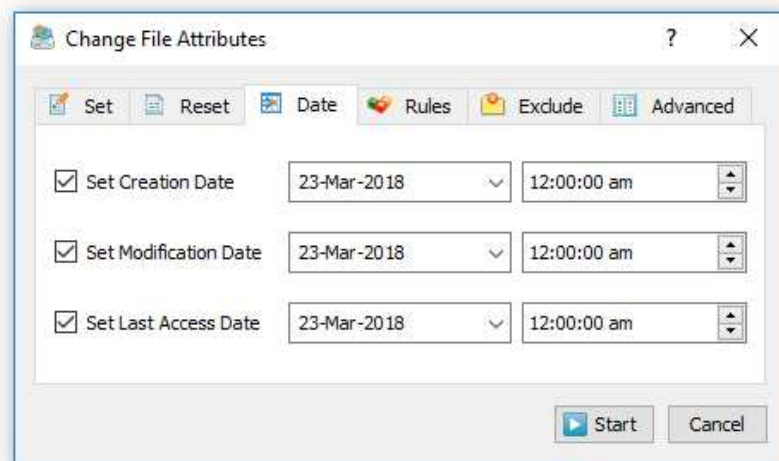
In order to start a simple change file attributes operation, select one or more directories or files in the DiskBoss file navigator and press the 'Attributes' button located on the main toolbar. On the 'Set' tab select file attributes that should be set, on the 'Reset' tab select file attributes that should be reset, on the 'Date' tab select timestamps that should be modified and press the 'Start' button. DiskBoss will scan the selected directories and all subdirectories and change selected file attributes and file creation, last modification and last access timestamps.

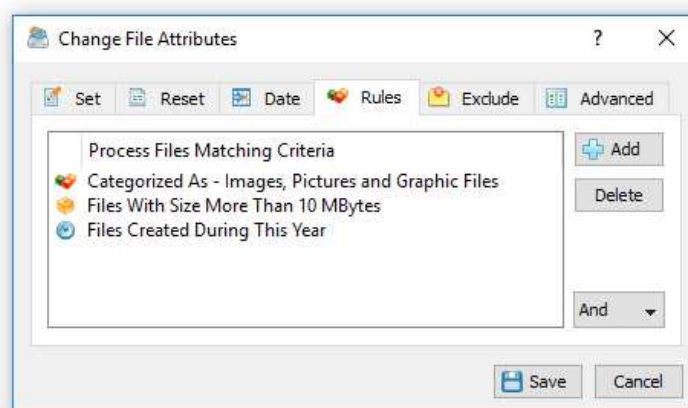## 11.2   Advanced Change File Attributes Options

The DiskBoss bulk file attributes changer provides a number of advanced change file attributes options allowing one to customize change file attributes operations for user-specific needs and requirements.
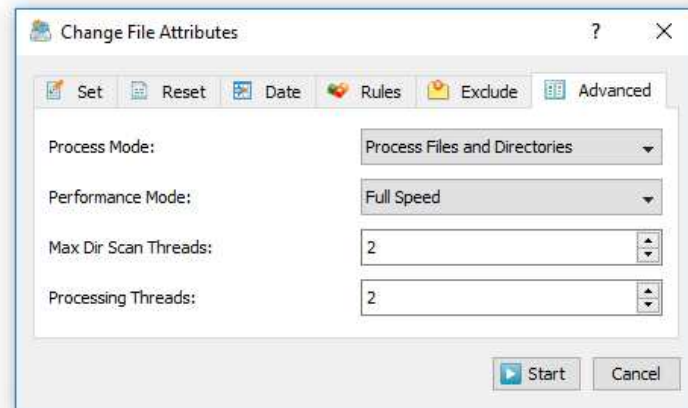
- **Process Mode** - this option provides the ability to change file attributes for files only, directories only or for files and directories.
- **File Scanning Mode** - DiskBoss is optimized for multi-core and multi-CPU servers and is capable of scanning files and directories in parallel using multiple CPUs. Use this option to select the 'Parallel' or 'Sequential' file scanning mode.
- **Performance Mode** - In order to minimize a potential performance impact on running production applications, DiskBoss provides the ability to intentionally slow down long-running change file attributes operations, which may be useful when changing attributes for millions of files on active production servers and storage systems.
- **Processing Threads** - Use this option to set the number of processing threads to be used for the change file attributes operation.

11.3   Changing Attributes for Specific Types of Files

DiskBoss allows one to change file attributes and/or file timestamps for files matching user-specified rules. For example, the user is provided with the ability to change file attributes for all types of images with the file size more than X MB. Multiple different types of file matching rules may be used to precisely select files to be processed.

In order to add one or more file matching rules to a change file attributes operation, select the 'Rules' tab, press the 'Add' button, select a rule type and enter all required parameters. During the file system scanning process, DiskBoss will select files using the specified file matching rules and change file attributes and/or timestamps for files matching the specified rules.

11.4   Excluding Directories from Change File Attributes Process

Sometimes, it may be required to exclude one or more subdirectories from a change file attributes operation. In order to exclude one or more directories, open the change file attributes dialog, select the 'Exclude' tab and add directories that should be excluded from the change file attributes process.


In addition, advanced users and IT professionals are provided with a number of exclude directories macro commands allowing one to exclude multiple directories using a single macro command.

- **$BEGINS <Text String>** - excludes directories beginning with the specified string.
- **$CONTAINS <Text String>** - excludes directories containing the specified string.
- **$ENDS <Text String>** - excludes all directories ending with the specified string.
- **$REGEX <Regular Expression>** - excludes directories matching the specified regular expression.
- **$DIRLIST <File Name>** - this macro command excludes all directories listed in the user-specified text file.
- **$FILELIST <File Name>** - this macro command excludes all files listed in the user-specified text file.

For example, the exclude macro command '$CONTAINS Temporary Files' will exclude all directories with 'Temporary Files' at any place in the full directory path and the exclude macro command '$REGEX \.(TMP|TEMP)$' will exclude directories ending with '.TMP' or '.TEMP'.

11.5   User-Defined Change File Attributes Commands

One of the most powerful capabilities of DiskBoss is the ability to pre-configure advanced change file attributes operations as user-defined commands and then execute these commands in a single mouse click using the DiskBoss CUI application. In addition, the user is provided with the ability to execute pre-configured change file attributes operations using the DiskBoss command line utility or schedule periodic change file attributes operations using DiskBoss Server, which runs in the background as a service and allows one to implement fully automated change file attributes operations.
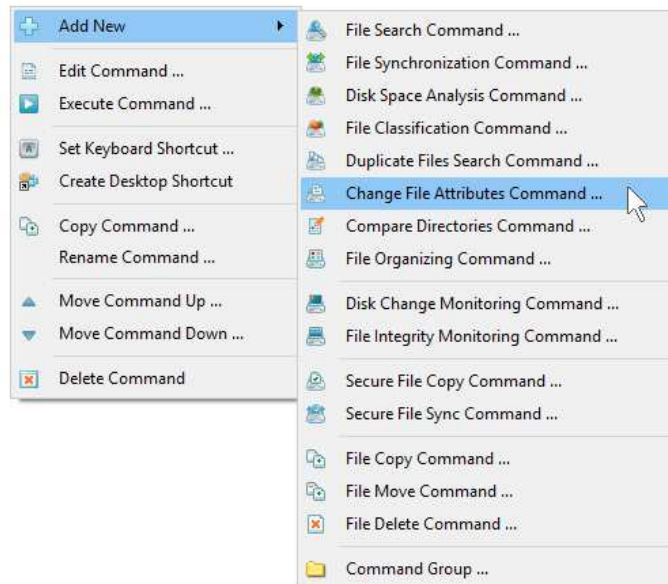
In order to add a new user-defined change file attributes operation, press the right mouse button over the 'Commands' pane, select the 'Add New - Change File Attributes Command' menu item and enter a unique command name. On the command inputs dialog, specify one or more directories or files to process and press the 'Next' button.
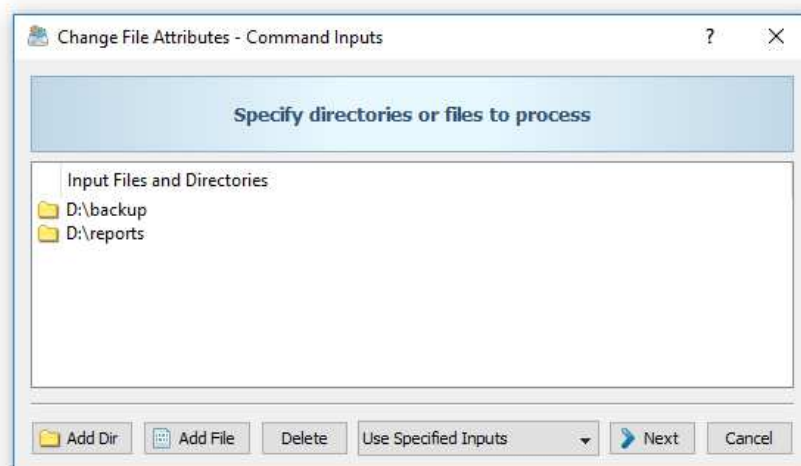
In order to execute a user-defined change file attributes command, just double-click on the command item in the 'Commands' pane. Another option is to create a desktop shortcut for the change file attributes operation and then click on the shortcut to execute the change file attributes operation without starting the DiskBoss GUI application. Finally, in order to execute the change file attributes operation using the command line utility, type the following command: **diskboss -execute <Command Name>**.

12 Files and Directories Compare Operations

DiskBoss provides the ability compare directories and detect changes in the directory structure, file contents, file size, file attributes, file ownership, creation and last modification dates. The user is provided with the ability to detect all changes between two directories and save reports into a number of various report formats including HTML, PDF, text, CSV and XML.
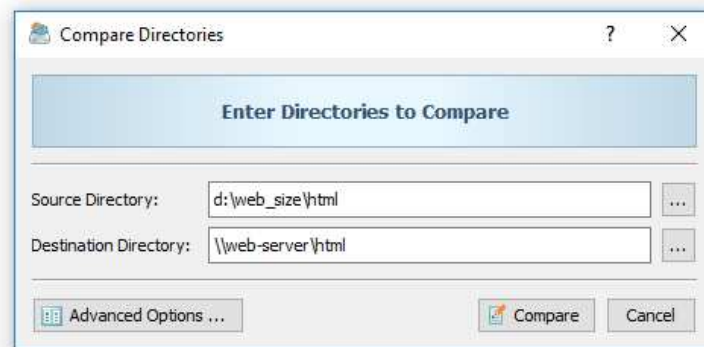

In addition, DiskBoss allows one to select which types of changes to detect, compare specific types of files using flexible file matching rules, exclude special subdirectories from the directories comparison process, customize various performance optimization options and export detected changes to an SQL database.

IT professionals and storage administrators are provided with the ability to schedule periodic execution of directory comparison operations and configure conditional actions allowing one to automatically save various types of reports, send E-Mail notifications and/or execute file synchronization or custom file management operations when a directory comparison operation detects a user-specified number of changes.

12.1   Comparing Files and Directories

In order to perform a simple directories comparison operation, press the 'Compare' button located on the main toolbar. On the 'Compare Directories' dialog, enter a source directory, a destination directory and press the 'Compare' button. DiskBoss will scan the specified source directory including all subdirectories, verify the directory structure, check all files and display the directories comparison results dialog showing all the detected file system changes.

In addition, the 'Compare Directories' dialog provides the ability to configure advanced directories comparison options allowing one to select which types of file system changes to detect, optimize the performance of directories comparison operations, configure specific types of files to compare, exclude subdirectories from the directories comparison process and configure conditional file management actions and E-Mail notifications to be executed when a user-specified number of changes are detected.
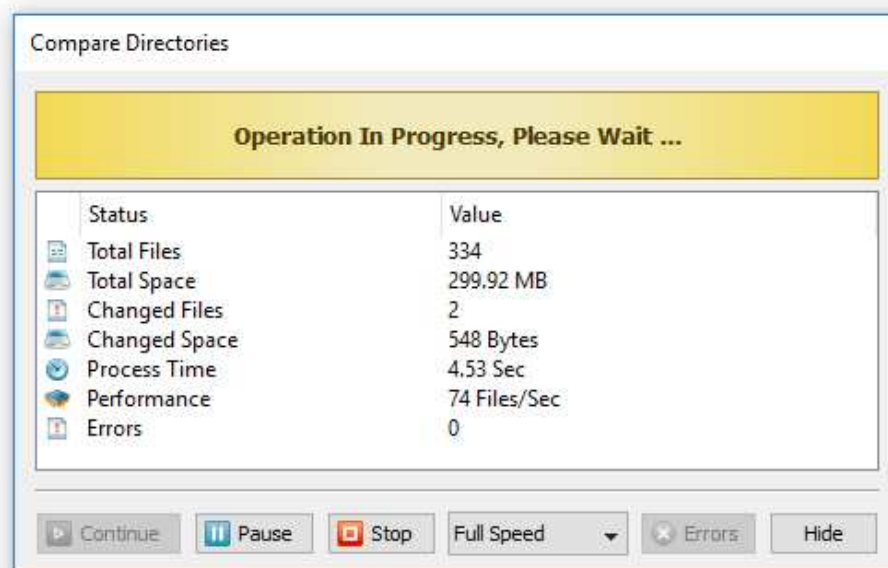
The compare directories results dialog shows the list of detected file system changes and provides the ability to view detailed information about the directories comparison operation, save the detected file system changes to a number of standard report formats, export changes to an SQL database and copy changes to the clipboard.

12.2   Saving Directories Comparison Reports

In order to save a directories comparison report, compare two directories, open the directories comparison results dialog, press the 'Save' button and select one of the following report formats: PDF, HTML, Text, Excel CSV or XML. In addition, DiskBoss Ultimate and DiskBoss Server provide the ability to export detected file system changes to an SQL database.
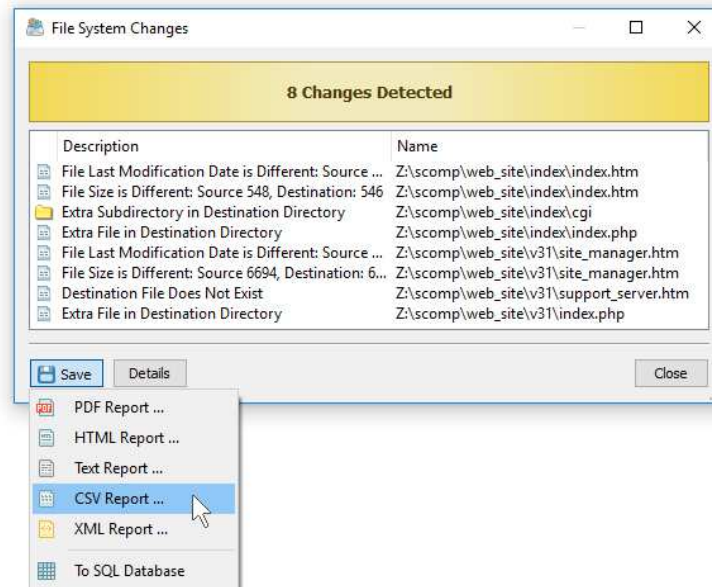
Each report includes a report summary showing the date and time of the report, the total number of processed files and the total amount of disk space, the number of changed files and changed directories and the list of detected file system changes. For each detected file system change, DiskBoss shows the change description and the name of the related file or directory.
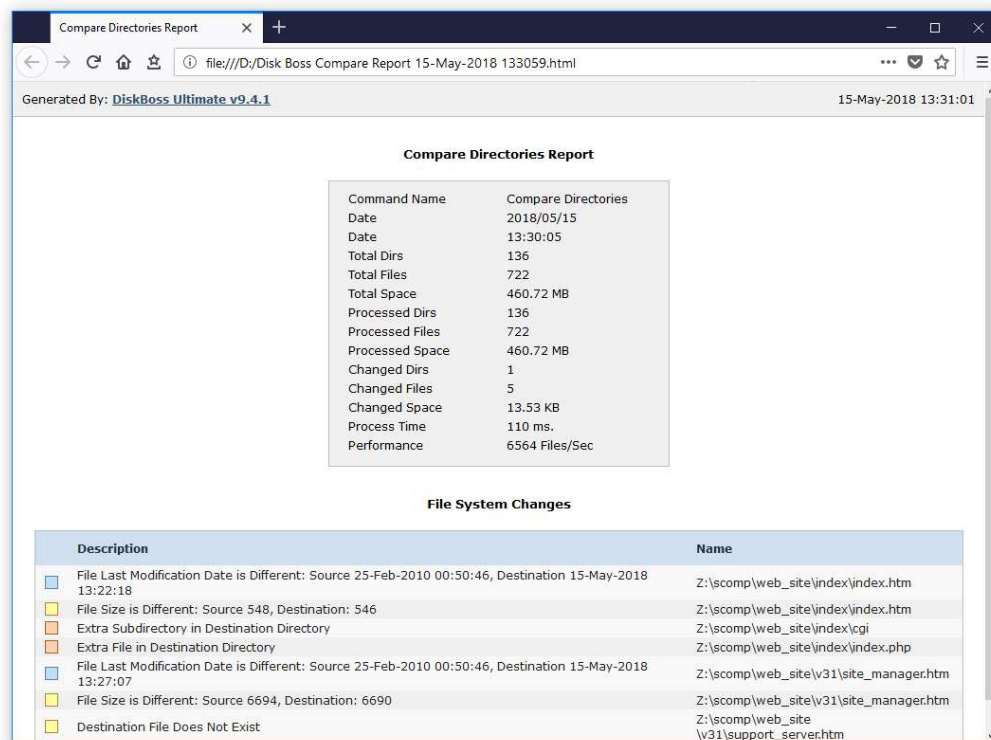
12.3   Advanced Directories Comparison Options

Depending on user-specific needs, sometimes it may be required to detect only specific types of files system changes and hide irrelevant changes. In order to select which types of file system changes to detect, open the 'Compare Directories' dialog, press the 'Advanced Options' button and select the 'General' tab.
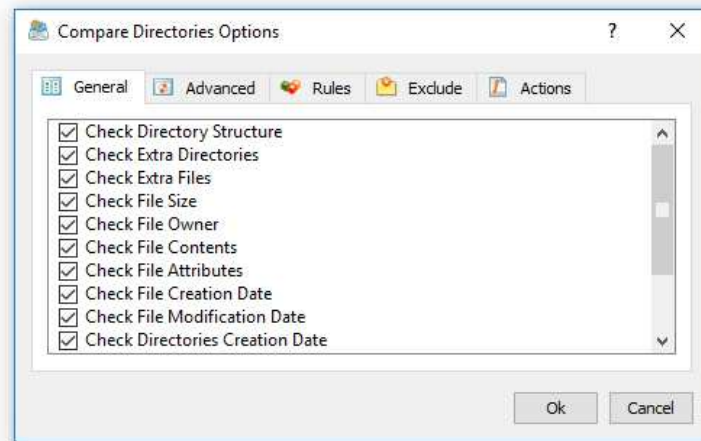
- **Check Directory Structure** - select this option to verify that the destination directory structure is identical to the source directory structure.
- **Check Extra Directories** - select this option to verify that there are no extra directories in the destination directory which do not exist in the source directory.
- **Check Extra Files** - select this option to verify that there are no extra files in the destination directory which do not exist in the source directory.
- **Check File Size** - select this option to verify that the size of each file existing in the source directory is identical to the size of the same file in the destination directory.
- **Check File Owner** - select this option to verify that the owner of each file and/or subdirectory existing in the source directory is identical to the owner of the same file and/or subdirectory in the destination directory.
- **Check File Contents** - select this option to verify that the contents of each file existing in the source directory is identical to the contents of the same file in the destination directory.
- **Check File Attributes** - select this option to verify that the attributes of each file existing in the source directory is identical to the attributes of the same file in the destination directory.
- **Check File Creation Date** - select this option to verify that the creation date of each file existing in the source directory is identical to the creation date of the same file in the destination directory.
- **Check File Modification Date** - select this option to verify that the last modification date of each file existing in the source directory is identical to the last modification date of the same file in the destination directory.
- **Check Directories Creation Date** - select this option to verify that the creation date of each subdirectory existing in the source directory is identical to the creation date of the same subdirectory in the destination directory.
- **Check Directories Modification Date** - select this option to verify that the last modification date of each subdirectory existing in the source directory is identical to the last modification date of the same subdirectory in the destination directory.
- **Detect and Skip Recursive Directories** - by default DiskBoss detects and skips recursive directories, which may form infinite directory scanning loops. Unselect this option to disable detection of recursive directories.
- **Report File Access Errors as Changes** - by default DiskBoss reports file access errors as changes. When this option is disabled, DiskBoss will show all file access errors in the process log, but not in the change list.
- **Report Directory Access Errors as Changes** - by default DiskBoss reports directory access errors as changes. When this option is disabled, DiskBoss will show all directory access errors in the process log, but not in the change list.

In order to configure advanced directories comparison options, open the 'Compare Directories' dialog, press the 'Advanced Options' button and select the 'Advanced' tab, which provides the ability to control the default report title, the maximum number of file system changes to report, the number of parallel directory comparison threads, the speed of the directories comparison operation and the files comparison mode.
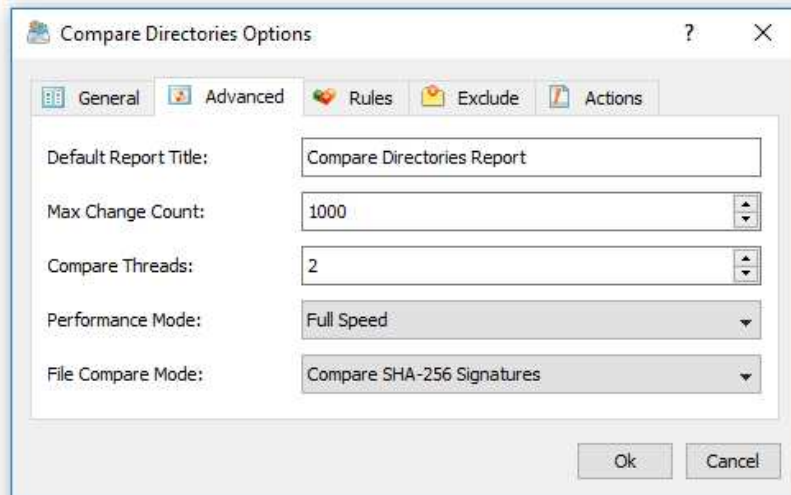

- **Default Report Title** - this option allows one to set the default report title, which will be saved in PDF, HTML, text, Excel CSV and XML reports. In addition, this option controls the default report title for reports automatically generated by conditional actions and reports sent in conditional E-Mail notifications.
- **Max Change Count** - this option provides the ability to limit compare directories reports to a user-specified maximum number of changes. By default, DiskBoss reports the first 1,000 detected file system changes. During a directories comparison operation, DiskBoss always processes the entire source and destination directories and detects all file system changes and the report summary always shows the total number of processed files and the total number of changed files and changed directories, but the list of changes in the report will include the first X file system changes according to the user-specified maximum number of changes.
- **Compare Threads** - this option sets the number of parallel directory comparison threads to use to compare the specified source and destination directories. When comparing two directories located on the same mechanical hard drive, it is recommended to use just one compare thread in order to avoid unnecessary disk seek operations. When comparing two directories located on two different mechanical drives, it is recommended to use two parallel compare threads. When the source directory is located on a local mechanical hard drive and the destination directory is located on a simple NAS device with a mechanical hard drive, it is recommended to use two parallel compare threads. When comparing two directories located on SSD disks or an enterprise-grade storage system with multiple physical drives or SSD disks, it is recommended to use 4-8 parallel compare threads depending on the number of CPUs available on the computer.
- **Performance Mode** - sometimes it may be required to intentionally slow down the directories comparison process in order to minimize the potential performance impact on running production applications. The 'Performance Mode' option provides the ability to execute the directories comparison operation using one of the following performance profiles: 'Full Speed', 'Medium Speed' and 'Low Speed'.
- **File Compare Mode** - when the 'Check File Contents' option is selected, DiskBoss calculates a hash signature for each file located in the source directory and compares the source file hash signature to the hash signature of the same file located in the destination directory. By default, DiskBoss uses the SHA-256 hash signature algorithm, which is very reliable, but requires significant CPU resources. In order to reduce the CPU usage during the directory comparison process, the user is provided with the ability to change the hash signature algorithm to SHA-1, MD5 or even simple CRC-32/CRC-64 checksums, which are less reliable, but require fewer CPU resources.

12.4   Comparing Specific Types of Files

DiskBoss allows one to compare selected files by the file type, size, file name, extension, file attributes, etc. using one or more user-specified file matching rules. For example, the user is provided with the ability to compare all types of documents, images and program files and skip all other types of files. Multiple different types of file matching rules may be used to precisely select files to be processed.
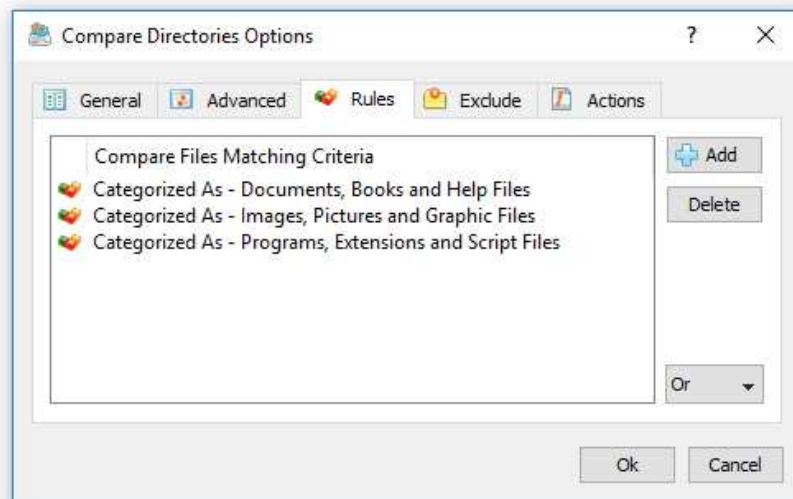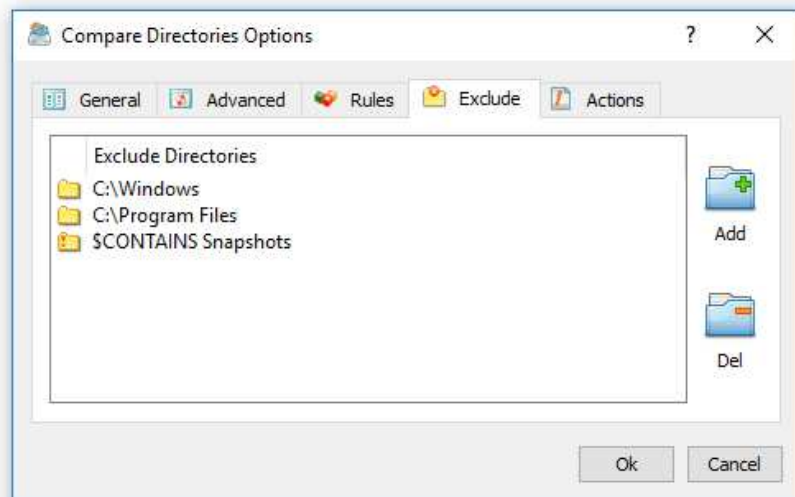

In order to add one or more file matching rules to a directories comparison operation, select the 'Rules' tab, press the 'Add' button, select a rule type and enter all required parameters. During the directories comparison process, DiskBoss will select files using the specified file matching rules, compare files matching the specified rules and skip all other files.
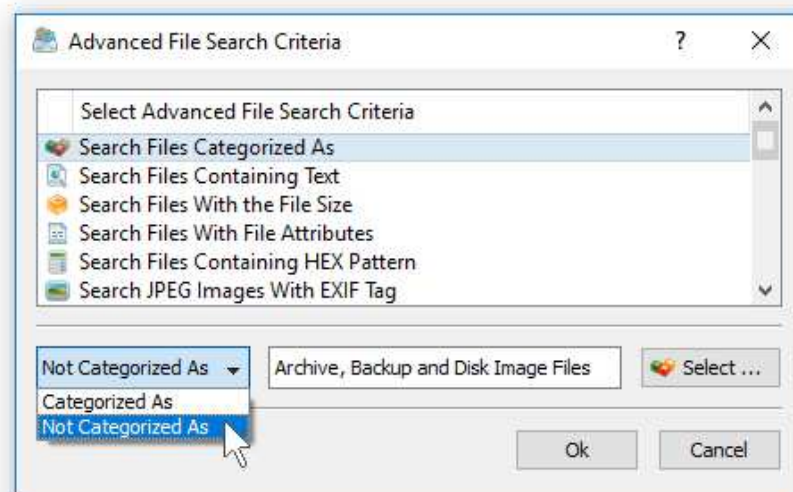
In addition to positive file matching rules, which can be used to specify files to compare, DiskBoss also provides negative file matching rules, which can be used to exclude specific files from the directories comparison process. For example, in order to exclude all types of backup files from the directories comparison process, add a new file matching rule, select the 'Search Files Categorized As' rule type, select the 'Archive, Backup and Disk Image' files category and then select the 'Not Categorized' rule operator.

12.5   Excluding Subdirectories from the Comparison Process

Sometimes, it may be required to exclude one or more subdirectories from the directories comparison process. In order to exclude one or more directories, open the 'Compare Directories' dialog, press the 'Advanced Options' button, select the 'Exclude' tab and add directories that should be excluded from the directories comparison operation.

In addition, advanced users and IT professionals are provided with a number of exclude directories macro commands allowing one to exclude multiple directories using a single macro command.

- **$BEGINS <Text String>** - excludes directories beginning with the specified string.
- **$CONTAINS <Text String>** - excludes directories containing the specified string.
- **$ENDS <Text String>** - excludes all directories ending with the specified string.
- **$REGEX <Regular Expression>** - excludes directories matching the specified regular expression.
- **$DIRLIST <File Name>** - this macro command excludes all directories listed in the user-specified text file.
- **$FILELIST <File Name>** - this macro command excludes all files listed in the user-specified text file.

For example, the exclude macro command '$CONTAINS Temporary Files' will exclude all directories with 'Temporary Files' at any place in the full directory path and the exclude macro command '$REGEX \.(TMP|TEMP)$' will exclude directories ending with '.TMP' or '.TEMP'.

12.6   Conditional Actions and E-Mail Notifications

DiskBoss provides the ability to compare two directories, evaluate the directories comparison results and then automatically save various type of reports, send E-Mail notifications or execute file management operations if the number of detected file system changes exceeds a user-specified number. In order to configure one or more conditional directories comparison actions, open the directories comparison options dialog, select the 'Actions' tab and press the 'Add' button.
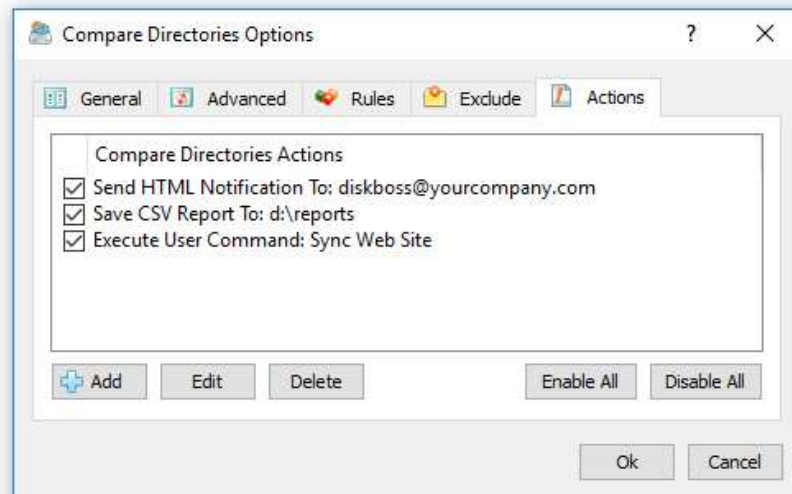
On the 'Add Action' dialog, specify the number of changes to trigger the action, select an appropriate action type and specify all the required parameters. The 'Send HTML Notification' and 'Send Text Notification' action send an E-Mail notification to the specified E-Mail address. In addition, the user needs to open the 'Options' dialog and configure an E-Mail server to use to send E-Mail notifications.
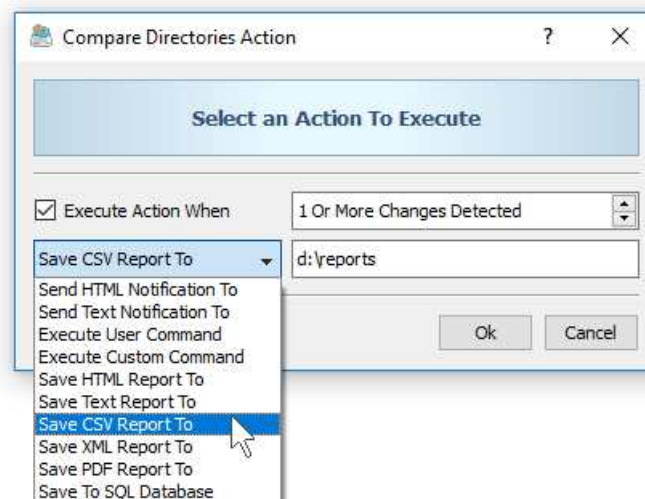
For all report generation actions, the user needs to specify a name of an existing directory where to save all report files. The 'Save To SQL Database' action saves the list of detected changes to an SQL database and in order to use this action the user needs to open the 'Options' dialog and configure an ODBC data source to use to export changes to the SQL database. The 'Execute User Command' action allows one to execute a pre-configured DiskBoss file copy, file synchronization or any other DiskBoss file management operation. The 'Execute Custom Command' action provides the ability to execute a user-custom command, script or batch file.

13 Real-Time Disk Change Monitor

DiskBoss Ultimate and DiskBoss Server include a real-time disk change monitor capable of detecting newly created, modified and deleted files. The real-time disk change monitor provides the user with the ability to monitor one or more disks or directories, detect all changes made in the monitored file systems, send E-Mail notifications, save HTML, PDF, XML, text and Excel CSV reports, export disk changes to an SQL database, automatically trigger DiskBoss file management operations and/or execute user-custom commands or batch files.

The real-time disk change monitor allows one to monitor specific types of files or file groups using flexible file matching rules. In addition, the user is provided with the ability to execute pre-configured file management commands as actions triggered by a disk change monitoring operation. For example, a user-defined file synchronization command may be automatically triggered after each X changes in a disk or directory effectively providing real-time file synchronization capabilities.

Finally, IT and storage administrators are provided with the ability to trigger file integrity monitoring operations based on real-time disk activities, automatically validate authenticity of critical system files, prevent malicious software from making any changes in the operating system files and ensure the security of critical production servers.

13.1   Configuring Disk Change Monitoring Commands

The most effective way to monitor changes in one or more disks or directories is to use DiskBoss Server, which runs in the background as a service and is capable of monitoring disks, saving reports and sending E-Mail notifications even when no one is logged in. In order to create a simple disk change monitoring command, start the DiskBoss client GUI application, press the 'Add' button located on the main toolbar, select the 'Disk Change Monitoring Command' menu item, enter a unique command name and press the 'Ok' button.
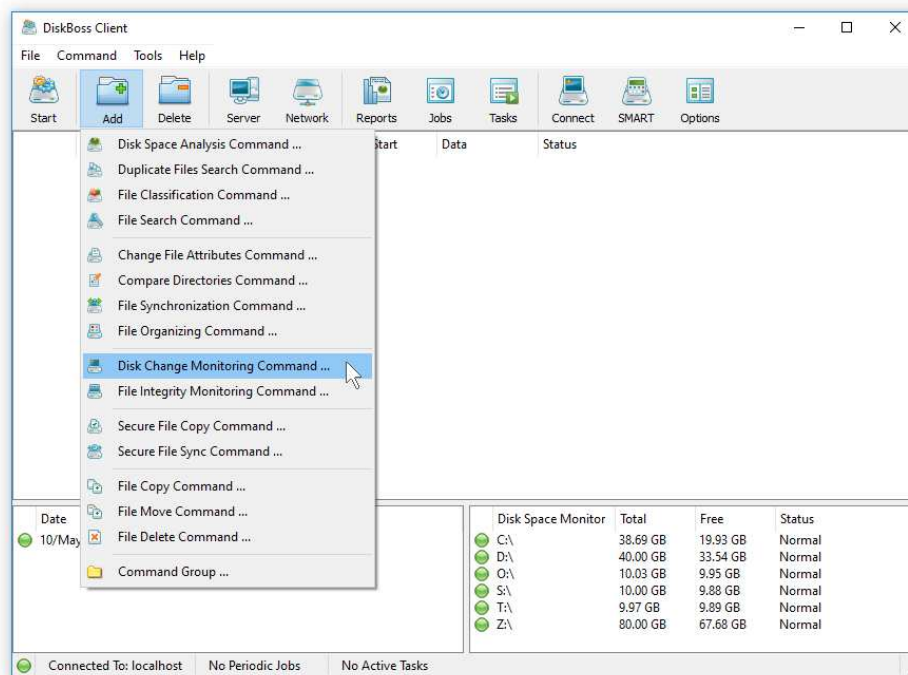
On the command inputs dialog, add one or more disks or directories that should be monitored and press the 'Next' button. On the disk change monitoring command options dialog, select the types of file system changes that should be monitored and press the 'Save' button.
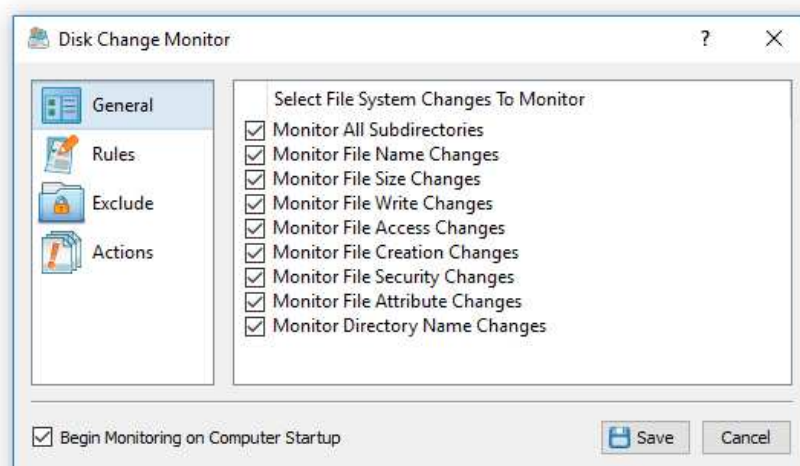
By default, DiskBoss will monitor all types of file system changes, but the user is provided with the ability to customize various disk change monitoring options, specify which types of files to monitor, exclude specific subdirectories from the disk change monitoring process, configure disk change monitoring reports, E-Mail notifications and custom actions.

13.2   Reviewing Detected File System Changes

In order to review detected file system changes, open the DiskBoss client GUI application and click on the disk change monitoring command item. The disk change monitoring results dialog shows a list of detected file system changes and allows one to start, pause, resume and stop the disk change monitoring operation, display statistical charts, save various types of disk change monitoring reports and export detected file system changes to an SQL database.
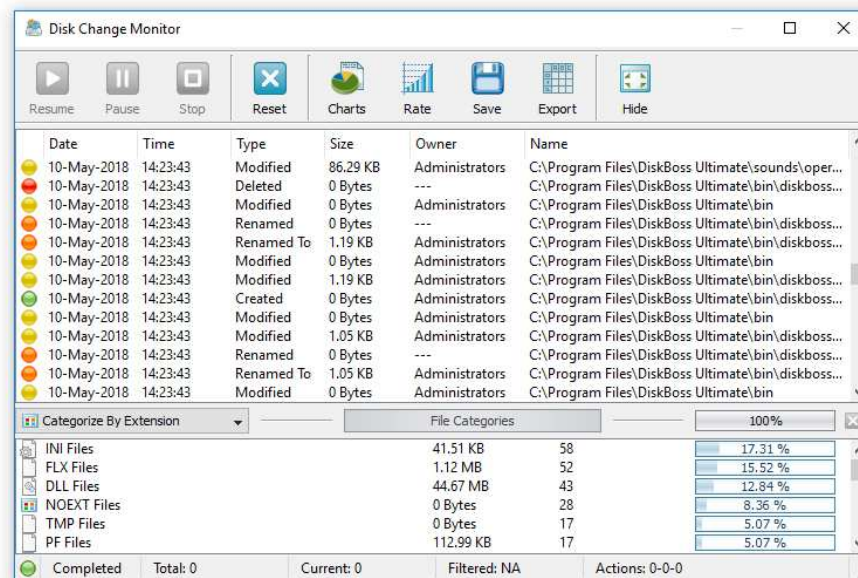
The top view shows the list of detected file system changes. For each change, DiskBoss shows the date and time of the change, the type of the change (created, modified, renamed or deleted), the size of the modified file as recorded at the time of the change, the user name of the file owner, and the full file or directory name.
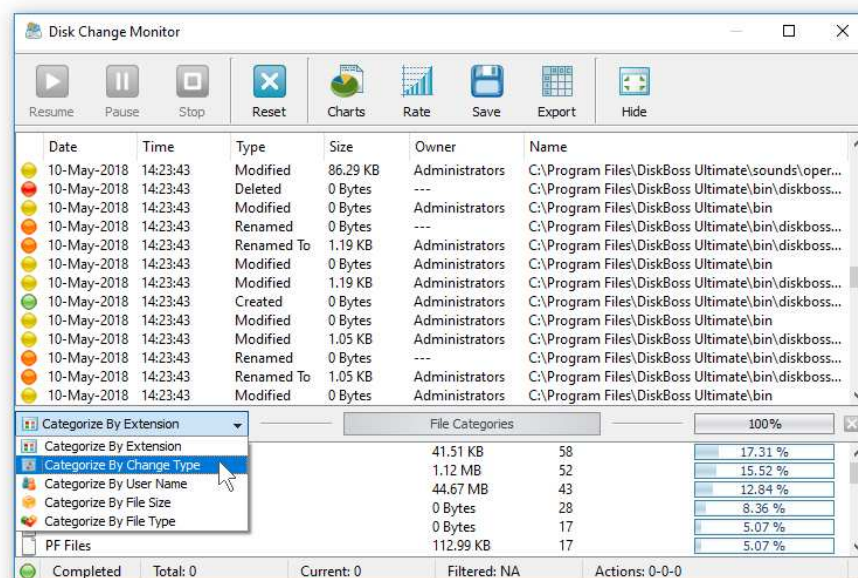
The bottom view shows categories of detected file system changes according to the currently selected file categorization mode. By default, DiskBoss categorizes detected file system changes by the file extension and displays a list of file extensions sorted by the number of detected file system changes. In addition, the user is provided with the ability to categorize changes by the change type, user name, file size and file type.

13.3   Filtering File System Changes

The disk change monitor allows one to filter detected file system changes by the change type, file type, extension, file size, user name, etc. Use the categories combo box located on the left side of the categories control bar to select an appropriate file categorization mode.
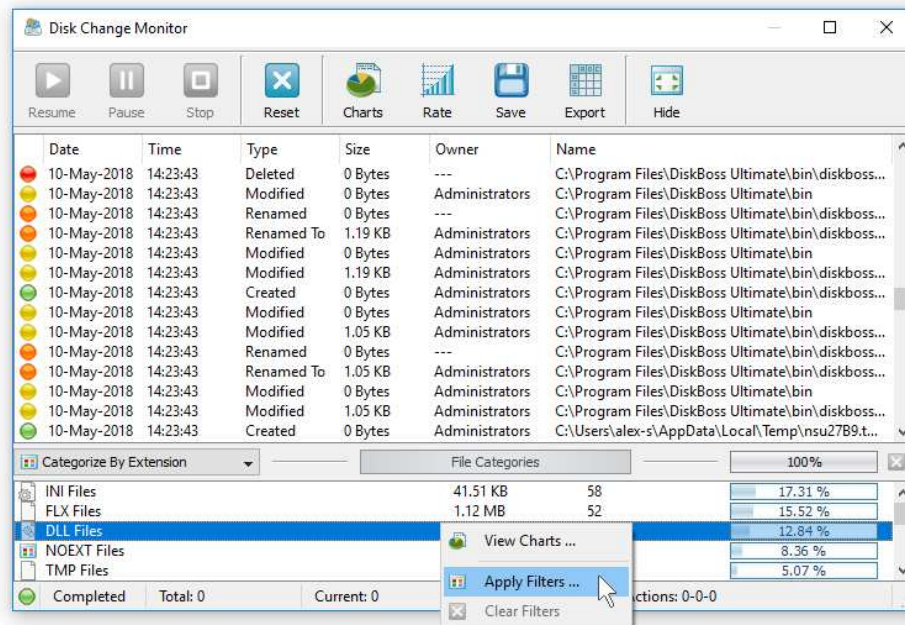
In order to filter changes using one or more filters, select the required file categorization mode, select one or more categories of changes, press the right mouse button and select the 'Apply Filters' menu item. The disk change monitor will update the change list and show file system changes matching the selected filters.
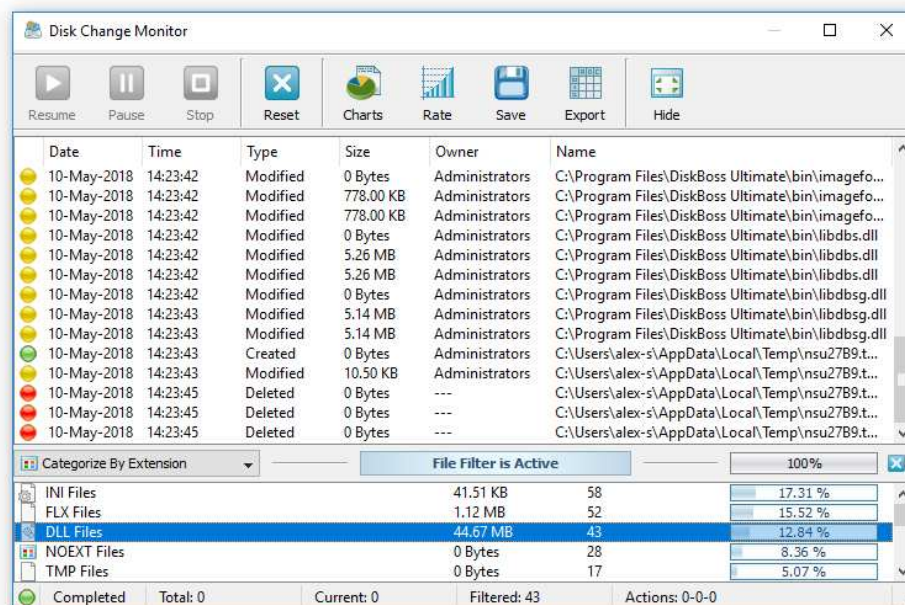
Change filters may be enabled when the disk change monitor is active filtering and displaying matching file system changes in real-time. In order to reset active file filters, just press the 'Clear' button located on the right side of the categories control bar.

13.4   Disk Change Monitoring Charts

The DiskBoss real-time disk change monitor provides the ability to display various types of statistical pie charts and bars charts showing the number of changes per file extension, file category, change type and user name. In order to display a pie chart, open the disk change monitoring results dialog and press the 'Charts' button.
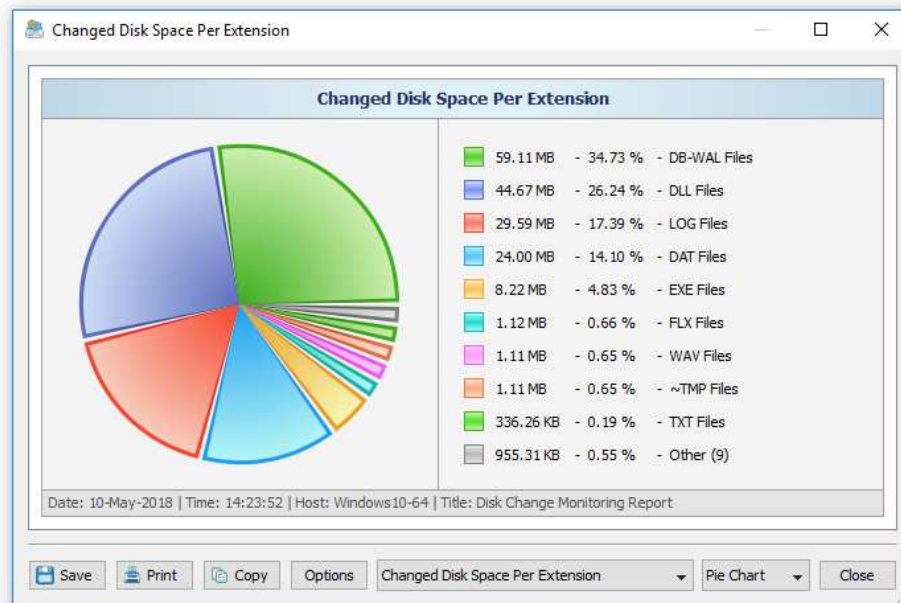
The charts dialog shows statistics according to the currently selected file categorization mode. For example, in order to display a pie chart showing the number of changes per change type, select the 'Categorize Changes Per Change Type' file categorization mode and then press the 'Charts' button.
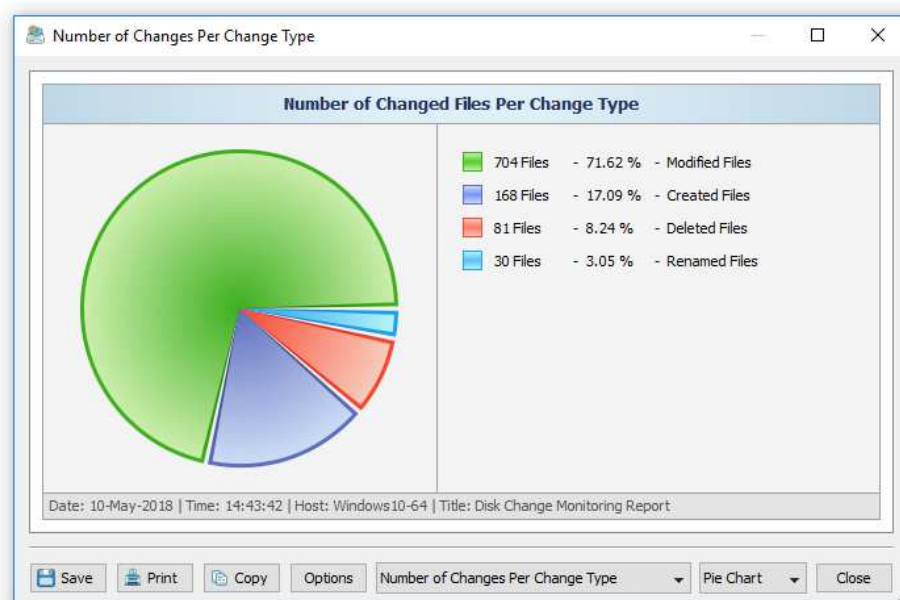
The charts dialog provides the ability to display the number of changes per file category or the total size of changed files. In addition, the user is provided with the ability to edit chart properties, copy the chart image to the clipboard or print the displayed chart image.

13.5   Saving Disk Change Monitoring Reports

The DiskBoss disk change monitor allows one to save HTML, PDF, XML, text and Excel CSV reports. In order to save a report file press the 'Save' button located on the disk monitor results dialog, enter a report title, select an appropriate report format, enter the maximum number of changes to export, enter the report file name and press the 'Save' button.
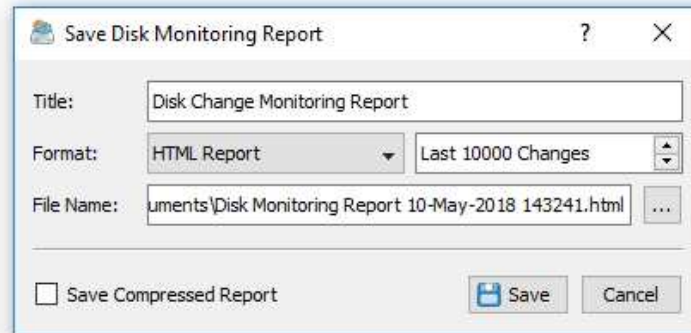
A typical report file includes a summary table showing the report date and time, the total number of file system changes that were detected, the number of changes exported to the report, the change rate, the process time and the status of the change filter. The change categories table shows up to 10 top change categories according to the currently selected file categorization mode. If the report is saved with one or more active file filters, the selected filters will be highlighted in the categories table and the change list will show changes matching the selected file filters.

The file categories table is followed by the list of detected file system changes. For each file system change, DiskBoss shows the date and time of the change, the change type (created, modified, renamed or deleted), the size of the file as recorded at the time of the change, the user name of the file owner and the full name of the changed file or directory.

13.6   Exporting Changes to an SQL Database

DiskBoss provides the ability to export detected file system changes to an SQL database. In order to be able to export changes to an SQL database, the user needs to configure the ODBC database interface on the main options dialog. Open the main options dialog, select the 'Database' tab, enable the ODBC database interface, enter the ODBC data source name, ODBC user name and ODBC password to use to connect to the SQL database and press the 'Verify' button to check the specified ODBC data source.
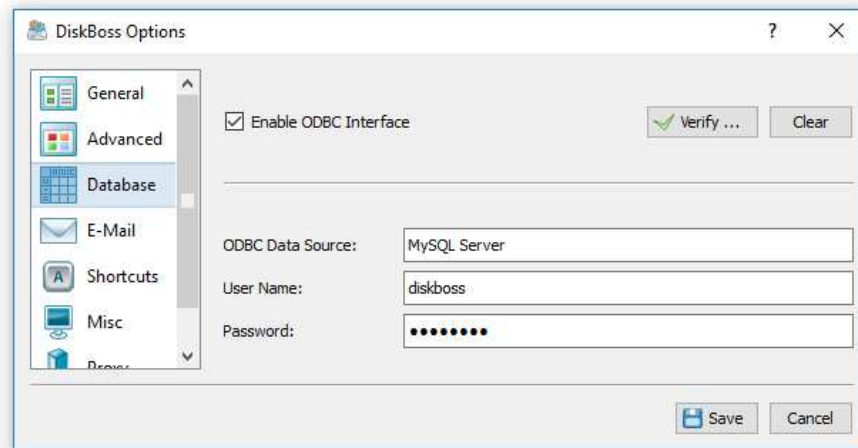
Once finished configuring the ODBC database interface, open the disk change monitoring results dialog, select one or more detected file system changes, press the right mouse button and select the 'Export Changes To SQL Database' menu item. On the next dialog, enter the name of the SQL database table to export the selected changes to and press the 'Ok' button.
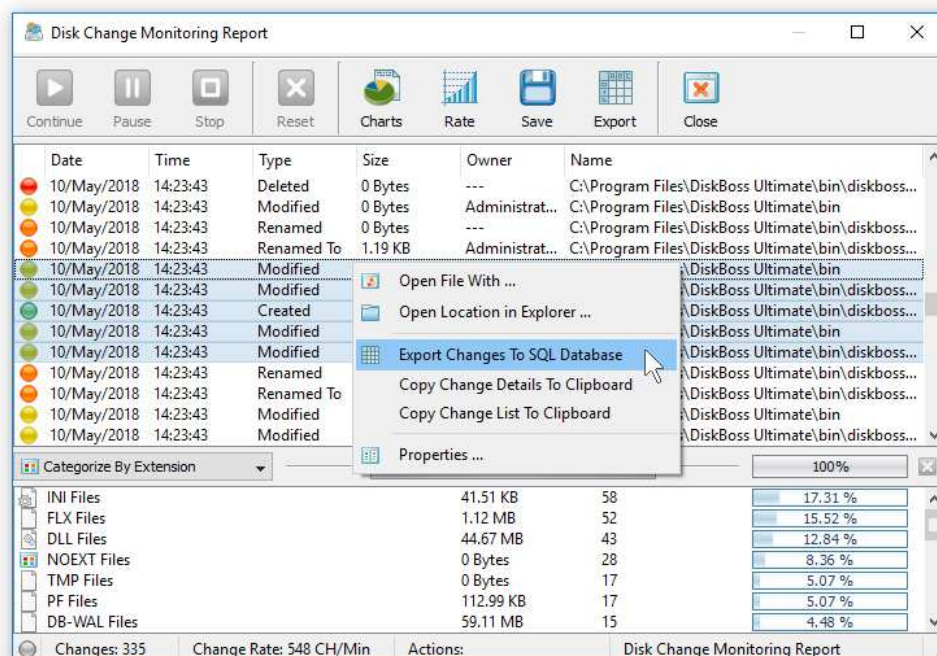
If the specified SQL database table does not exist, DiskBoss will create a new SQL database table and export the selected file system changes to the newly created database table. If the specified SQL database table already exists, DiskBoss will add selected changes to the existing SQL database table.

In order to import file system changes from an SQL database to Microsoft Excel, select the menu 'Data - Import External Data - New Database Query' menu item, select the ODBC data source to import the data from, select the SQL database table name that was specified during the export operation, select SQL database table columns to be imported, optionally select the data sorting mode and press the 'Finish' button.
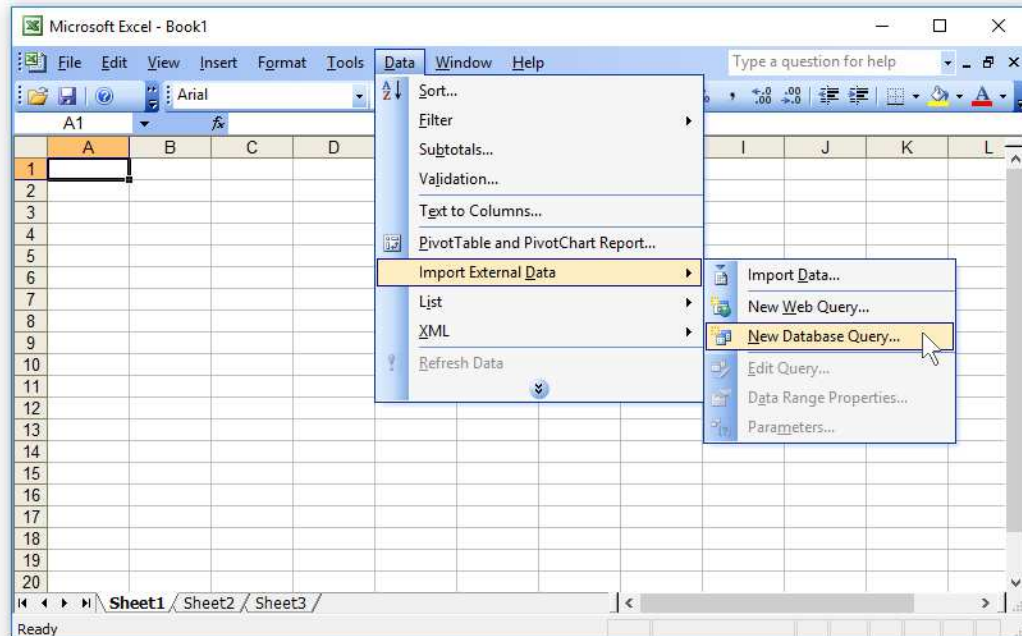
For each detected file system change, DiskBoss exports to the SQL database the following columns of data: a unique change ID, the date and time of the change, the type of the change (created, modified, renamed or deleted), the size of the file as recorded at the time of the change, the user name of the file owner and the full file or directory name.

13.7   Disk Change Monitoring E-Mail Notifications

DiskBoss provides the ability to send E-Mail notifications when a disk change monitoring operation detects a user-specified number of changes. In order to configure E-Mail notifications for a disk change monitoring command, open the disk change monitoring command options dialog, select the 'Actions' tab, enable disk change monitoring actions, specify the number of changes that should trigger the actions, enable E-Mail notifications and specify an E-Mail address to send E-Mail notifications to.
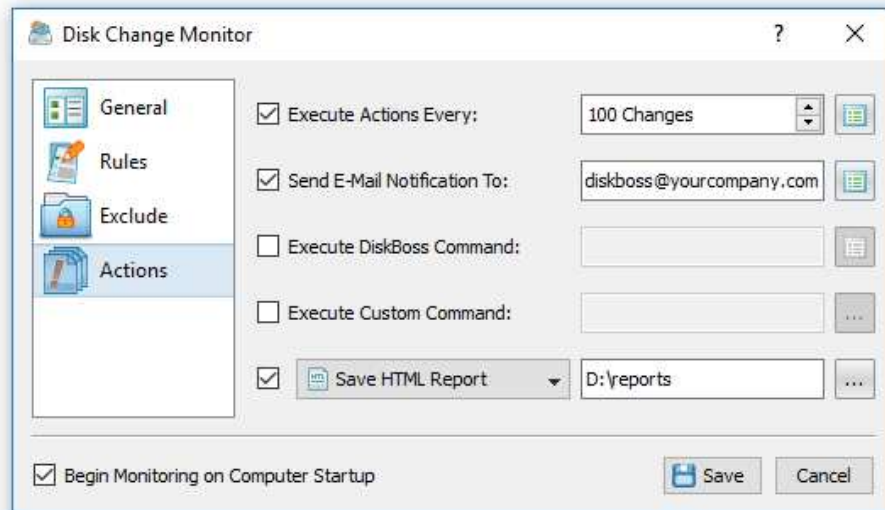
In addition, the user needs to configure an SMTP server to use to send E-Mail notifications. In order to configure the SMTP server, open the options dialog, select the 'E-Mail' tab, enable E-Mail notifications, specify the source E-Mail address, the SMTP server name, the SMTP server port, the SMTP user name and password to use to send E-Mail notifications.
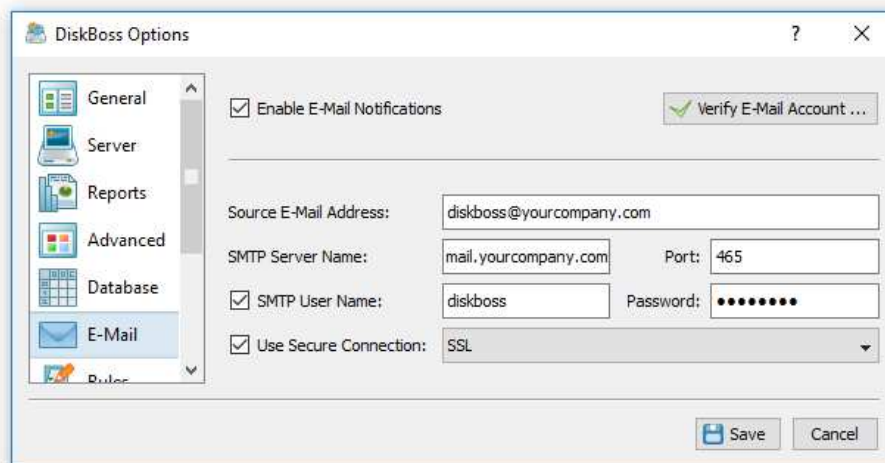
Optionally, the user can send E-Mail notifications via a secured network connection using the TLS or SSL network protocols. Once finished configuring the SMTP server, press the 'Verify E-Mail Account' button to test the specified SMTP server name, user name and password.

13.8   Automatic Generation Of Disk Change Monitoring Reports

In addition to E-Mail notifications, the user is provided with the ability to automatically save disk change monitoring reports in a user-specified directory. In order to enable automatic report generation, open the disk change monitoring command dialog, select the 'Actions' tab, enable disk change monitoring actions, specify the number of changes that should trigger the monitoring actions, enable the report generation action, select an appropriate report format and specify a directory where to save disk change monitoring reports.
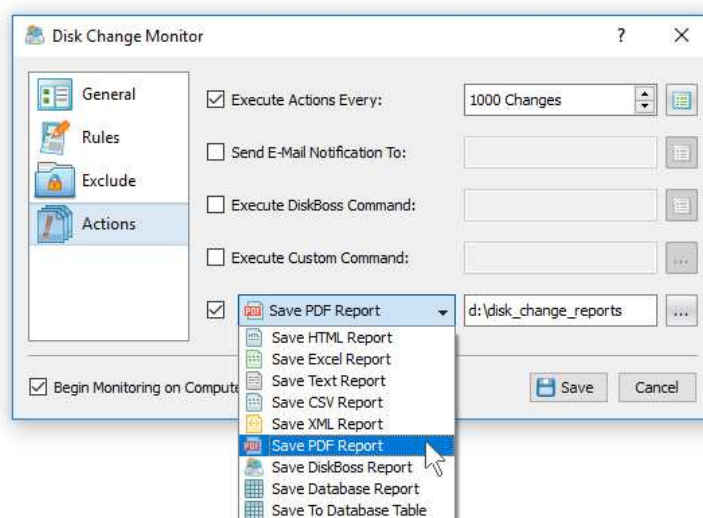
During runtime, DiskBoss will monitor the specified disks and directories and automatically save disk change monitoring reports in the specified directory every X file system changes as configured on the 'Actions' tab. Each report file will be saved with an automatically generated file name including the date and time of the report.

13.9   Monitoring Specific File Types or File Categories

Active production servers may have a very high rate of disk changes resulting in very long disk change monitoring reports significantly complicating identification of critical file system changes and resulting in additional overhead on running, production systems. In order to minimize the number of unimportant file system changes recorded by a disk change monitoring operation, DiskBoss provides the ability to limit the disk change monitoring operation to user-specified types of files.
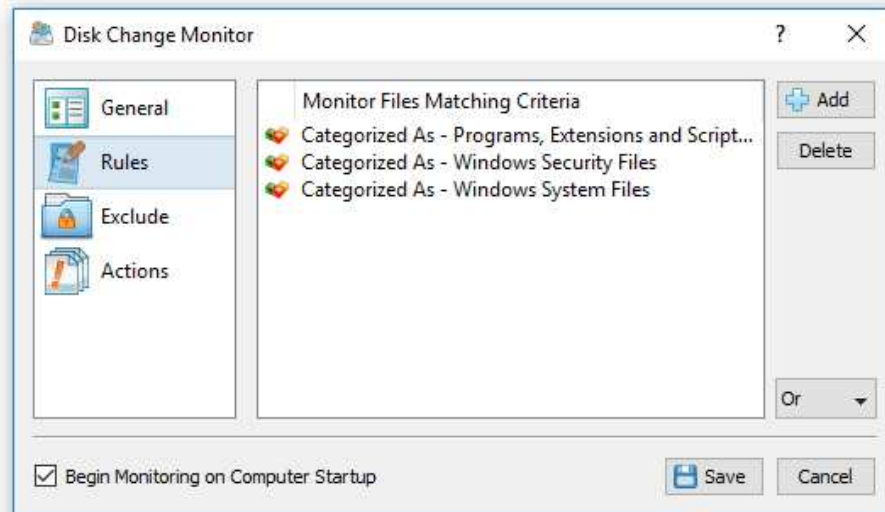
For example, the user may configure a disk change monitoring command to monitor only programs and executable files and exclude changes detected in all other types of files. In order to configure a disk change monitoring command to monitor specific types of files, open the disk change monitoring command options dialog, select the 'Rules' tab and add one or more file matching rules specifying which types of files to monitor. During runtime, the disk change monitor will evaluate detected file system changes and just skip all changes not matching the specified rules.
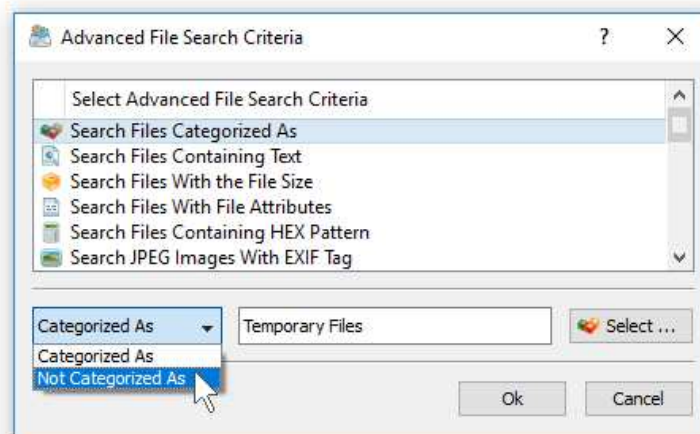
Another option is to exclude specific types of files from the disk change monitoring process using one or more negative file matching rules. For example, in order to exclude temporary files from a disk change monitoring operation, add a file matching rule, select the 'Temporary Files' file category and select the 'Not Categorized As' rule operator. Now, the disk change monitoring operation will skip all temporary files from the disk change monitoring process.

13.10 Excluding Subdirectories from the Monitoring Process

Sometimes, it may be required to exclude one or more subdirectories from the disk change monitoring process. For example, if you need to monitor a disk excluding one or two special directories, you may specify the whole disk as an input directory and add the directories that should be skipped to the exclude list.
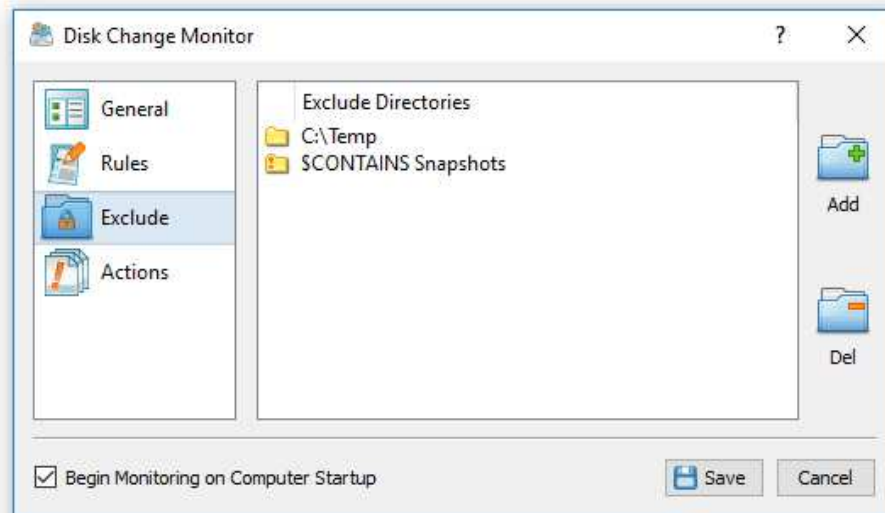
In order to add one or more subdirectories to the exclude list, open the disk change monitoring command dialog, select the 'Exclude' tab and press the 'Add' button. All files and subdirectories located in the specified exclude directory will be excluded from the disk change monitoring process. In addition, users are provided with a number of exclude directories macro commands allowing one to exclude multiple directories using a single macro command.

DiskBoss provides the following exclude directories macro commands:

- **$BEGINS <Text String>** - this macro command excludes all directories beginning with the specified text string.
- **$CONTAINS <Text String>** - this macro command excludes all directories containing the specified text string.
- **$ENDS <Text String>** - this macro command excludes all directories ending with the specified text string.
- **$REGEX <Regular Expression>** - this macro command excludes directories matching the specified regular expression.
- **$DIRLIST <File Name>** - this macro command excludes all directories listed in the user-specified text file.
- **$FILELIST <File Name>** - this macro command excludes all files listed in the user-specified text file.

For example, the exclude macro command '$CONTAINS Temporary Files' will exclude all directories with 'Temporary Files' in the full directory path and the exclude macro command '$REGEX \.(TMP|TEMP)$' will exclude directories ending with '.TMP' or '.TEMP'.

13.11 Triggering Automated File Management Operations

One of the most powerful capabilities of DiskBoss is the ability to trigger custom file management operations after a user-specified number of file system changes is detected in one or more disks or directories. This capability may be very effectively used to trigger file synchronization, policy-based file management and automatic file delete and data retention operations on production servers and corporate storage systems.
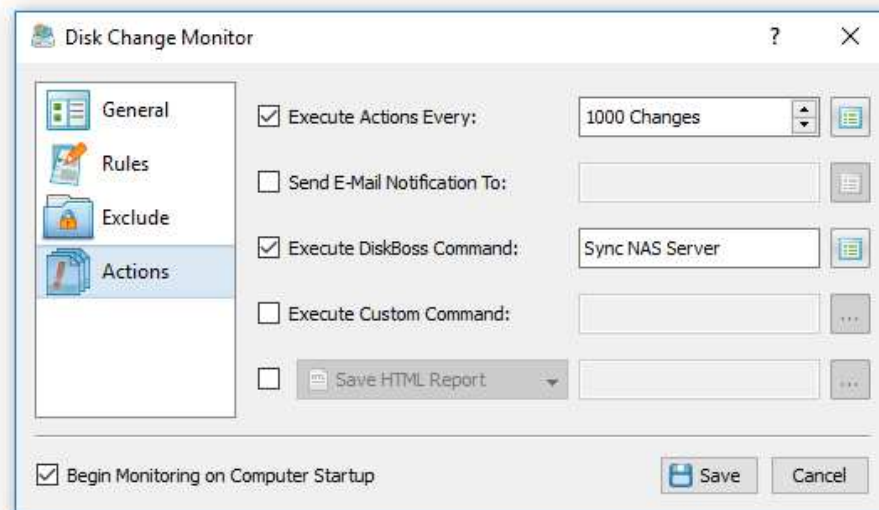
For example, in order to automatically synchronize a server with a NAS device, create a file synchronization operation configured to synchronize a source directory on the server to a destination directory on the NAS device, create a disk change monitoring command configured to monitor the source directory on the server, open the disk change monitoring command dialog, select the 'Actions' tab, enable disk change monitoring actions, specify the number of file system changes that should trigger the action, enable the DiskBoss command action and select the previously configured file synchronization command to be executed.
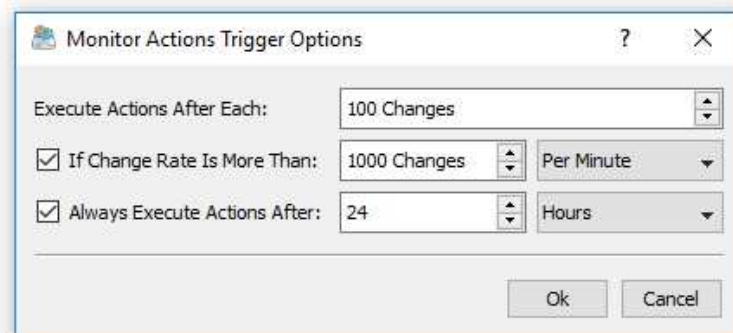
In addition to the ability to trigger the disk change monitoring actions every X file system changes, DiskBoss allows one to trigger the actions if the change rate reaches a user-specified number of changes per minute or per hour. Finally, the user is provided with the ability to trigger the disk change monitoring actions after a user-specified timeout even if the number of detected file system changes is less than the specified value.

13.12 Triggering File Integrity Monitoring Operations

In addition to the real-time disk change monitor, DiskBoss provides the file integrity monitor, which is capable of saving digital security signatures of critical system files and then periodically verifying authenticity of critical system files by comparing the current digital security signatures to the previously saved digital security signatures. One of the most powerful capabilities of DiskBoss is the ability to monitor one or more disks or directories and automatically trigger verification of critical system files based on real-time disk activities and then send E-Mail notifications and generate reports if any unauthorized changes are detected in critical system files thus ensuring the security of critical systems and production servers.
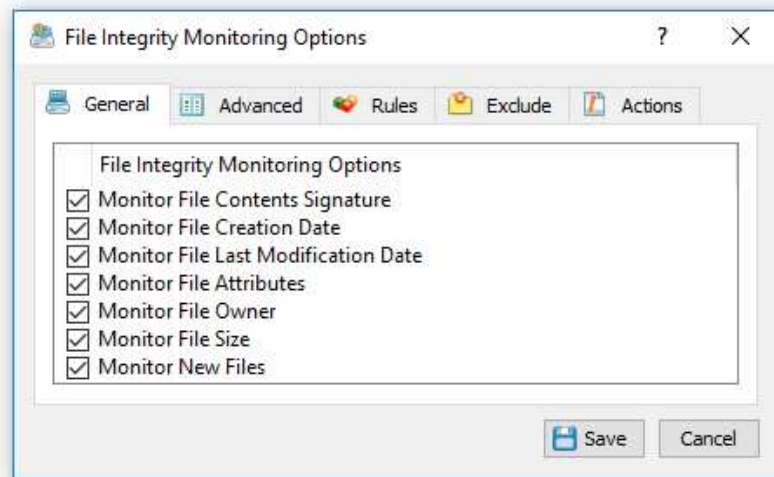
For example, in order to monitor critical files in the Windows system directory, create a file integrity monitoring command, configure the command to monitor the Windows directory, add a file matching rule limiting the monitoring operation to programs and executable files and than save a reference digital signature of the Windows system directory.
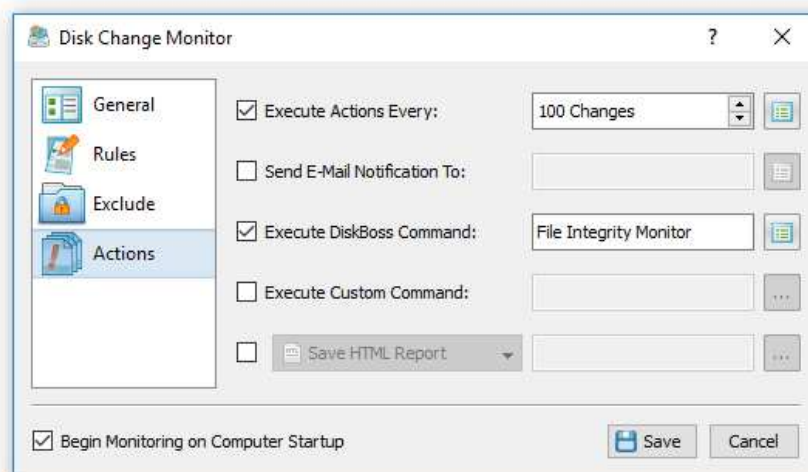
Now, create a new real-time disk change monitoring command, configure the command to monitor the Windows system directory, select the 'Actions' tab, enable disk change monitoring actions, enable the DiskBoss command action and specify the previously configured file integrity monitoring command to be automatically triggered after each X changes detected in the Windows system directory. The file integrity monitoring command will scan the Windows system directory, verify digital signatures of programs and executable files, check if there are any modified programs or executable files and send an E-Mail notification if required.

13.13 Monitoring Disks Using the DiskBoss Command Line Utility

In addition to the GUI application, DiskBoss Ultimate and DiskBoss Server provide a command line utility allowing one to monitor one or more disks or directories from batch files and shell scripts. The DiskBoss command line utility is located in the '**<ProductDir>/bin'** directory.

Command Line Syntax:

diskboss -monitor -dir <Directory 1> [... <Directory X> <Options>]

This command monitors the specified disks or directories and displays detected file system changes on the standard output. In addition, the user is provided with the ability to export detected file system changes to HTML, XML, text and Excel CSV reports.

diskboss -execute <User-Defined Disk Monitoring Command>

This command executes a user-defined disk change monitoring command pre-configured using the DiskBoss GUI application or imported from an XML file.

Parameters:

-dir <Directory 1> [... <Directory X>]

This parameter specifies the list of input directories to process. In order to ensure proper parsing of command line arguments, directories and file names containing space characters should be double quoted.

Options:

-exclude_dir <Exclude Directory 1> [... <Exclude Directory X>]

This parameter specifies the list of directories that should be excluded from the disk change monitoring process. In order to ensure proper parsing of command line arguments, directories containing space characters should be double quoted.

-save_html_report [ReportFileName]

This optional parameter saves an HTML report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template:

diskboss_monitor_[date]_[time].html

-save_csv_report [ReportFileName]

This optional parameter saves an Excel CSV report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template:

diskboss_monitor_[date]_[time].csv

-save_text_report [ReportFileName]

This optional parameter saves a text report file. If no file name is specified, DiskBoss will automatically generate a file name according to the following template:

diskboss_monitor_[date]_[time].txt

-v

This parameter shows the product's major version, minor version, revision and build date.

-help

This parameter shows the command line usage information.

14 File Integrity Monitor

14.1 File Integrity Monitor Overview

DiskBoss Ultimate and DiskBoss Server provide a built-in file integrity monitor allowing one to save digital signatures of critical system files and then periodically monitor the integrity of critical system files, detect unauthorized changes, export HTML, text, Excel CSV or XML reports and send E-Mail notifications.

The user is provided with the ability to specify one or more disks or directories to be monitored, select which types of files should be monitored, types of changes that should be detected and optionally save reports, send E-Mail notifications or execute custom commands when a user-specified number of changes is detected.
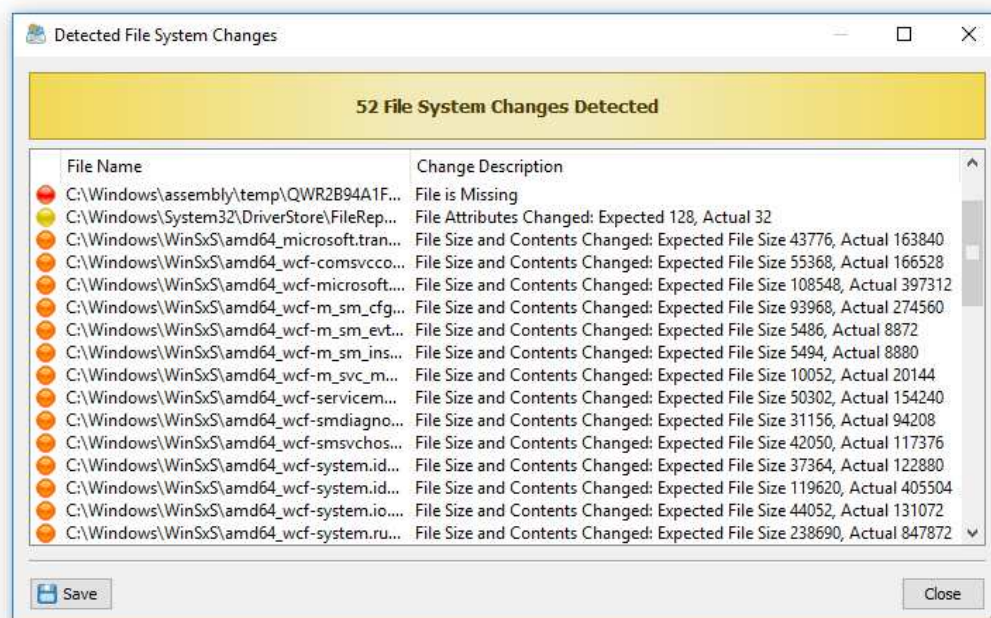
In addition to the file integrity monitoring capabilities available in the DiskBoss GUI application, DiskBoss provides a command line utility allowing one to verify the integrity of critical system files, save reports and send E-Mail notifications from shell scripts and batch files. Finally, DiskBoss Server, which runs in the background as a service, allows one to continuously monitor the integrity of system files in critical servers and NAS storage system.

14.2   Saving Signatures of Critical System Files

The DiskBoss file integrity monitor verifies the integrity of critical file system files by comparing a reference file system state with the current file system state including verification of digital signatures of critical system files, creation and last modification dates, attributes, file ownership information, etc. In order to be able to perform the verification process, the user needs to create a file integrity monitoring command, specify disks or directories that should be monitored, types of files that should be monitored and types of changes that should be detected.
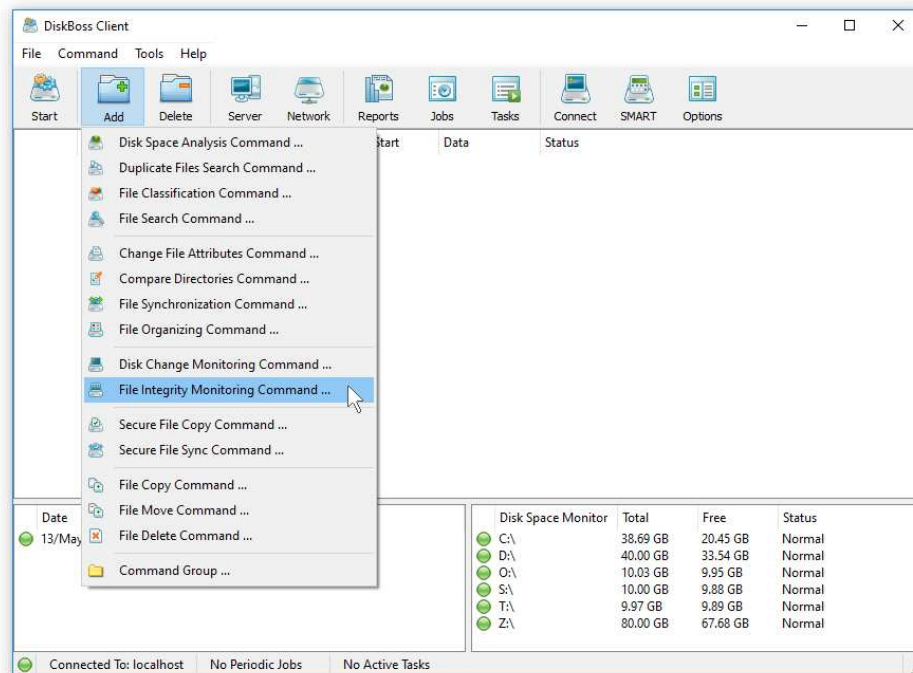
First of all, let's create a new file integrity monitoring command. On the user-defined commands dialog or the commands tool pane, select the 'Add New' menu item and select the 'File Integrity Monitoring Command' menu item. On the command name dialog, enter a unique command name and press the 'Ok' button.
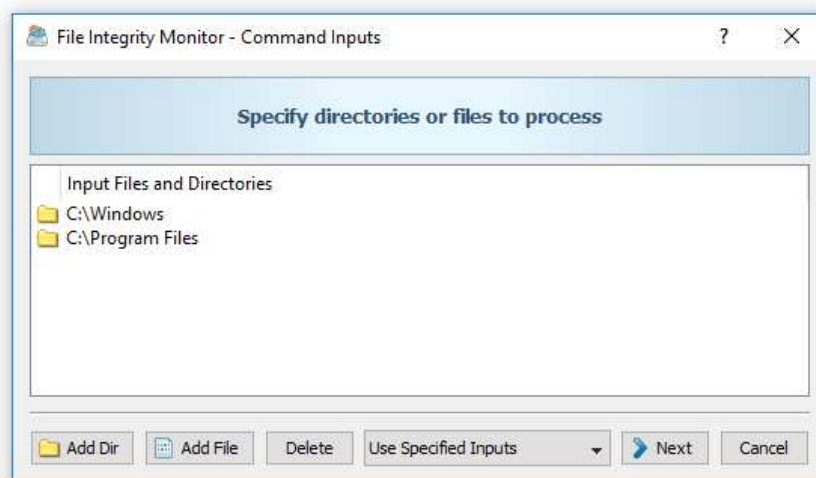
If you need to monitor the system disk on a critical server, add the 'Windows' directory and the 'Program Files' directory. In addition, on a 64-Bit server, add the 'Program Files (x86)' directory. Once finished adding input directories, press the 'Next' button.

On the file integrity monitoring options dialog, select the 'General' tab and select/unselect types of changes that should be detected. By default, the DiskBoss file integrity monitor detects all types of changes and usually there is no need to change the default configuration.
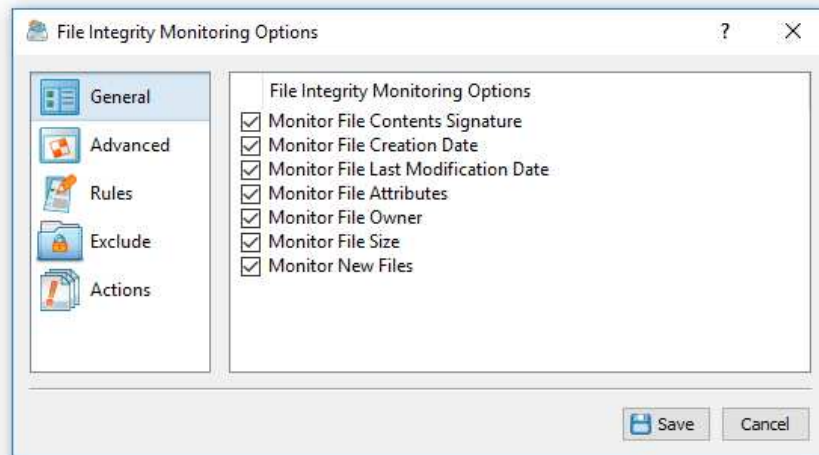
Now, select the 'Rules' tab and add one or more file matching rules specifying types of files that should be monitored. If no rules are added on this tab, the DiskBoss file integrity monitor will verify all types of files. If one or more file matching rules are specified, the DiskBoss file integrity monitor, will verify files matching the specified rules and skip all other types of files.
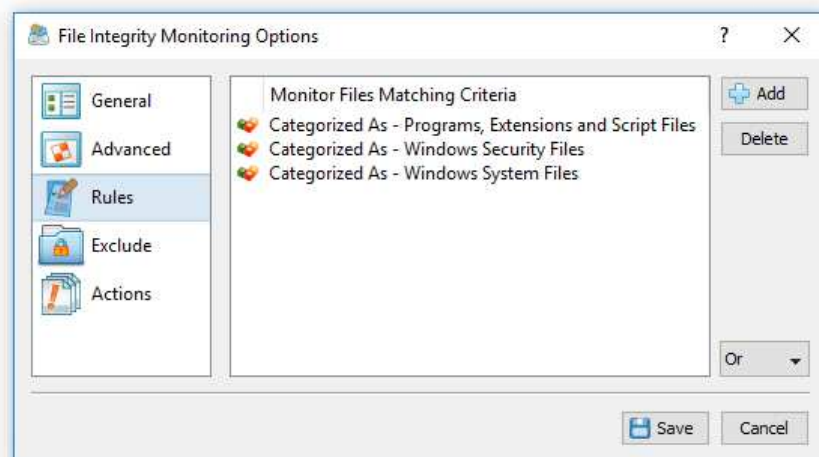
In the simplest case, just add a single file matching rule named 'Programs, Extensions and Script Files', which will match all types of programs, executable files, DLL libraries, batch files, various types of scripts, etc. For a more advanced configuration, consider adding Windows configuration files and security files.

In order to simplify the configuration process, DiskBoss provides a logically organized hierarchy of file types allowing one to easily select required file categories. In total, DiskBoss is capable of automatically recognizing more than 2,500 file types and categories making it very easy to select the types of files which should be monitored. During runtime, DiskBoss will categorize and classify file detected in the input disks and directories, verify files matching the specified rules and report all the detected file system changes.

Once finished adding file matching rules, press the 'Save' button to save the file integrity monitoring command. Each time a file integrity monitoring command is saved, DiskBoss will show a confirmation message asking the user to confirm whether the command's settings and the file system state should be updated or the user wish to save just the command's configuration settings without updating the file system state file.
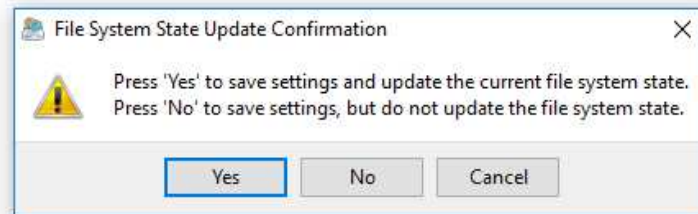
In general, if the user has changed input disks or directories, file matching rules or exclude directories, the file system state should be updated and the user needs to press the 'Yes' button. On the other hand, if the user has modified types of changes that should be detected and/or actions that should be executed when one or more changes are detected, there is no need to update the file system state file and the user can press the 'No' button.
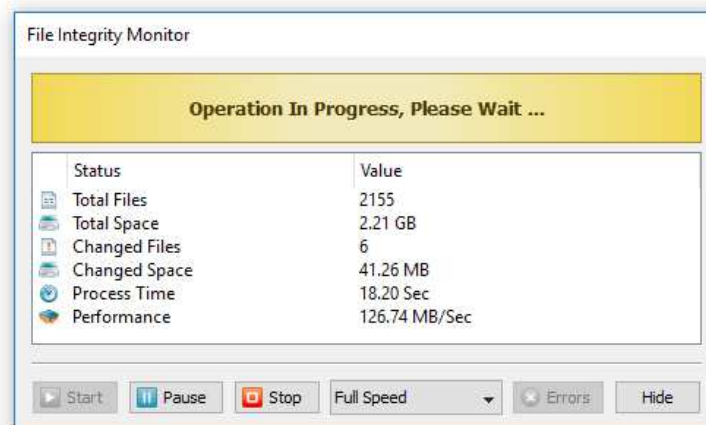
During the file system state update process, DiskBoss will display the process dialog showing the amount of processed disk space, the number of processed files and the current status. If you need to temporary pause the operation, press the 'Pause' button. Press the 'Continue' button, to resume the update operation. Wait for the file system state update process to complete and once the operation is finished, press the 'Close' button.
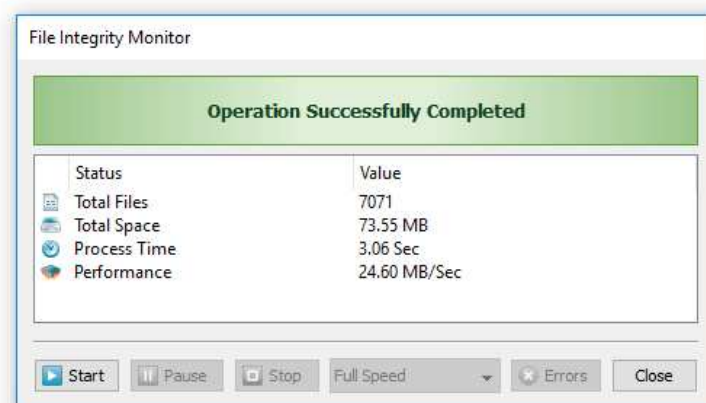
14.3   Verifying Critical System Files

In order to manually verify critical system files, just click on the required file integrity monitoring command in the user-defined commands tool pane. Another option is to create a desktop shortcut for the file integrity monitoring command and to execute the command directly from the Windows desktop.
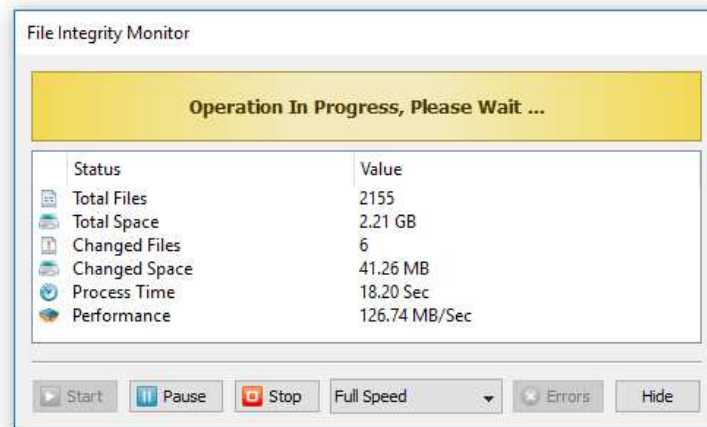
During the verification process the process dialog shows the verification status, the number of verified files, the number of detected changes, the verification performance and the process time. In order to temporary pause the verification process, press the 'Pause' button. Press the 'Continue' button to resume a previously paused verification operation.
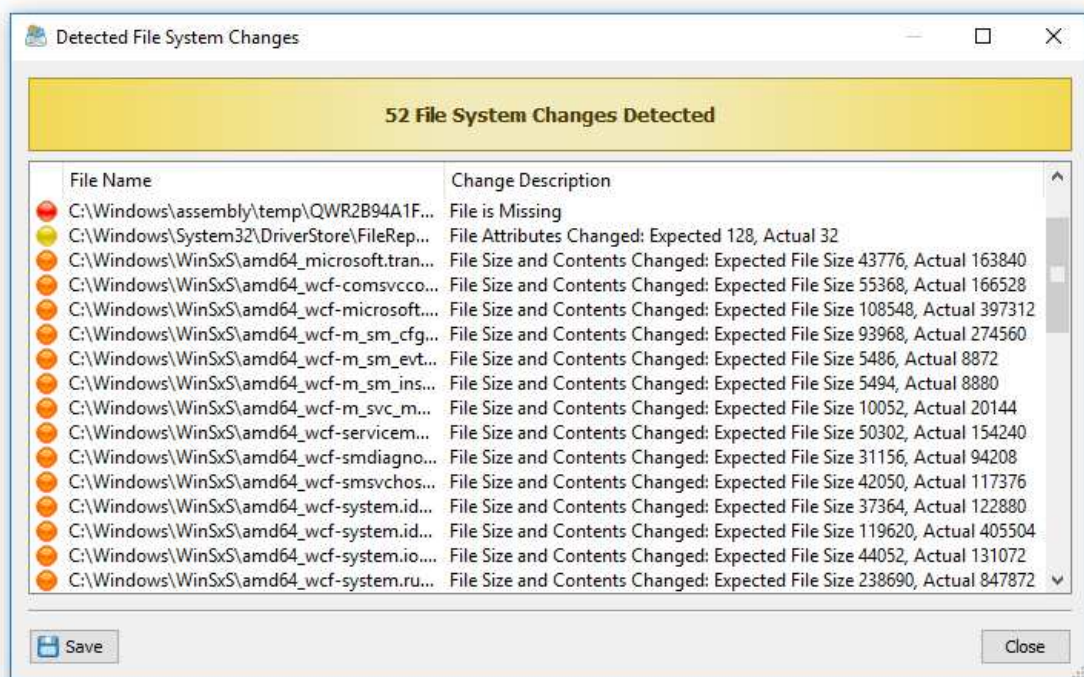
If one or more file system changes will be detected, the file integrity monitor will display the change list dialog showing all the detected file system changes and allowing one to review detected file system changes and export reports. For each detected file system change, the file integrity monitor displays the full name of the changed file and a change description explaining what exactly has been changed in each specific file.

14.4   Exporting Report Files

The DiskBoss file integrity monitor allows one to export HTML, PDF, Excel, text, CSV and XML report files. In order to export a report file, open the change list dialog, press the 'Save' button and select an appropriate report format.
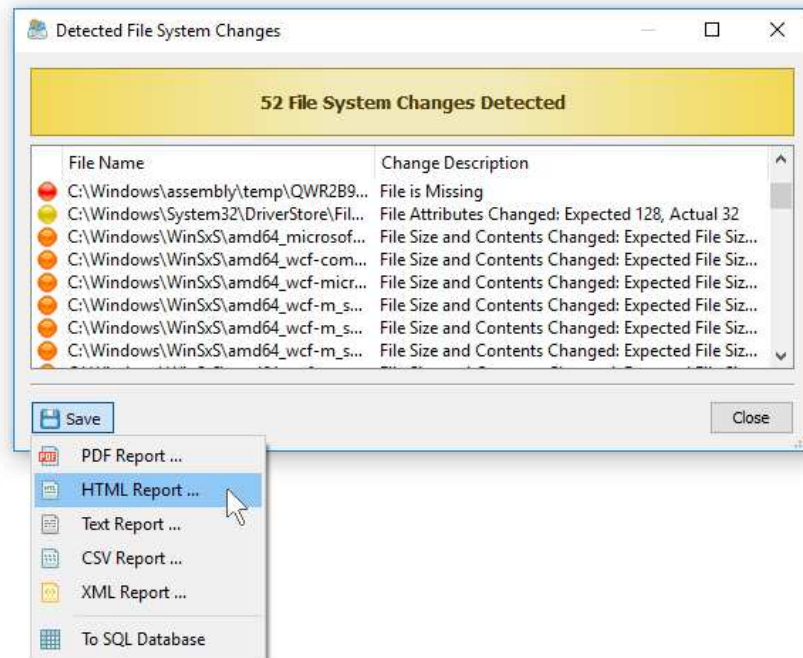
DiskBoss will open the save report dialog allowing one to select a destination directory and enter the report file name. A typical file integrity monitoring report includes a report title, a summary section showing general information and a list of detected file system changes. For each detected file system change, DiskBoss shows the full name of the changed file and a description explaining what exactly has been changed in each specific file.

216
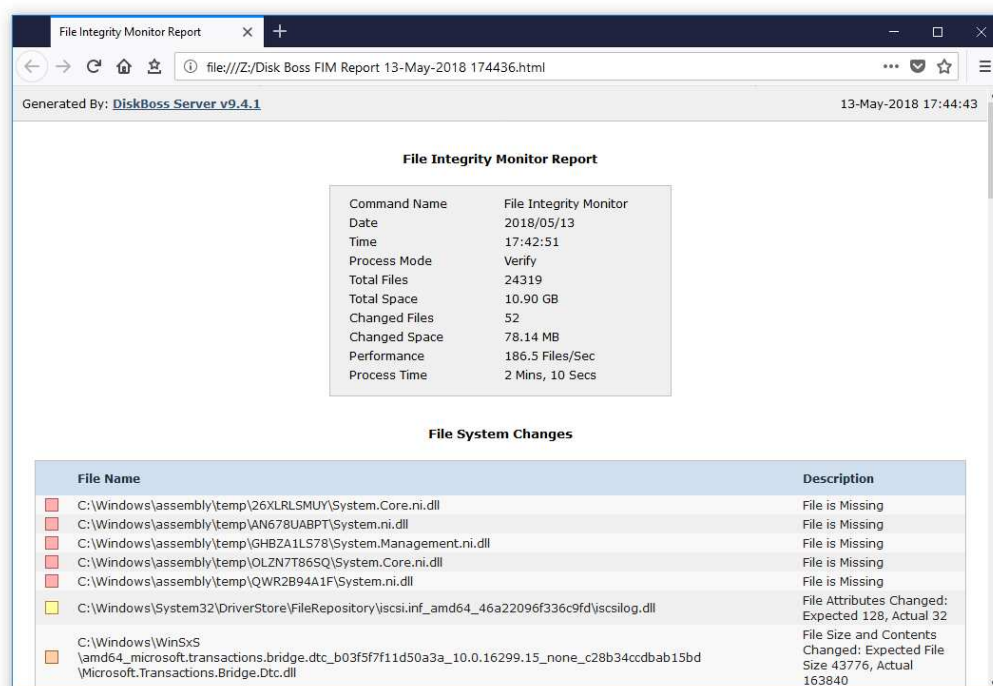
14.5   Saving Detected Changes in SQL Database

The DiskBoss file integrity monitor allows one to save detected file system changes in an SQL database through the ODBC database interface. In order to enable database export capabilities, open the options dialog, select the 'Database' tab, enable the 'ODBC' interface and specify an ODBC data source name, user name and password that should be used to connect to the database.
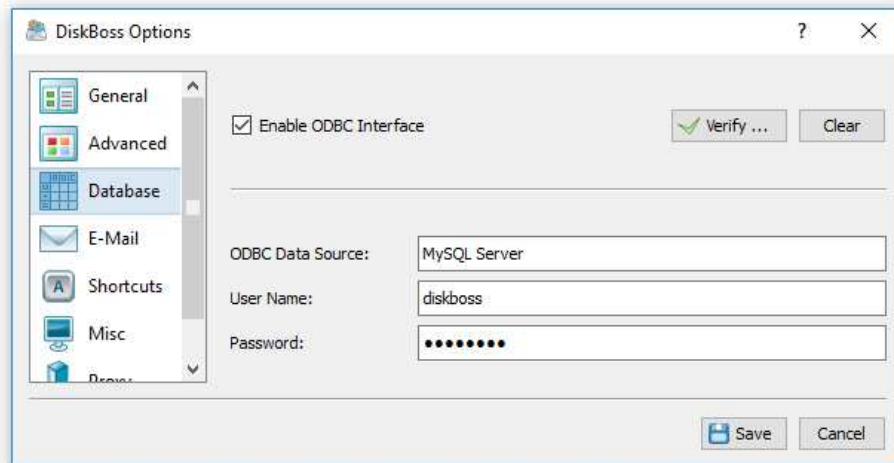
Once finished configuring the ODBC interface, press the 'Verify' button to make sure the DiskBoss file integrity monitor is capable of connecting to the database using the specified ODBC database interface. In order to manually save detected file system changes to the database, open the change list dialog, press the 'Save' button and select the 'SQL Database' menu item.
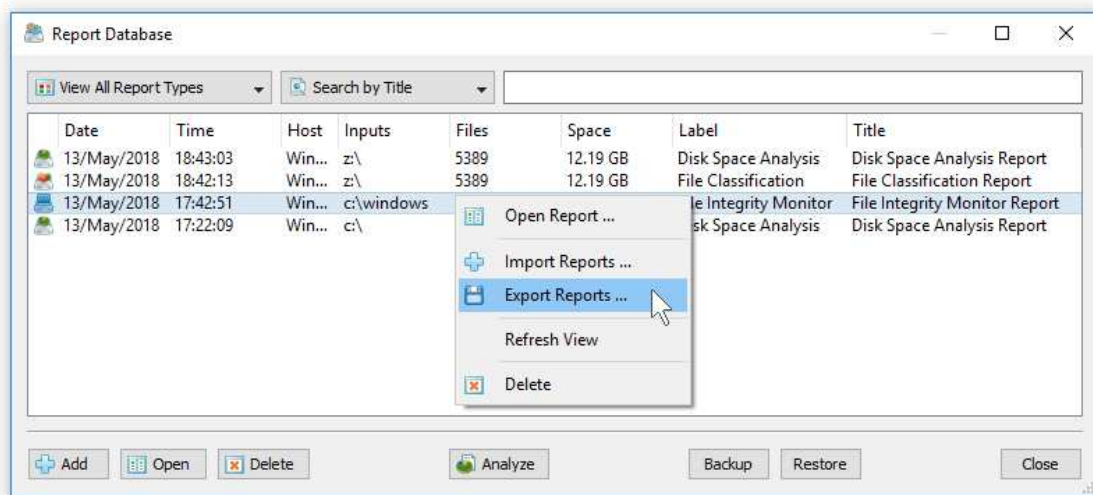
In order to see reports saved in the database, just press the 'Database' button located on the main toolbar. The top part of the database dialog provides a number of report filters allowing one to filter reports by the report type, title, host name, etc. In order to open a report, just click on a report item in the reports view.

The database dialog allows one to export/import reports from/to the database. Select one or more reports, press the right mouse button and select the 'Export Reports' menu item to export the selected reports. Press the right mouse button over the reports view and select the 'Import Reports' menu item to import reports to the database.

14.6   Periodic Verification of Critical System Files

The DiskBoss file integrity monitor allows one to periodically verify critical system files, automatically detect unauthorized changes, generate reports, send E-Mail notifications and/or execute custom actions. In order to execute a file integrity monitoring command periodically, open the periodic jobs dialog and press the 'Add' button to add a new periodic job.
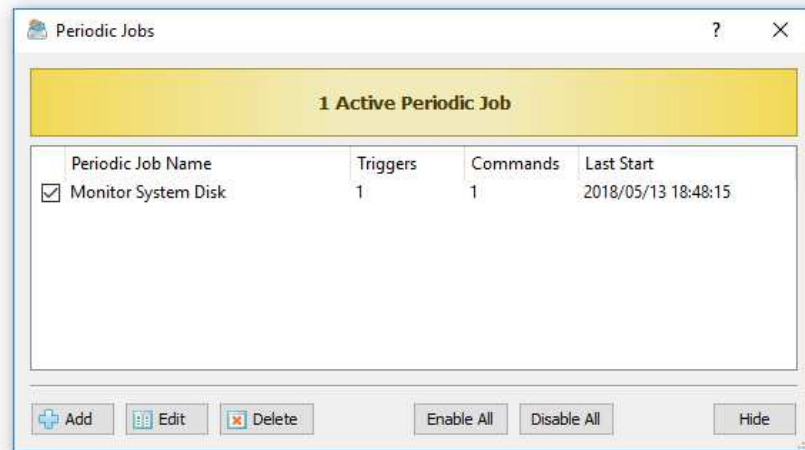
On the job dialog, select the file integrity monitoring command that should be executed and specify the required time interval. According to the selected time interval, the DiskBoss file integrity monitor will execute the specified command, verify critical system files, detect changes and optionally generate reports, send E-Mail notifications and/or execute custom commands, scripts or batch files.
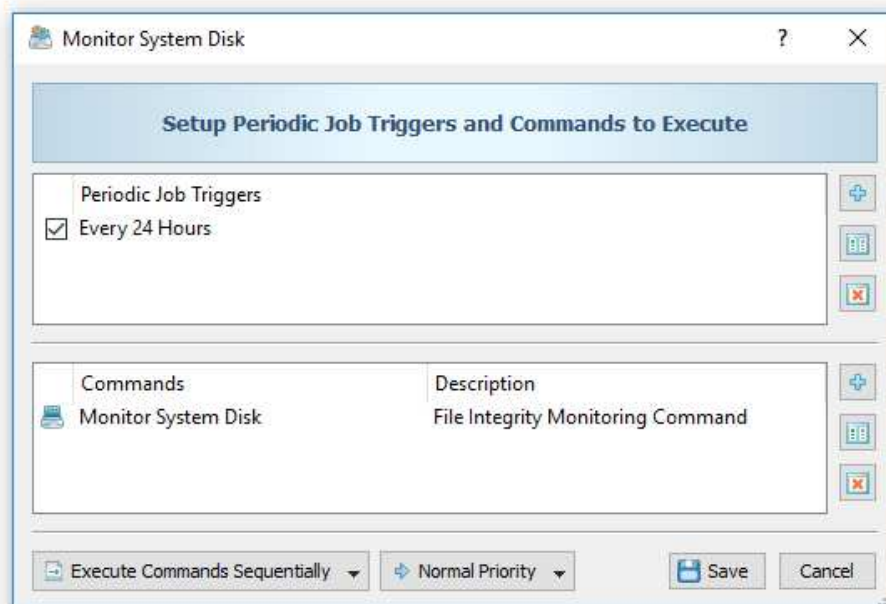
Important: Keep in mind that when using periodic file integrity monitoring commands in DiskBoss Ultimate, the DiskBoss main GUI application should be running. For continuously running mission critical servers, it is more appropriate to use **DiskBoss Server**, which runs in the background as a service and is capable of automatically verifying critical system files, generate reports and send E-Mail notifications even when no one is logged in.

14.7   File Integrity Monitoring Actions

The DiskBoss file integrity monitor provides the ability to automatically save reports, submit reports to an SQL database, send error messages to the system event log and/or send E-Mail notifications when a user-specified number of file system changes are detected. In order to add one or more file integrity monitoring actions, open the file integrity monitoring options dialog, select the 'Actions' tab and press the 'Add' button.
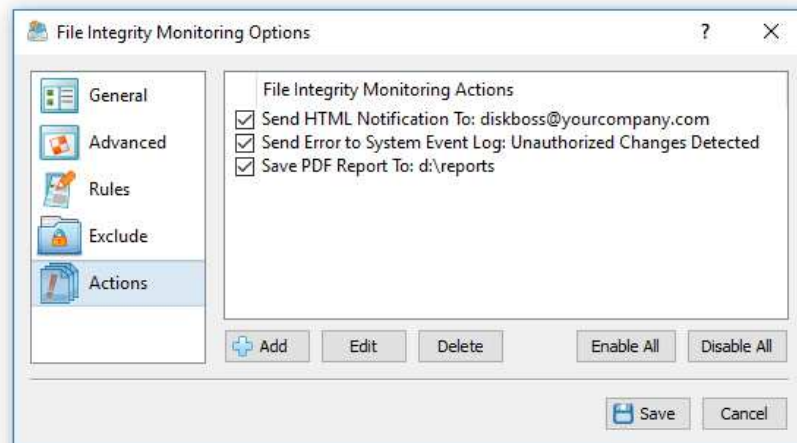
On the action dialog, enter the number of file system changes that should trigger the action, select an appropriate action type and enter an action value. For all types of report files, the action value should be set to an existing directory where to save report files or a full file name if all reports should be saved to the same file.
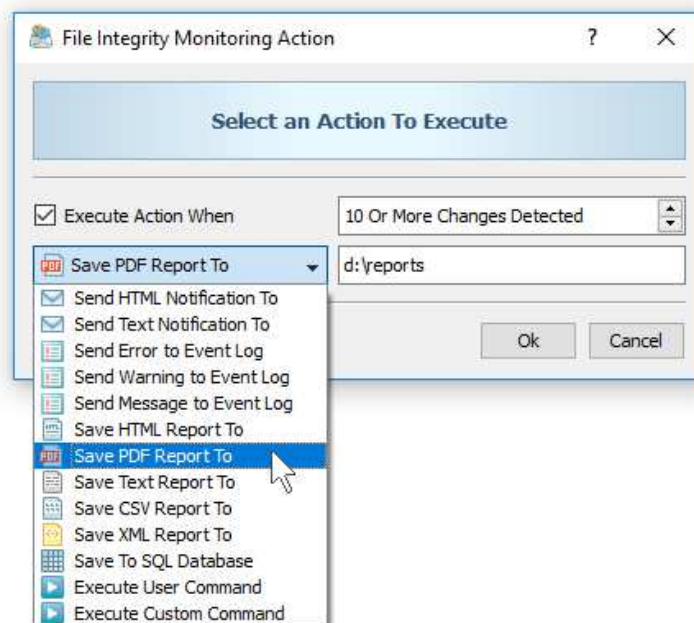
For E-Mail notifications, the action value should be set to the destination e-mail address. In addition, in order to be able to send E-Mail notifications, the user needs to open the options dialog, enable E-Mail notifications and specify an SMTP server to use to send E-Mail notifications. For system event log actions, the action value should specify a textual message that should be send to the system event log. For user-defined commands and custom commands, the action value should specify the name of the command to be executed.

14.8   Using DiskBoss Server to Monitor Critical Servers

DiskBoss Server, which runs in the background as a service, is capable of operating in a fully automatic mode, periodically verifying critical system files, generating reports, sending E-Mail notifications and/or executing user custom commands, scripts or batch files. DiskBoss Server may be controlled locally or through the network using the DiskBoss client GUI application or the DiskBoss command line utility.

In order to configure file integrity monitoring operations, connect to DiskBoss Server using the client GUI application, add a file integrity monitoring command and configure a periodic job to execute the file integrity monitoring operation at specific time intervals.
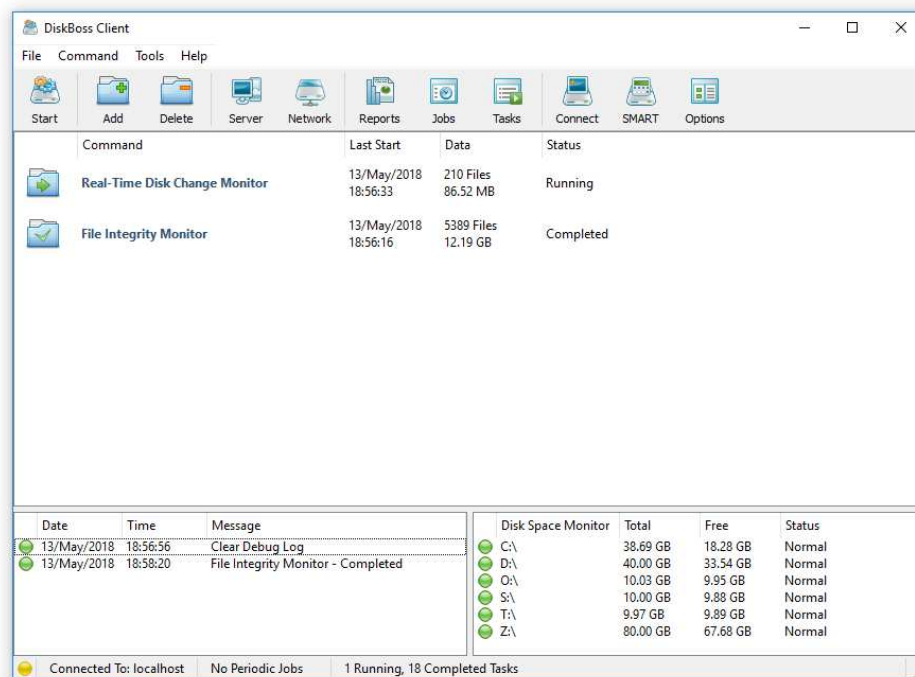
In addition to the ability to periodically verify critical system files, the user is provided with an option to setup a real-time disk change monitoring operation, which may automatically trigger verification of critical system files in real-time when a user-specified number of changes is detected in the system disk or the Windows system directory.

DiskBoss Server is capable of operating in a fully automated mode, without any user intervention, continuously monitoring the system disk, detecting file system changes, saving reports and sending E-Mail notifications even when no one is logged in allowing one to use it on mission critical servers requiring a high level of protection and security.

14.9   Using File Integrity Monitor Command Line Utility

In addition to the GUI application, the DiskBoss file integrity monitor may be controlled using the DiskBoss command line utility, which is located in the **'<ProductDir>/bin'** directory. The DiskBoss command line utility allows one to execute file integrity monitoring commands, save reports, export detected changes to an SQL database, send E-Mail notifications, etc.

Command Line Syntax:

diskboss -fim_update <User-Defined File Integrity Monitoring Command>

This command scans the file system and updates the file system state file.

diskboss -fim_verify <User-Defined File Integrity Monitoring Command>

This command verifies critical system files, displays detected file system changes and optionally saves reports, exports detected changes to an SQL database, sends E-Mail notifications and/or executes custom actions, batch files or scripts.

Options:

-save_html_report [Report File Name or Directory]

This optional parameter saves detected file system changes to an HTML report file. If no file name is specified, DiskBoss will automatically generate a file name and save the report to the user's home directory.

-save_csv_report [Report File Name or Directory]

This optional parameter saves detected file system changes to an Excel CSV report file. If no file name is specified, DiskBoss will automatically generate a file name and save the report to the user's home directory.

-save_text_report [Report File Name or Directory]

This optional parameter saves detected file system changes to a text report file. If no file name is specified, DiskBoss will automatically generate a file name and save the report to the user's home directory.

-save_xml_report [Report File Name or Directory]

This optional parameter saves detected file system changes to an XML report file. If no file name is specified, DiskBoss will automatically generate a file name and save the report to the user's home directory.

-save_ report [Report File Name or Directory]

This optional parameter saves detected file system changes to a report file in the DiskBoss native report format. If no file name is specified, DiskBoss will automatically generate a file name and save the report to the user's home directory.

-save_to_database

This optional parameter saves detected file system changes to an SQL database according to the ODBC interface configured in the options dialog.

-v

This parameter shows the product's major version, minor version, revision and build date.

-help

This parameter shows the command line usage information.

15 DiskBoss GUI Application

15.1 File Management and Navigation

DiskBoss is integrated around a unique file navigator providing file type coloring, a customizable detailed view, a thumbnail view, user-selectable tool panes, file system location bookmarks and advanced file filters. The DiskBoss' built-in file navigator allows one to execute any required operation in a single mouse click. Just select one or more files, directories or disks and press a command button on the main toolbar to start the file classification, storage utilization analysis, data migration or duplicate files identification process.
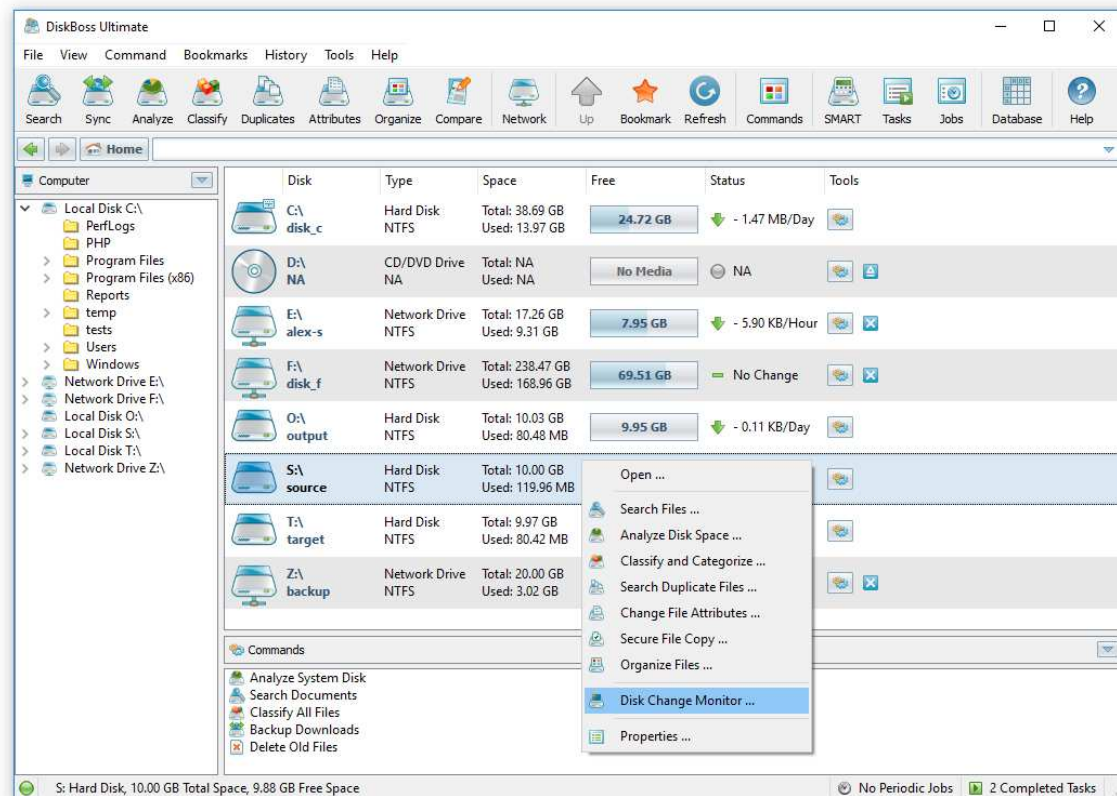
The DiskBoss' built-in file navigator provides the following file view modes: the list view mode, the icon view mode, the detailed view mode and the thumbnail view mode. In the thumbnail view mode, DiskBoss supports the following image formats: JPEG, GIF, PNG, BMP, TIFF, PBM, PGM, PPM, XBM, and XPM.

In the detailed view mode, DiskBoss allows one to customize columns, define user-specific file types and edit the display style for each of them. For example, files having the extension 'EXE' may be displayed as 'Programs' using a bold font on the yellow background.

All customizations are saved in the user configuration file and may be exported for backup purposes or transferred to another computer by using the DiskBoss' configuration export/import capabilities.

In addition, the detailed view mode provides the user with the ability to sort files by the file name, type, size, creation time, last modification time or last access time. In order to sort files, just click on an appropriate column header. When the user clicks on a column header for the first time, all the files are sorted in the ascending order. To sort files in the descending order, click on the same column header for the second time.

15.2 DiskBoss GUI Layouts

In order to improve GUI usability and facilitate specific file management tasks, the DiskBoss main GUI application provides four user-selectable GUI layouts. Press the '**Layouts**' button to switch the GUI application to the next GUI layout. The first GUI layout places tool panes on the bottom side of the file view.
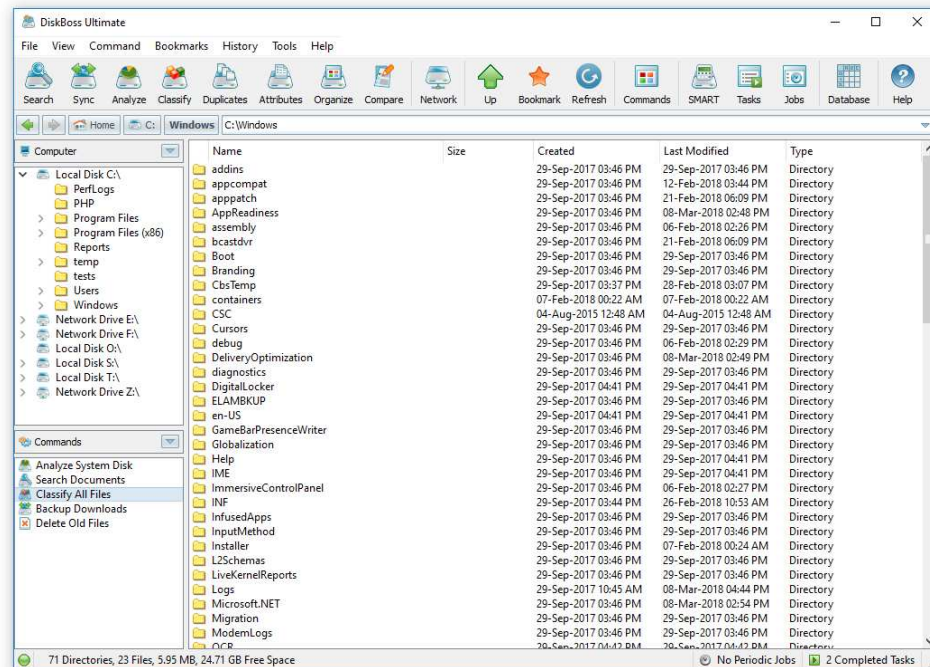
The second GUI layout places tool panes on the left side of the file view. The third GUI layout places tool panes on the right side of the file view. Finally, the fourth GUI layout places the first tool pane on the right side of the file view and the second tool pane on the bottom side of the file view.
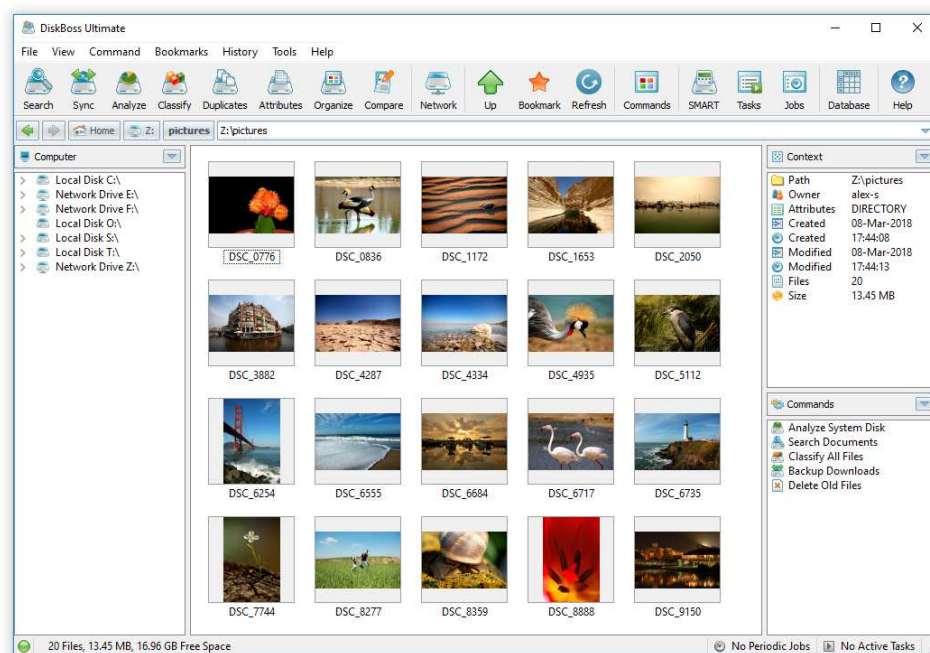
15.3 User-Defined Commands

DiskBoss is a powerful and flexible product providing a large number of features, capabilities and configuration options allowing one to perform many different file and storage management operations. In order to simplify management and execution of frequently used operations, DiskBoss provides the user with the ability to add user-defined commands. All major product features such as file search, classification, organizing, synchronization, copy, move, delete, storage utilization analysis, duplicate files search and disk monitoring may be added as user-defined commands and pre-configured for user-specific needs and custom hardware configurations.
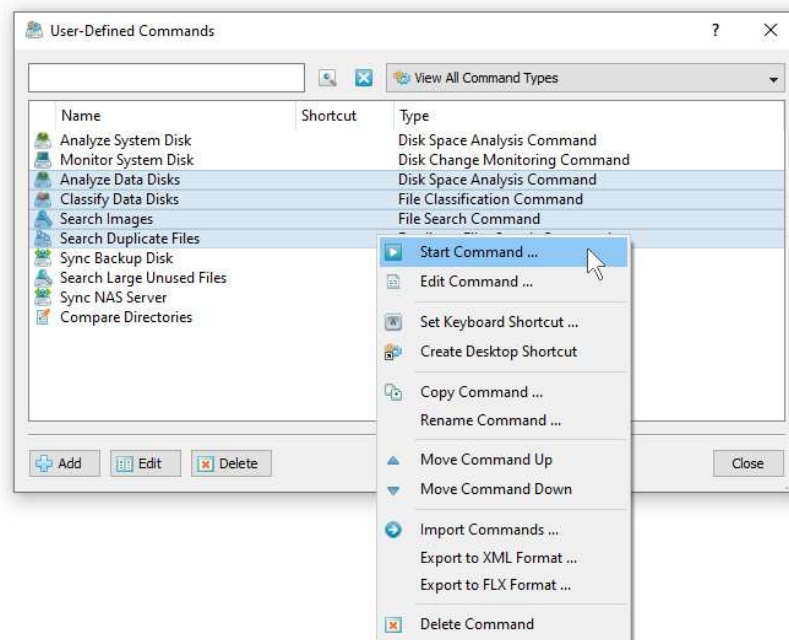
In order to add and a new command, select the 'user-defined commands' tool pane, click the right mouse button, select the 'Add' menu and select the required command type. All command types require the user to specify one or more directories or files to be processed. In addition, depending on the command type, command-specific dialog will be displayed and the user will be provided with the ability to control all the command-specific options. Once added, a user-defined command will be saved in the DiskBoss user's configuration and displayed in the user-defined commands tool pane. In order to manage user-defined commands, select the 'User-Defined Commands' tool pane, select the required command, click the right mouse button and select one of the following operations:

- **Edit Command** – use this feature to edit a previously created user-defined command. Depending on the command type, DiskBoss will show all the required dialog and the user will be provided with the ability to control all the command-specific options.
- **Execute Command** – use this feature to execute the selected user-defined command. Alternatively, just click on a command in the user-defined commands list.
- **Create Desktop Shortcut** – use this feature to create direct desktop shortcuts for frequently used commands. Commands started using desktop shortcuts are executed without the DiskBoss GUI application. For example, after clicking on a desktop shortcut pointing to a user-defined search command, the user will see the search dialog only and not the full DiskBoss GUI application.
- **Rename Command** – use this feature to rename an existing user-defined command. DiskBoss will show an entry dialog and the user will be provided with the ability to specify a new command name.
- **Move Command Up** – use this feature to move frequently used commands to the beginning on the command list.
- **Move Command Down** – use this feature to move less frequently user commands to the end of the command list.
- **Delete Command** – use this feature to delete unused commands.

In addition, DiskBoss allows one to write user-defined commands using an open XML-Based format. The XML-Based format provides support for all features and capabilities available in the DiskBoss GUI application and allows one to import custom user-defined commands to the product configuration. Finally, DiskBoss Ultimate allows one to execute XML-Based user-defined command on-the-fly using the DiskBoss command line tool.

Any user-defined command may be executed in three different ways: in DiskBoss' main GUI application, as a standalone GUI tool and using DiskBoss' command line tools. In order to execute a user-defined command in DiskBoss' main GUI application, select the user-defined commands tool pane and click on the command item in the commands list. DiskBoss will load the user-defined command and execute it in the main GUI application showing all the required GUI windows and dialogs according to the information saved in the user-defined command.
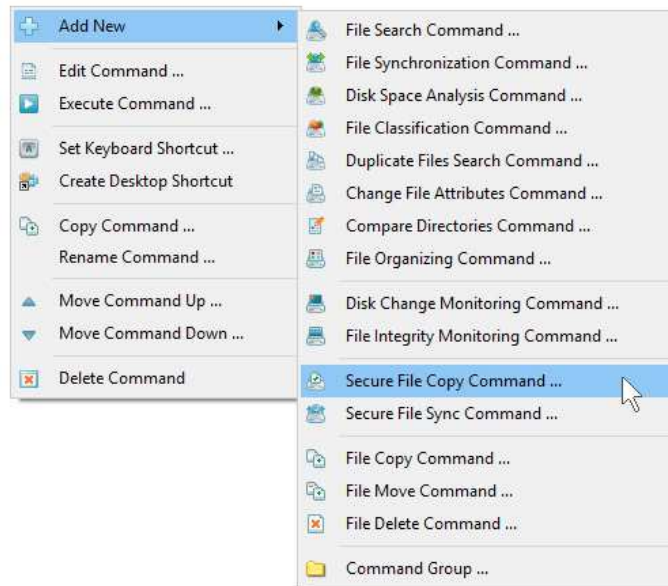
A more effective way to execute frequently used commands is to add command shortcuts to the Windows desktop. In order to do that, select the user-defined commands tool pane, press the right mouse button over the required command and select the 'Add Desktop Shortcut' menu item. DiskBoss will create a desktop shortcut with the same file name as the command's name. In order to execute such a command, just click on the command shortcut on the Windows desktop. When executing user-defined commands using desktop shortcuts, DiskBoss will open a command-specific process dialog that will perform all the required operations and terminate after the user will press the 'Close' button.

Advanced Commands Management

DiskBoss provides the user with an advanced user-defined commands GUI management interface allowing one to manage and execute user-defined commands more effectively. To open advanced user-defined commands management dialog, select the menu "Tools – Manage Commands". In addition to the features available in the user-defined commands tool pane, the commands management dialog provides commands search and filters, user-defined command copy, command import/export capabilities and user-defined command shortcuts.

For each user-defined command, the commands management dialog displays the command name, a user-selected command shortcut and the command type. In order to find a specific user-defined command, enter all or a part of the command name in the search entry and press the 'Search' button. Alternatively, select a specific command type in the command filter to show commands of a specific type only. For example, select the 'View Search Commands' filter to see search commands only. The command type filter may be user in conjunction with the command search capability. In order to reset search results and the command type filter, press the 'Clear' button and the command management dialog will show all the defined commands.

In order to add a new user-defined command, press the 'Add' button and select an appropriate command type. On the command inputs dialog add one or more directories or files that should be processed and press the 'Next' button. A typical command dialog shows command specific features and options depending on the selected command type. For detailed information about how to use a specific command refer to an appropriate section in the DiskBoss product manual.

Select a user-defined command and press the 'Edit' button to edit the selected user-defined command. Select one or more user-defined commands and press the 'Delete' button to delete all the selected commands. Select a user-defined command and press the 'Up' or 'Down' buttons to change the position of a command in the command list. Use this feature to move more frequently used commands to the beginning of the command list. All changes made in user-defined commands will take effect in both command management interfaces - the user-defined commands management dialog and the user-defined commands tool pane.

Sometimes, when you have a working user-defined command and need to create a slightly modified or customized version of the command, it will be very helpful to copy the existing command and make all the required changes in the command's copy. In order to copy a user-defined command, select the command item, press the 'Copy' button and enter a new command name. DiskBoss will create a new command, copy all the setting and options from the original command and save the new command to the user's configuration file.

Another useful feature is the ability to import/export user-defined commands to/from different DiskBoss installations. In order to export one or more user-defined commands, select all the required command items, press the right mouse button, select the 'Export Commands' menu item and select a destination directory where all the selected commands should be exported to. In order to import previously exported commands, press the right mouse button, select the 'Import Commands' menu item and select all the command files that should be imported. Take into account that these features are available in DiskBoss Ultimate only and there is no ability to import/export commands to/from DiskBoss Express or DiskBoss Professional.

In order to execute a user-defined command directly from the commands management dialog, select the command item and press the 'Execute' button. DiskBoss will load the user-defined command and execute it in the main GUI application showing all the requiring GUI windows and dialogs according to the information saved in the user-defined command. In order to create a desktop shortcut for a command, select the command item, press the right mouse button and select the 'Create Desktop Shortcut' menu item. DiskBoss will create a desktop shortcut with the same file name as the command's name. In order to execute such a command, just click on the command shortcut on the Windows desktop.

Finally, DiskBoss Ultimate allows one to associate custom keyboard shortcuts with user-defined commands. In order to set a keyboard shortcut for a user-defined command, select the command item in the command list, press the right mouse button and select the 'Set Keyboard Shortcut' menu item. On the 'Customize Keyboard Shortcut' dialog select an available keyboard sequence and press the 'Ok' button. Now, you can execute the user-defined command by pressing the selected keyboard shortcut.

In addition to the GUI application, the DiskBoss Ultimate edition provides a command line tool allowing one to use all features of DiskBoss from an OS shell window. The DiskBoss command line tool provides power users and system administrators with the ability to automate the file management operations and to integrate DiskBoss features into batch files and shell scripts. The DiskBoss command line tool is located in <ProductDir>/bin directory.

diskboss.exe -execute <Command Name> or <XML File Name>

This command executes user-defined commands using input directories, files and all configuration options saved in the specified user-defined command. In addition, DiskBoss Ultimate allows one to directly execute user-defined commands written according to the DiskBoss XML-Based format. For detailed information about the XML format refer to the section 13 in this document.

15.4   Automatic Selection of Input Disks Using Macro Commands

Normally, DiskBoss disk analysis and file search commands process a pre-defined set of input disks, directories and/or network shares, but sometimes it may be required to dynamically select disks to be analyzed depending on the configuration of the analyzed host computer.

For example, let's assume that the user needs to analyze a number of internal hard disks and a number of external hard drives with external hard disk drives sometimes connected and sometimes not depending on each specific situation. In such cases, it is not possible to pre-configure an analysis operation to process a pre-defined set of input disks and such operations should be configured dynamically according to the current configuration of the host computer.
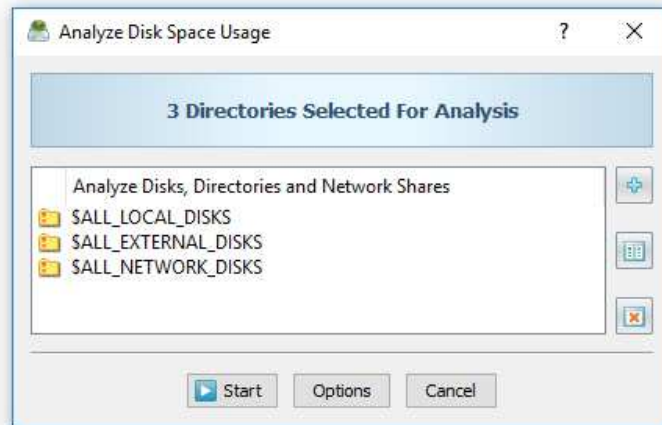

In order to enable dynamic configuration of disk space analysis, file classification and file search operations, DiskBoss provides a number of macro commands allowing one to automatically select which disks to process according to the current configuration of the host computer. The following macro commands may be added instead of input directories to disk space analysis, file classification, duplicate files detection and file search commands:

- **$ALL_LOCAL_DISKS** - this macro command inserts all internal hard disks to the list of directories that should be processed.
- **$ALL_EXTERNAL_DISKS** - this macro command inserts all external hard disks to the list of directories that should be processed.
- **$ALL_NETWORK_DISKS** - this macro command inserts all mapped network drives to the list of directories that should be processed.
- **$ADD_NETWORK_SHARES <Host Name or IP Address>** - this macro command inserts all network shares accessible in a server or NAS storage device identified by the specified host name or IP address.
- **$ADD_DISK_LABEL <Label>** - this macro command inserts all disks containing the specified disk label to the list of directories that should be processed.
- **$DEL_DISK_LABEL <Label>** - this macro command removes all disks containing the specified disk label from the list of directories that should be processed. For example, this macro command may be used with the $ALL_LOCAL_DISKS macro to remove the system disk or other special disks that should be excluded from the analysis operation.
- **$DEL_DISK_LETTER <Letter>** - this macro command removes the specified disk letter from the list of directories that should be processed. For example, this macro command may be used with the $ALL_LOCAL_DISKS macro to remove the system disk from the analysis operation.

In addition, these macro commands may be used to pre-configure disk space analysis, file classification, duplicate files detection and/or file search commands to be executed on a number of different servers when each server has a different set of hard disks to be analyzed. A set of disk analysis commands may be pre-configured and tested on a single server and then broadcasted to a number of DiskBoss Servers through the network using the DiskBoss Server configuration sync feature.

15.5   Excluding Directories From Analysis and File Management Operations

DiskBoss provides the ability to exclude one or more directories from disk space analysis and file management operations. In order to configure exclude directories, open the analysis or file management command configuration dialog, press the 'Options' button, select the 'Exclude' tab and add one or more directories to exclude.
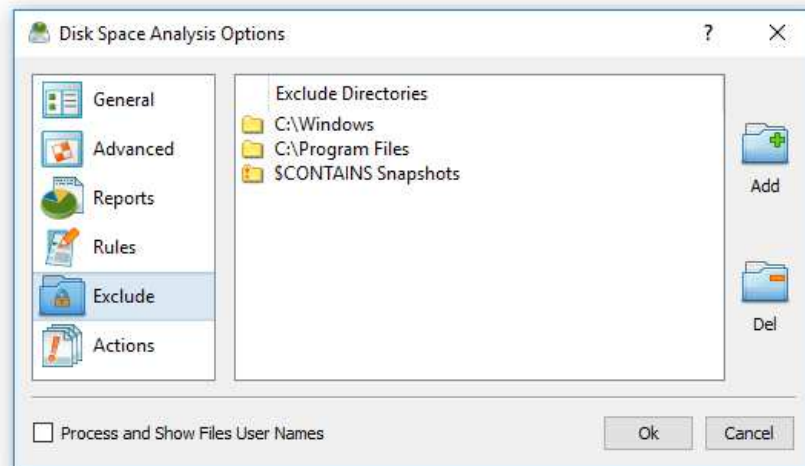
In the simplest case, just add a full directory path to exclude from the analysis or file management operation. In addition, advanced users are provided with a number of exclude directories macro commands allowing one to exclude multiple directories using a single macro command.

DiskBoss provides the following exclude directories macro commands:

- **$BEGINS <Text String>** - this macro command excludes all directories beginning with the specified text string.
- **$CONTAINS <Text String>** - this macro command excludes all directories containing the specified text string.
- **$ENDS <Text String>** - this macro command excludes directories ending with the specified text string.
- **$REGEX <Regular Expression>** - this macro command excludes all directories matching the specified regular expression.

For example, the exclude macro command '$CONTAINS Temporary Files' will exclude all directories with 'Temporary Files' at any place in the full directory path and the exclude macro command '$REGEX \.(TMP|TEMP)$' will exclude all directories ending with '.TMP' or '.TEMP'.

15.6 Task Management

DiskBoss allows one to execute multiple file management operations simultaneously. Multiple simultaneous file management operations may be started, stopped, paused or resumed according to user's specific needs. For example, the user is provided with the ability to suspend a long running operation, execute an urgent task and after that resume the previously paused long running operation. When starting multiple file management operations, DiskBoss allows one to submit all tasks to the tasks queue or execute all tasks simultaneously.
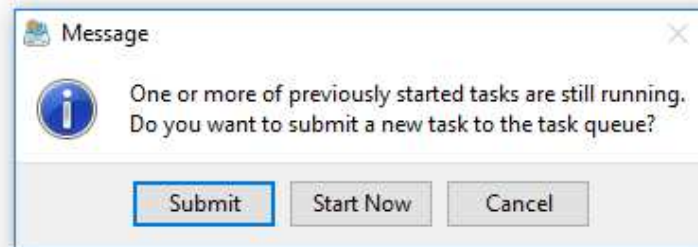
Press, the 'Submit' button to add the new operation to the task queue. In this case all started operations will be executed sequentially, one after one without interfering with each other. If you wish to execute multiple operations on numerous disks or storage devices simultaneously, press the 'Start Now' button.
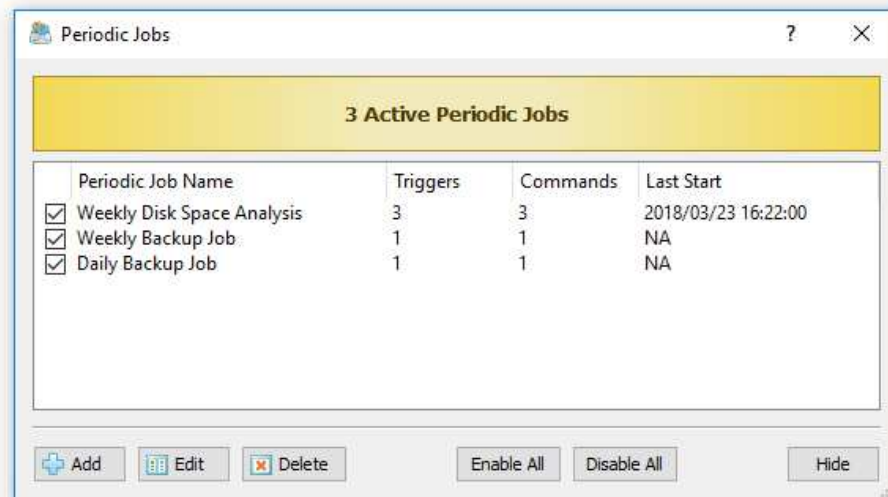
The 'Tasks' button (located on the main toolbar) allows one to access the task management dialog, which provides a number of task management capabilities. Select one or more running tasks and press the 'Pause' button to pause all the selected tasks. Select one or more previously paused tasks and press the 'Continue' button to resume all the selected tasks. Select one or more running (or paused) tasks and press the 'Stop' button to cancel all the selected tasks. Click on a task item in the tasks view to open the task's status dialog. If the task has been completed, DiskBoss will open the results dialog.
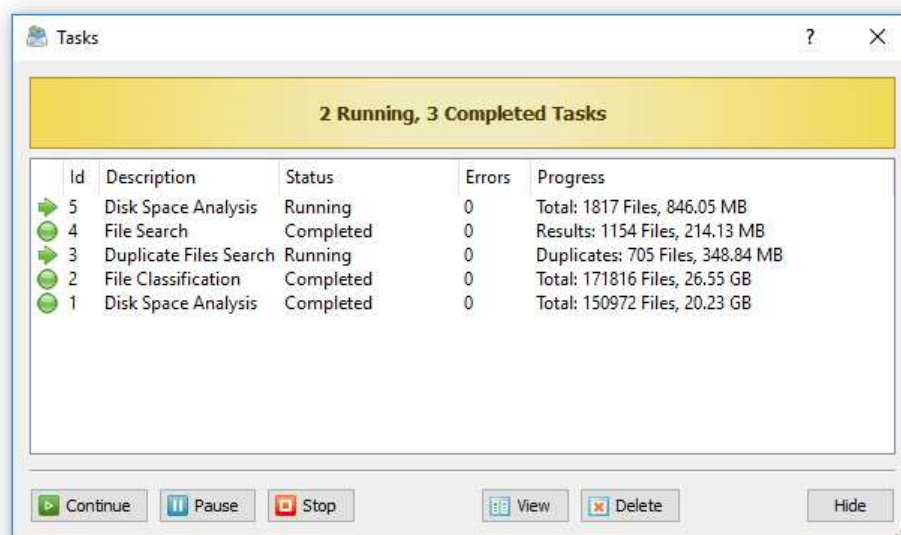
In addition to the ability to start/stop multiple tasks, DiskBoss Ultimate provides the user with the ability to dynamically control the speed of any running operation thus allowing one to slow down or speed-up long running operations according to specific needs. Select a running task, press the right mouse button and select the 'Performance' menu item to set a custom performance mode for the selected task. The same may be achieved using the 'Speed' button located on all types of process dialogs.

15.7   Schedule Periodic Analysis and File Management Operations

DiskBoss provides the ability to execute disk space analysis and file management operations periodically at specific time intervals, weekly or monthly schedules, etc. The user is provided with the ability to define an unlimited number of periodic jobs with each one configured to execute one or more disk space analysis or file management commands.


Each periodic job can be started by multiple hourly, daily, weekly and/or monthly triggers with different schedules for each trigger allowing one to execute disk space analysis and file management operations at different times depending on the week day, month day, etc. In addition, the user is provided with the ability to execute multiple disk space analysis and/or file management operations in each periodic job.


By default, DiskBoss executes multiple commands specified in a periodic job sequentially one after one. In order to analyze files located on multiple physical disks or multiple severs or NAS storage devices more effectively, DiskBoss provides the ability to execute multiple disk space analysis or file management operations in parallel.

In order to add a periodic job trigger, press the 'Add' button located on the right side of the periodic job triggers view. DiskBoss provides the following five types of periodic job triggers: periodic, daily, weekly, monthly and a single time trigger.
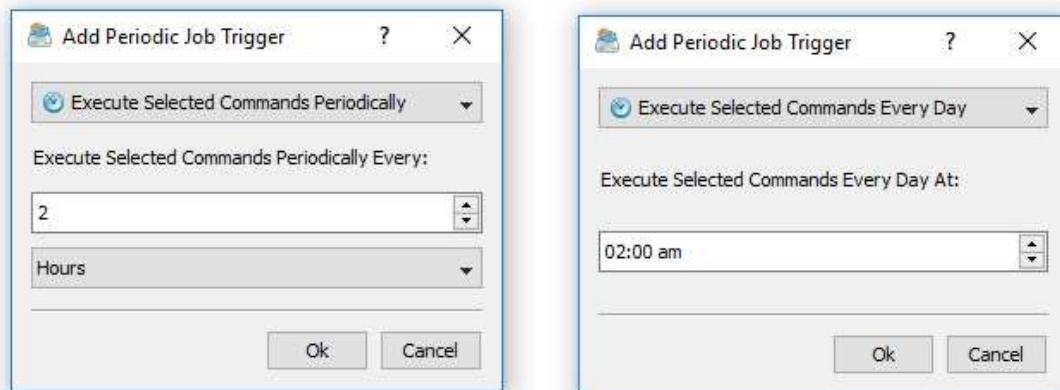
The regular periodic job trigger starts selected disk space analysis or file management commands according to the selected time interval, which may be specified in minutes or hours. The daily periodic job trigger starts selected commands every day exactly at the specified time.
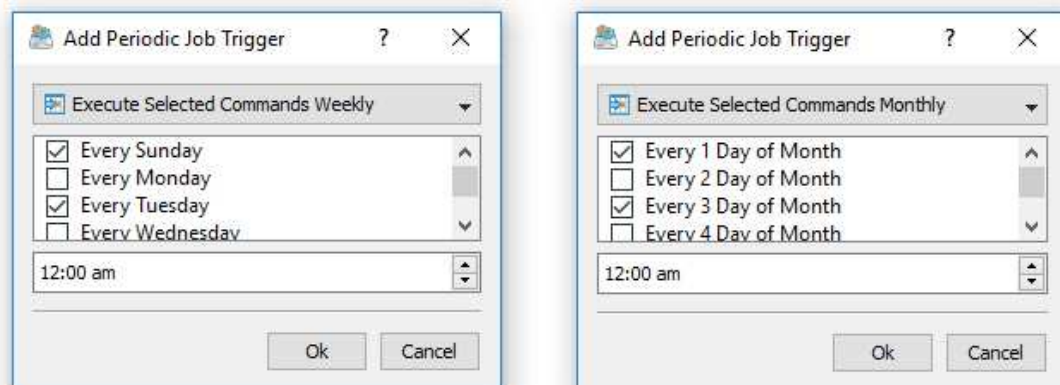
The weekly periodic job trigger starts commands according to the selected week days and the specified time of the day. Let's assume that a backup operation should be executed every Monday at 12am and every Tuesday at 2am. In this case, the user can add two periodic job triggers with the first one configured to start the backup operation every Monday at 12am and the second trigger configured to start the backup operation every Tuesday at 2am.

The monthly periodic job trigger provides the ability to execute disk space analysis or file management commands on specific month days. Finally, the single time periodic job trigger allows one to schedule execution of disk space analysis and/or file management operations on an exact date and time.

An arbitrary number of triggers may be combined in a single periodic job allowing one to precisely control how and when to execute automated disk space analysis and/or file management operations.

Periodic jobs available in DiskBoss Pro and DiskBoss Ultimate are executed in the DiskBoss GUI application and in order to work properly the GUI application should be continuously running. Another option is to use DiskBoss Server, which runs in the background as a service and is capable of executing multiple periodic disk space analysis and/or file management operations even when no one is logged in.

15.8   Sound Notifications

DiskBoss provides the ability to play notification sounds when a file management operation is started, completed or failed. In addition, the user is provided with the ability to enable, disable or customize all types of sound notifications.
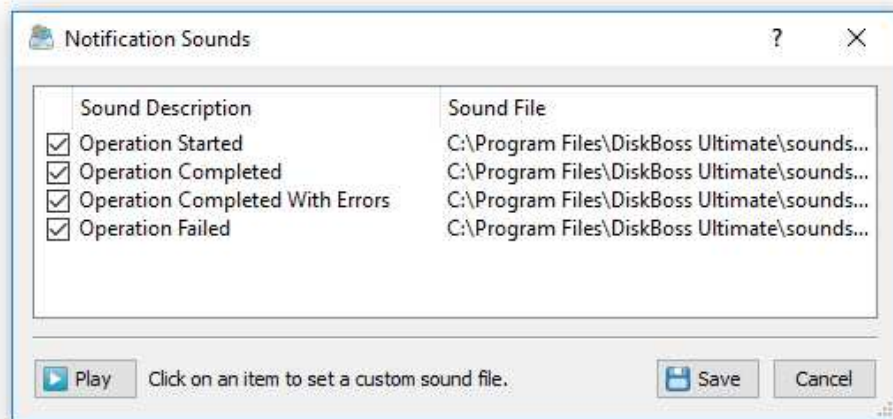
In order to open the 'Notification Sounds' dialog, select the 'Tools - Notification Sounds' menu item. The 'Notifications Sounds' dialog shows all the available sound notifications and allows one to enable or disable specific sound notifications.
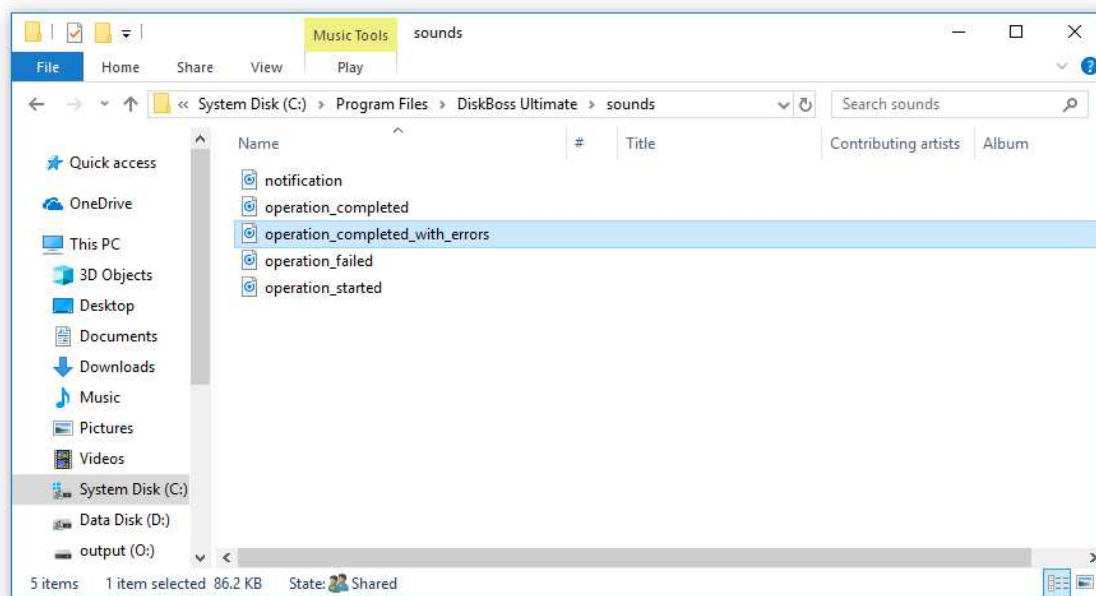
In order to select a custom notification sound file, click on a notification sound item in the sounds list and select a custom WAV file. In order to play a notification sound, select the required notification sound in the sounds list and press the 'Play' button.

15.9   Built-In Disk SMART Viewer

DiskBoss provides a built-in disk SMART viewer allowing one to view the health status of physical hard disks installed in the computer. In order to open the disk SMART viewer, press the 'SMART' button located on the main toolbar. The disk SMART viewer shows the disk model name, the firmware version, the disk serial number and the list of supported SMART attributes for the currently selected physical disk.
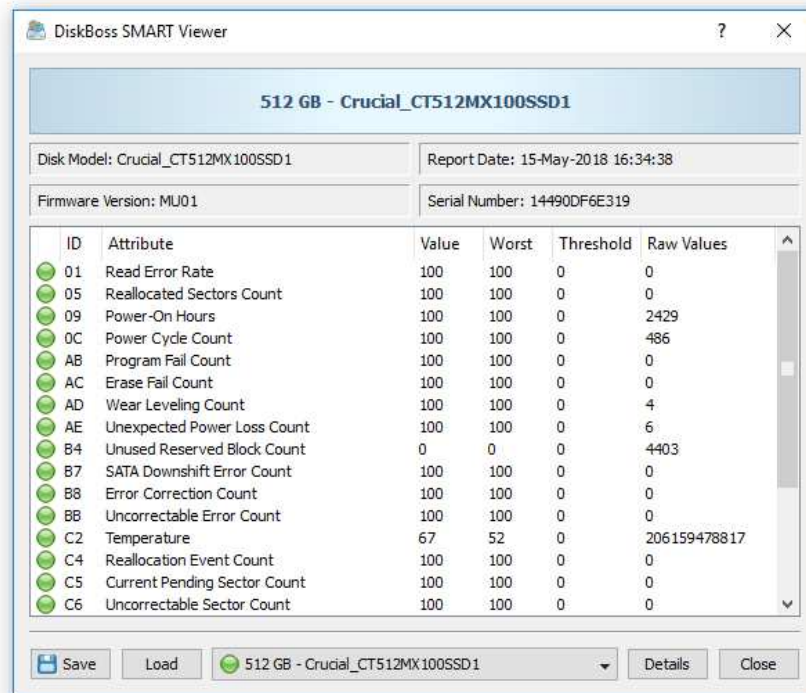
If multiple physical disks are installed in the computer, use the disk selector combo box, located on the bottom side of the SMART viewer, to change the currently displayed disk. If one or more critical SMART attributes are out of valid ranges, the attributes will be marked with yellow (warning) icons or red (error) icons depending on the status and meaning of each specific SMART attribute.
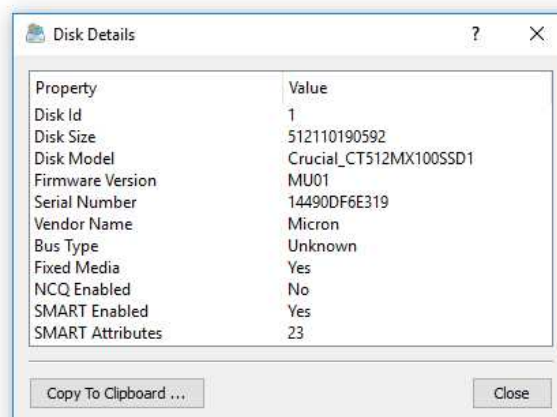
In order to save the disk SMART information to a report file, press the 'Save' button and specify a report file name. In order to open a previously saved disk SMART report, press the 'Load' button and select the report file to load.

15.10 Built-In HEX Editor

DiskBoss includes a built-in HEX editor allowing one to view files and edit file data in the HEX and text modes. The HEX editor provides the ability to view and edit huge files while using a very small amount of system memory thus allowing one to work with large DVD image files and virtual machine disk image files sometimes reaching tens and hundreds of Gigabytes per file. When a file larger than 4 Gigabytes is opened, the HEX editor switches to the 64-Bit position display mode.
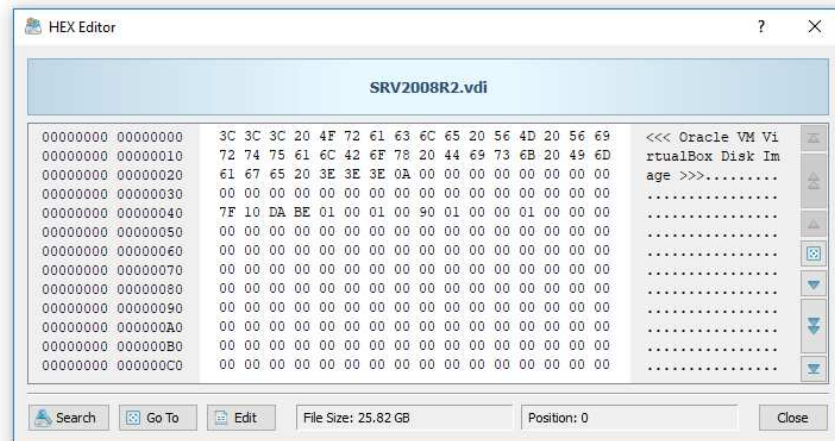
The DiskBoss HEX editor provides the ability to browse a file using navigation buttons located on the right side of the window, jump to a specific position in the file, search for binary or text patterns in the file and edit data in the binary or text modes.
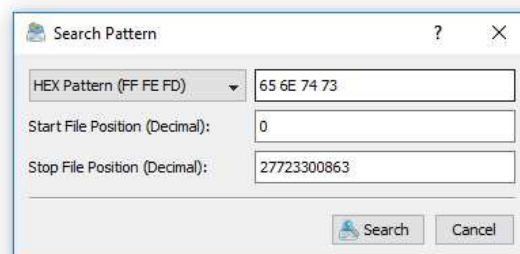
In order to search for a binary pattern, press the 'Search' button, enter the pattern as a series of bytes with each byte represented by two HEX characters. By default, the HEX editor will start searching from the current file position to the end of the file. If required, change the start/stop file positions on the search dialog. In order to search for a text string, change the search mode to 'Text' and enter a text string to search.
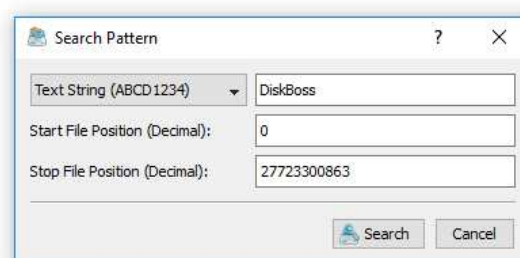
In order to change one or more data bytes in the file, select the data bytes in the HEX display and press the 'Edit' button. In order to edit a text string, select the text string in the text display and press the 'Edit' button.

15.11 Built-In Disk Cleaner

All web browsers and many popular online applications are using the local hard disk to cache web pages, images and video files. Information from visited web sites is stored in your Web browser's cache, wasting your storage space and compromising your privacy. In general, it is a good practice to cleanup your disk once a month. DiskBoss includes a built-in disk cleaner allowing one to cleanup the disk and reclaim the wasted storage space.
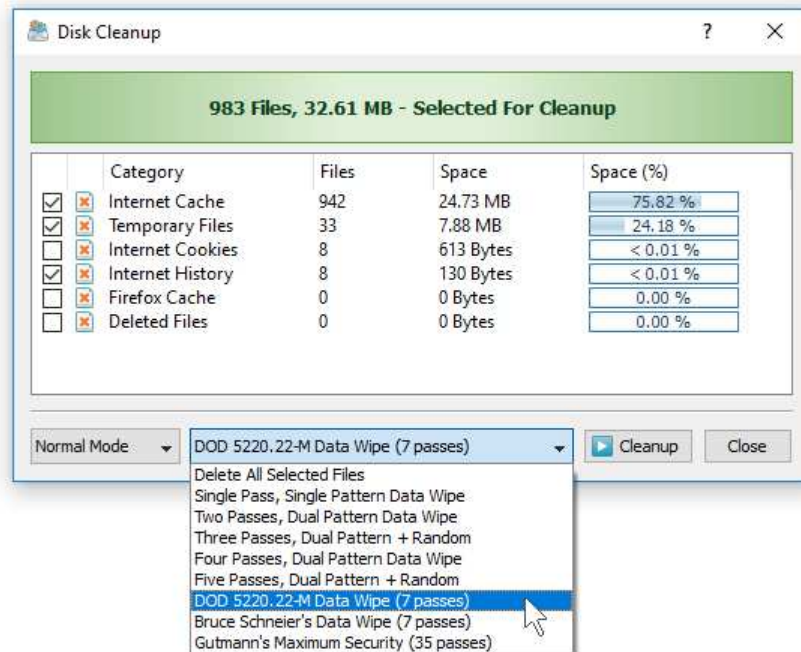
Press the 'Cleanup' button to launch the DiskBoss' built-in disk cleaner. DiskBoss will scan the system hard drive and show the user all detected cache, history and temporary files. During the initial scanning process, DiskBoss just scans the disk and discovers what files may be safely deleted. After finishing the scanning process, DiskBoss indicates all detected file categories and provides the user with the ability to select the file categories that should be cleaned-up.

By default, DiskBoss' built-in disk cleaner selects Internet cache files, Interned history and temporary files to be deleted. The user is provided with the ability to select one of the following automatic cleanup modes: 'Safe', 'Normal' and 'All'. In the safe mode, DiskBoss will cleanup Internet cache and Internet history files only. In the normal mode, DiskBoss will delete Internet cache files, Internet history file, temporary files and deleted files. In the 'All' cleanup mode, DiskBoss will delete files related to all categories including Internet cookies. Alternatively, the user is provided with the ability to select specific file categories manually. Select any number of file categories and press the 'Cleanup' button. DiskBoss will delete all the selected file categories and free-up the wasted storage space.

15.12 User-Selectable Tool Panes

The bottom part of the DiskBoss main GUI application includes two user-selectable tool panes. Each of them may be selected to display bookmarks, file filters, user-defined commands, the local disks status view or the system status view.

File Filters - More and more files are stored in modern computers. A simple Windows-based computer with a number of software products may include 50,000 - 100,000 files. More advanced computer users and professionals may have as much as 100,000 - 200,000 files in their personal computers. Almost everyone has tried to find a file in a directory that contains a couple of thousand files. Although it is possible to search for a file by pressing on the key representing the first letter in the file name, sometimes it is still difficult to find the required file in a file-crowded directory.

Another issue that bothers advanced computer users is how to perform various file management operations on a number of files in a directory selected according to a specific criteria. Using the current version of the Windows Explorer the user will need to select all the required files manually, which may be a really tedious task if you need to deal with hundreds of files.
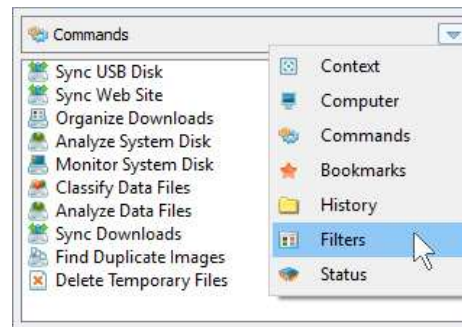
To help users to deal with large amounts of files in directories, DiskBoss introduces advanced files filtering capabilities. For each opened directory, DiskBoss analyzes existing files and automatically builds a list of filters allowing one to select a specific file type to be displayed. The filters view is located in the bottom-right corner of the DiskBoss main GUI application. For each file type in the current directory, DiskBoss displays the number of files and the total storage space consumed by all files related to the file type. In order to see files related to a specific file type, just select the required filter in the filter view. To reset the current view and to see all files in the current directory, select the 'Show All' item in the filter view.

Bookmarks - Overtime disks are getting larger and larger and we are storing more and more files, documents, songs and movies. Some computers are equipped with multiple hard drives and many regular computer users are beginning to use network drives to share files between computers on the home network. Business needs are much more demanding requiring computer professionals to design complex file hierarchies and directory structures for specific business needs. We have are now in a situation where we need to remember much information about the location of various programs, documents, reports, songs, videos, etc.

The DiskBoss' built-in file navigator includes a simple and flexible solution allowing one to save an unlimited number of file system locations in a dedicated bookmarks view and to switch between them in a single mouse click.
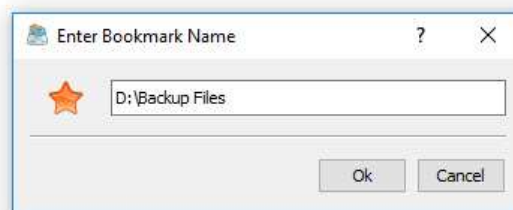
To add a new file system bookmark, browse to the required directory and press the 'Bookmark' button on the main GUI toolbar. On the add bookmark dialog specify a unique bookmark name and press the 'Ok' button. The bookmarks view is located in the bottom-left corner of the DiskBoss main GUI application. During installation, DiskBoss automatically adds bookmarks for 'Computer Home', 'My Documents' and all local hard drives installed in the computer. To jump to a previously bookmarked directory, just select a bookmark name in the bookmark view.

Disk List - The local disks status view lists all the local disks as defined in the OS configuration. For each disk DiskBoss displays the drive letter, the total disk size and the amount of free storage space. Click on a disk item to see more detailed information about the disk.

System Status - The system status view shows a summary system status including the current CPU usage, the system memory status and the system disk status.

15.13 DiskBoss Options

Select the '**Tools – DiskBoss Options**' menu item to open the options dialog.
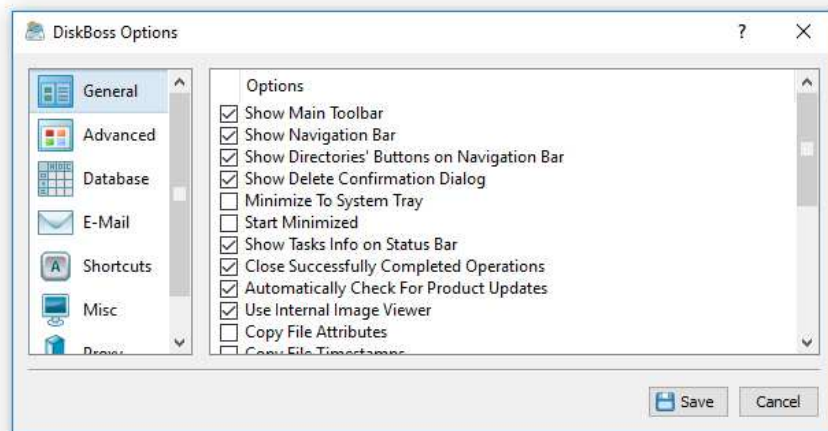
The '**General**' tab allows one to control the following options:

- **Show Main Toolbar** – Enables/Disables the main toolbar
- **Show Navigation Bar** – Enables/Disables the navigation bar
- **Show Directories' Buttons on Navigation Bar** – Enables/Disables directories' buttons on the navigation bar
- **Show Delete Confirmation Dialog** - select this option to show delete confirmation dialog.
- **Close Successfully Completed Operations** – select this option to automatically close successfully completed file copy, move and delete operations.
- **Automatically Check For Product Updates** – select this option to instruct DiskBoss to automatically check for available product updates.
- **Use Internal Image Viewer** – select this option to use the DiskBoss' built-in image viewer as the default image viewer.
- **Copy File Attributes** – select this option to enable default copying file attributes for all file copy and move operations.
- **Copy File Timestamps** – select this option to enable default copying file timestamps for all file copy and move operations.

The '**Shortcuts**' tab provides the user with the ability to customize keyboard shortcuts. Click on a shortcut item to edit the currently assigned key sequence. Press the 'Default Shortcuts" button to reset all keyboard shortcuts to default values.
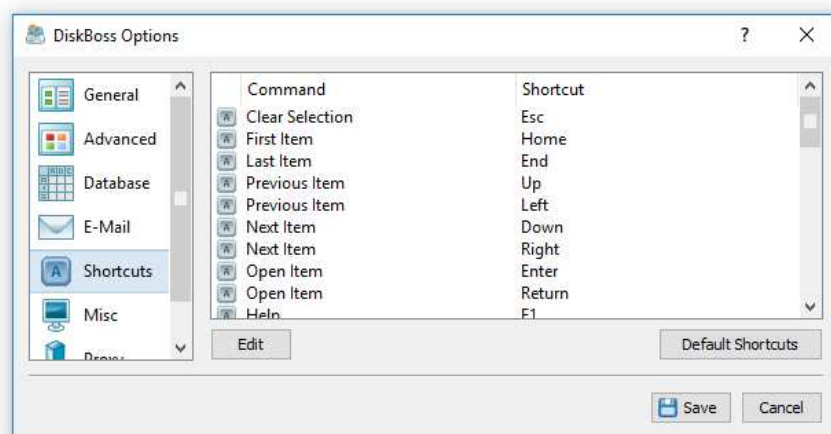
The '**E-Mail**' tab allows one to define an e-mail account to be used for sending e-mail notifications. In order to enable e-mail notifications, select the 'Enable E-Mail Notifications' checkbox and enter account details. In the 'SMTP Server Name' entry specify the host name of the SMTP server that should be used to send notifications, enter an appropriate user name, password and specify a source e-mail address to be used as the 'From' e-mail address for DiskBoss e-mails. In order to test the specified email account, click on the 'Verify E-Mail account' button.
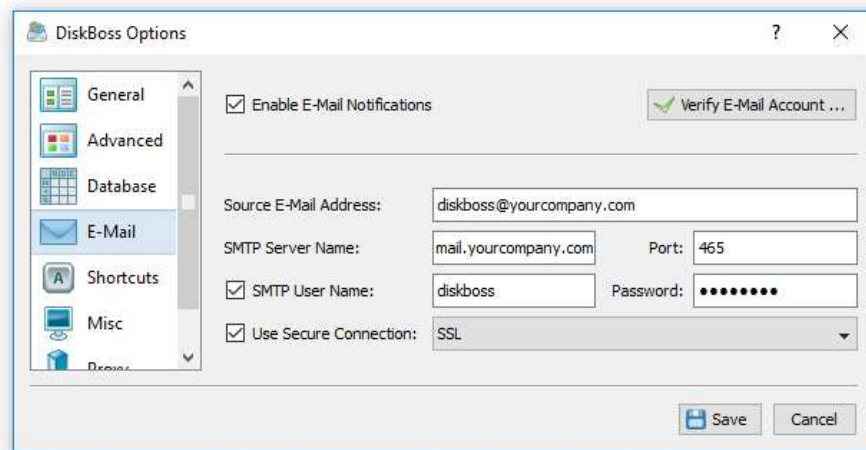
The '**Database**' tab allows one to configure an ODBC data source to use to export disk space analysis, file classification, duplicate files, file search and disk change monitoring reports to an SQL database. In order to enable database exports, specify the ODBC data source name, user name and password to use to connect to the SQL database.
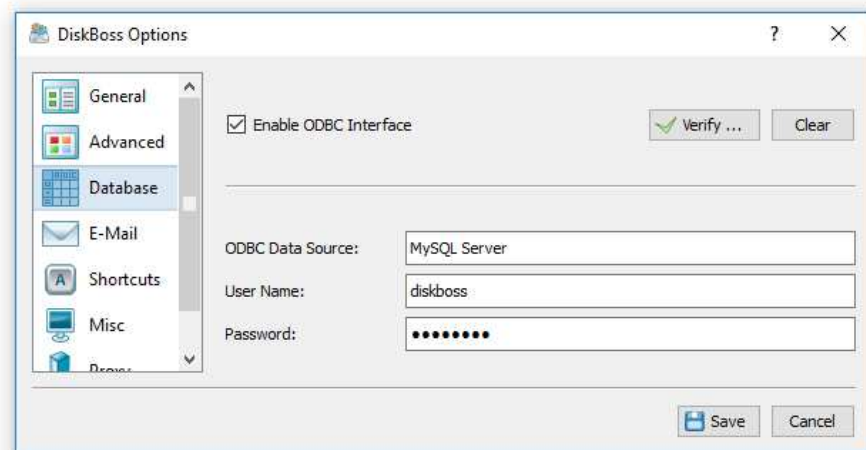
The '**Reports**' tab allows one to keep a user-specified number of reports in the reports directory or the reports SQL database while automatically deleting old reports and freeing up the disk space. These features are especially useful for fully automated disk space analysis, file classification, file search or disk change monitoring operations when the user needs to keep a history of report files in a reports directory or a history of reports in an SQL database.
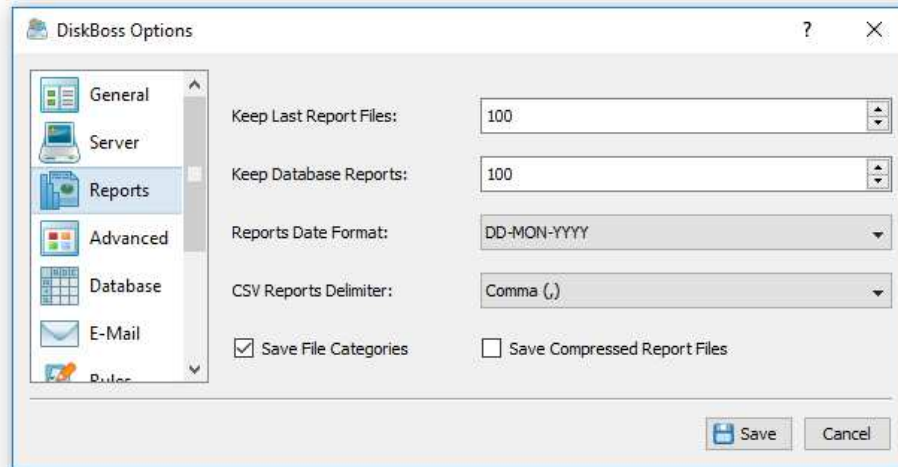
By default, DiskBoss keeps all reports in the reports directory or the SQL database. In order to enable automatic report management, open the 'Options' dialog, select the 'Reports' tab and change the 'Report Files' or 'Report Database' options to appropriate values.

The '**Report Files**' option is applicable to HTML, text, Excel CSV, XML and DiskBoss native reports saved to a reports directory or to the user's home directory using the DiskBoss server or the command line utility. After saving each new report, DiskBoss will check if there are too many reports of the same type (HTML, XML, CSV, etc.) in the reports directory and delete old reports according to the user-specified configuration.

The '**Report Database**' option is applicable to reports submitted to an SQL database using the DiskBoss GUI application, the DiskBoss server or the DiskBoss command line utility. After saving each new report to the database, DiskBoss will check if there are too many reports from the same host computer, for the same set of disks or directories and delete old reports according to the user-specified configuration. For example, if reports from two different servers are submitted to the same SQL database, DiskBoss will keep in the database X last reports for each server.

The '**File Categories**' option allows one to enable/disable exporting of file categories to HTML, text, Excel CSV and XML reports. Second-level file categories are available when reports are saved using the DiskBoss GUI application manually. Automatically generated reports or reports saved using the DiskBoss command line utility always saved without file categories. When the 'File Categories' option is enabled, DiskBoss GUI application will save second-level file categories to HTML, text, Excel CSV and XML reports.

The '**Compressed Reports**' option allows one to save automatically generated HTML, text, Excel CSV and XML reports as compressed archive files.

The '**Advanced**' tab provides the following configuration options:
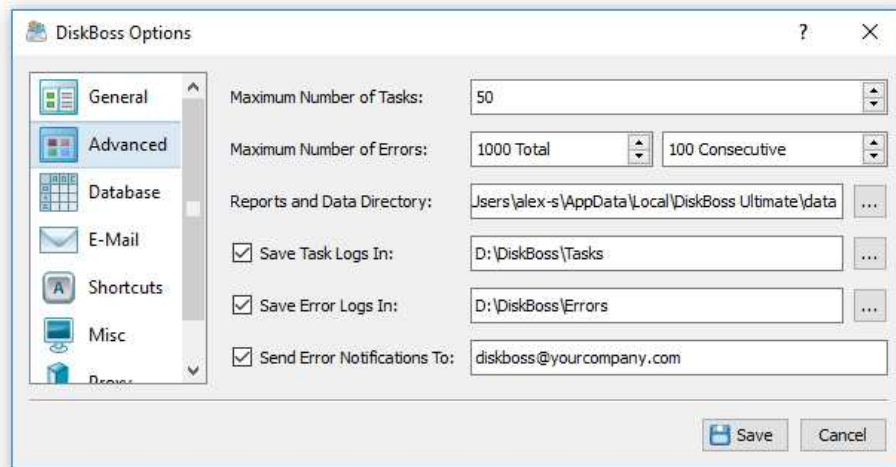
- **Maximum Tasks** – According to the selected value, DiskBoss will save results for X last operations (such as search, classify, analyze, etc.). For detailed information about task management capabilities refer to the 'Task Management' section in this document.
- **Maximum Errors** – use this option to set the maximum number of errors for all file management operations. If a file management operation such as copy, move, delete, synchronize will reach the specified maximum number of errors, the operation will be aborted.
- **Maximum Consecutive Errors** – use this option to set the maximum number of consecutive errors for all file management operations. If a file management operation such as copy, move, delete, synchronize will reach the specified maximum number of consecutive errors, the operation will be aborted.
- **Data Directory** – use this option to set the directory where DiskBoss should save the user generated data such as user-defined commands and file system signatures.
- **Save Errors Logs In** – enable this option and specify an existing directory to automatically save all error logs to the specified directory.
- **Save Tasks Logs In** - enable this options and specify an existing directory to automatically save tasks logs to the specified directory.
- **Proxy Configuration** - Periodically, DiskBoss connects to the product's web site and checks for available product updates. If DiskBoss is installed on a computer connected to the Internet through an HTTP proxy, use the proxy configuration options to set a custom HTTP proxy configuration.

15.14 Registering Product

Licenses for DiskBoss Pro, DiskBoss Ultimate, DiskBoss Server, discounted license packs and various license bundles may be purchased on the following page:

http://www.diskboss.com/purchase.html

After finishing the purchase process, wait for the following two e-mail messages: the first one with a receipt for your payment and the second one with an unlock key. If you will not receive your unlock key within 24 hours, please check your spam box for e-mail messages originating from **support@flexense.com** and if it is nor here contact our support team.
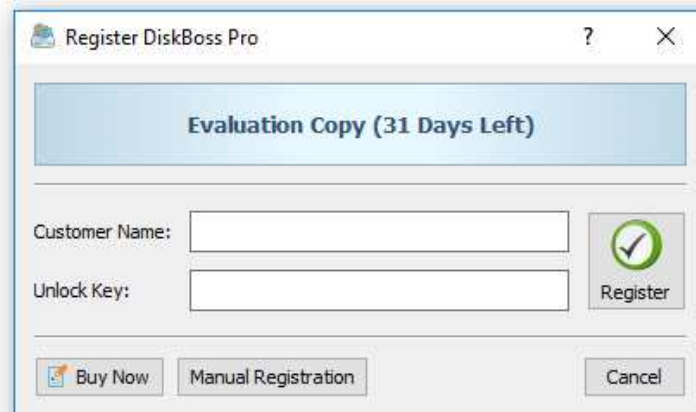

After you will receive your unlock key, start the DiskBoss GUI application and press the 'Register' button located in the top-right corner of the window. On the register dialog, enter your name and the received unlock key and press the 'Register' button to finish the registration procedure.

16 Appendix

16.1 Installing and Configuring MySQL Database

DiskBoss Ultimate and DiskBoss Server are capable of saving disk space usage analysis, file classification, duplicate files, disk change monitoring reports in an SQL database. Reports may be saved manually or automatically using the DiskBoss periodic jobs, DiskBoss Server or the command line utility periodically executed by the Windows built-in task scheduler.

In order to configure DiskBoss to use the MySQL database, the user needs to install the following two components: the MySQL Server and the MySQL ODBC connector. First of all, let's install the MySQL Server. Download the latest version of the MySQL Server from the MySQL web site and start the setup program. On the setup type page, select the 'Typical' setup type and press the 'Next' button. By default, the setup will install the MySQL server and a command line utility, which will be used to configure the MySQL server.
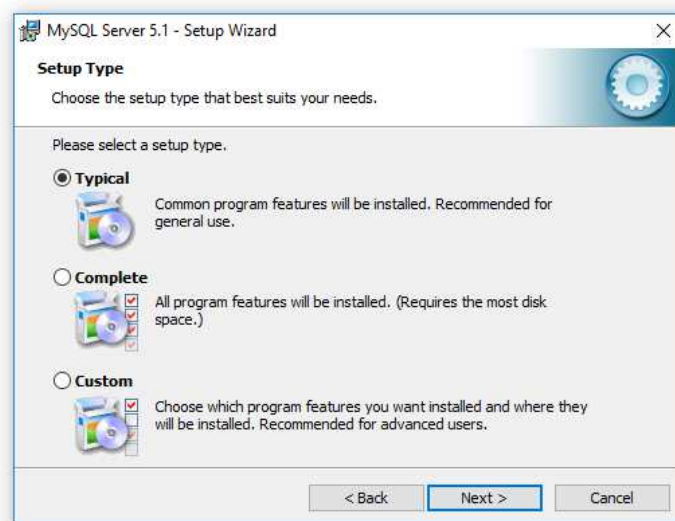

On the next setup page, select the 'Configure the MySQL Server now' option and press the 'Finish' button. The setup program will open a MySQL configuration wizard allowing one to configure basic server settings.

On the next setup page, select the 'Detailed Configuration' option and press the 'Next' button. The detailed configuration mode is required to configure the MySQL server for maximum database performance.
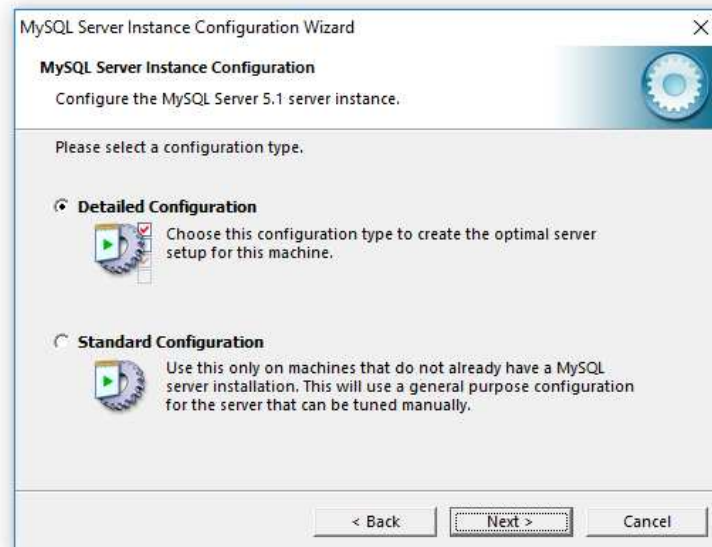

On the next page, select the 'Server Machine' option, which is the most balanced configuration for typical DiskBoss workloads. If the server is intended to process large volumes of reports and is dedicated for DiskBoss, select the 'Dedicated Server' configuration option.
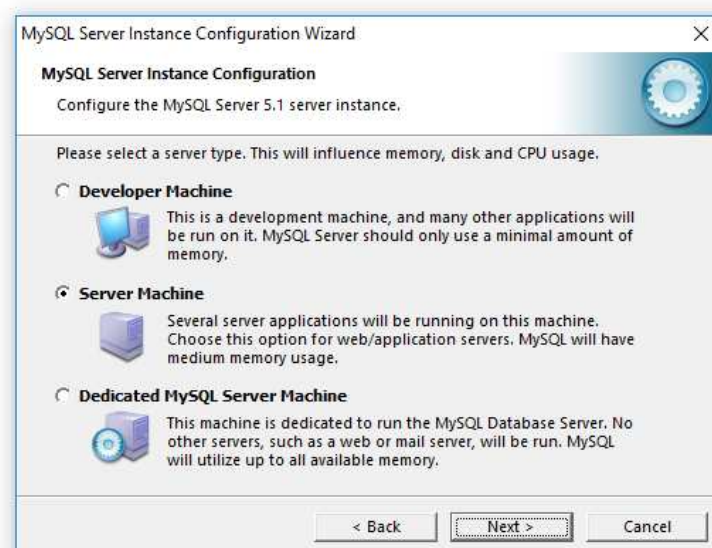
On the next page, select the 'Non-Transactional Database' option. DiskBoss does not perform concurrent insert or modify operations on the database and a transactional database is not required. Moreover, configuring the MySQL server as a non-transactional database will significantly improve the performance of database import operations.
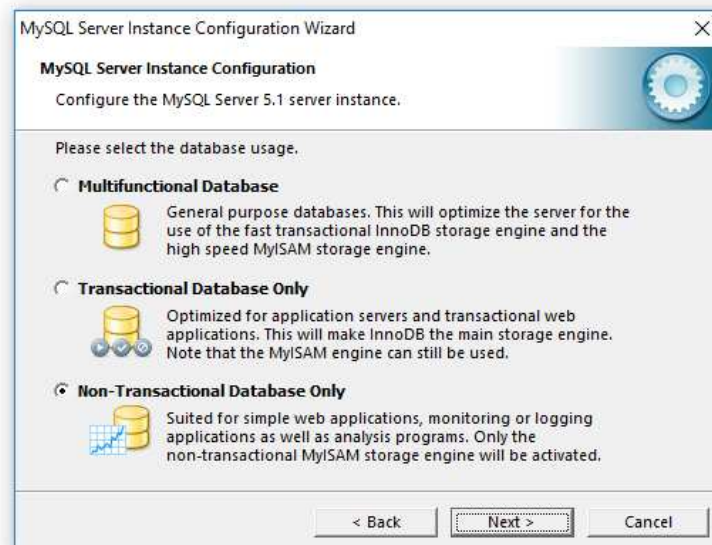

On the next page, select the 'Manual Setting' option and set the number of concurrent database connections to 5, which is the optimal number for typical DiskBoss installations.
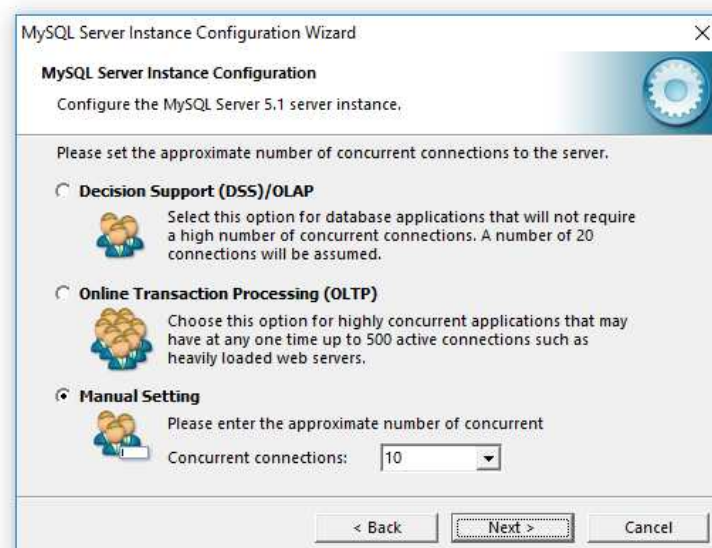
On the next page, enable TCP/IP networking and if the server will be accessed from other computers on the network, add a firewall exception for the MySQL server port. In general, a single MySQL server may be used to collect reports from multiple DiskBoss installations using remote ODBC connections.
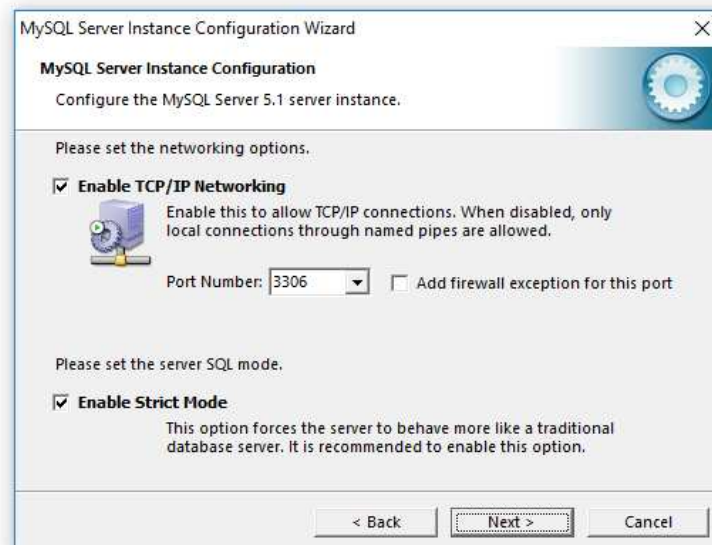
On the next page select an appropriate character set. By default, DiskBoss uses the UTF-8 character set to store names of files and directories, but if there is no need to process Unicode file names, this option may be set to the standard Latin1 character set.
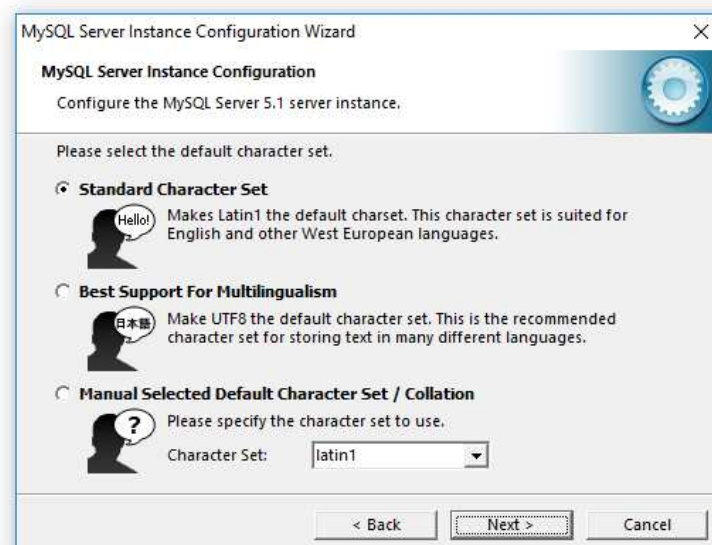
On the next page, select the 'Install as Windows Service' option and select the 'Include Bin Directory in Windows PATH' option. The PATH option will enable execution of the MySQL command line utility from any location.
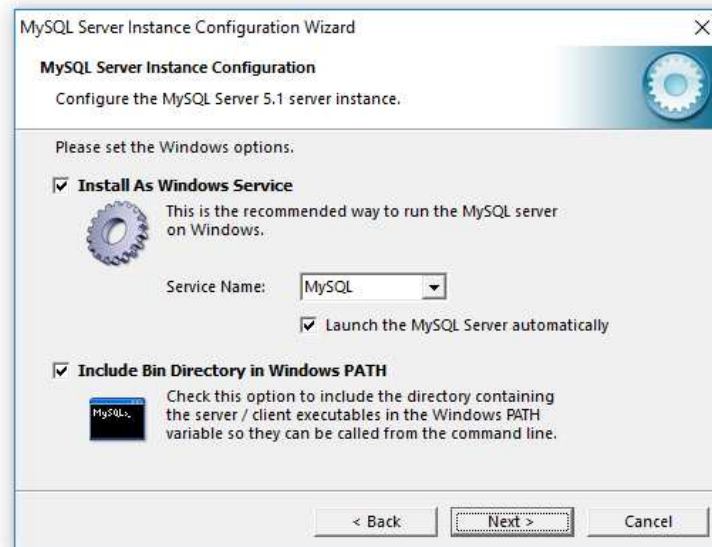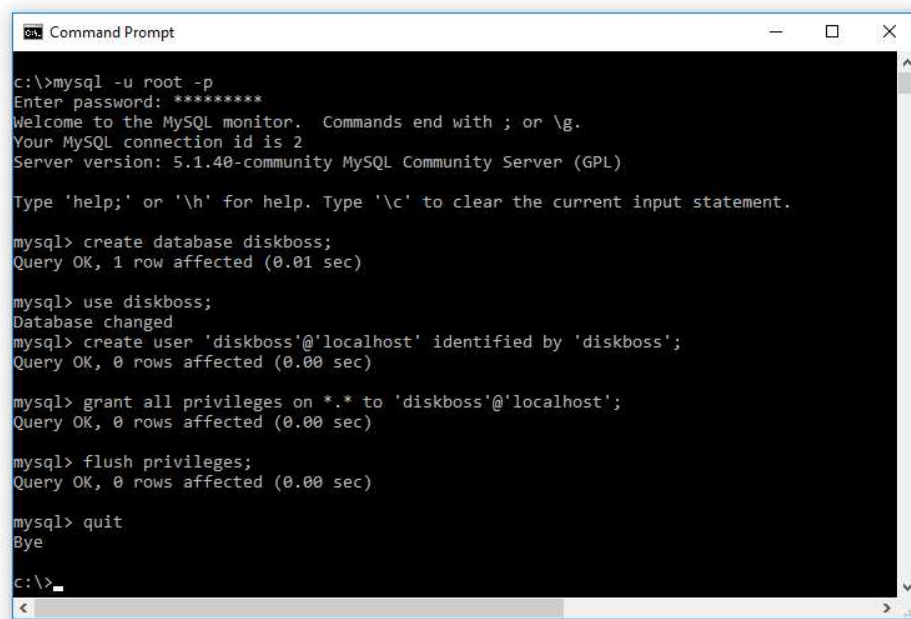

On the next page, select the 'Modify Security Settings' option and specify a root password for the MySQL server, which later will be used to configure regular MySQL users.

That's all. Press the 'Next' button to finish the installation procedure.

Configuring MySQL Database

The MySQL database provides the 'mysql' command line utility, which may be used to configure the database and the user account to be used by DiskBoss.

In order to configure the MySQL database, open the command prompt window and type the following command:

mysql –u root –p

This command will start the 'mysql' command line utility and login to the MySQL server with root permissions. The user will be asked to provide the root password, which was specified during the MySQL server installation procedure.

Once logged in, the user needs to create a database that will be used by DiskBoss to store disk space analysis reports. In order to do that, type the following command:

create database diskboss;

Now, add a user account that will be used by DiskBoss to submit reports to the database. Single quotes are required and should be specified exactly as displayed.

create user 'diskboss'@'localhost' identified by 'password';

Now, grant permissions to the user account using the following command:

grant all privileges on *.* to 'diskboss'@'localhost';

Finally, flush user privileges using the following command.

flush privileges;

That's all. Now the MySQL server is fully configured. In order to disconnect from the MySQL database, just type '**quit**' in the command window.
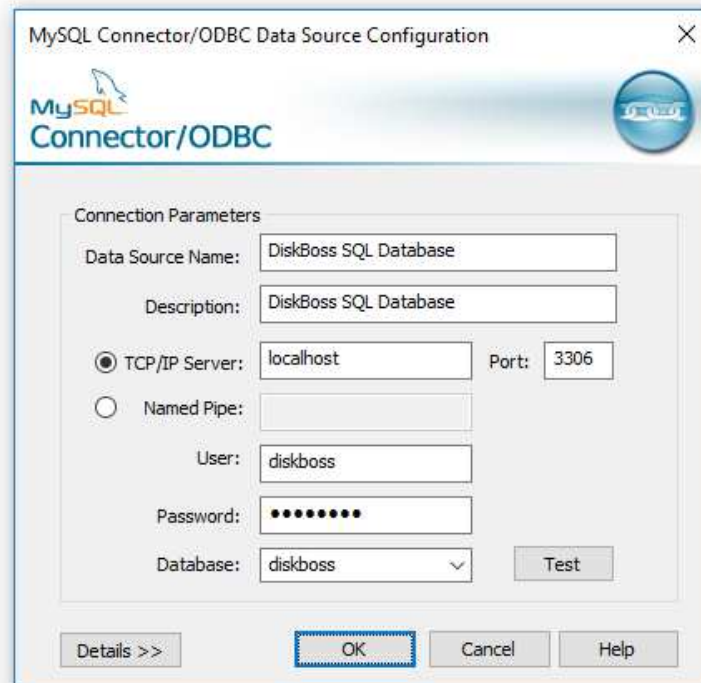
16.2   Configuring MySQL ODBC Data Source

DiskBoss connects to the MySQL database through the ODBC interface. Download an appropriate version of the MySQL ODBC connector from the MySQL web site and execute the setup program. There are no critical configuration options in the MySQL ODBC connector installation procedure and the user can just press the 'Next' button until the last page keeping the default configuration options.
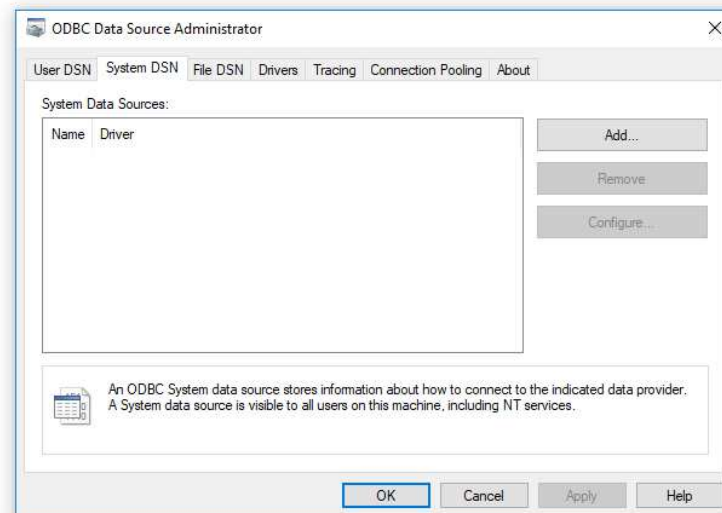
After finished installing MySQL ODBC Connector, open the Windows control panel and select 'Administrative Tools – Data Sources (ODBC)'. On the ODBC Administrator window, select the 'System DSN' tab and press the 'Add' button. On the next page, select the 'MySQL ODBC Driver' and press the 'Finish' button.
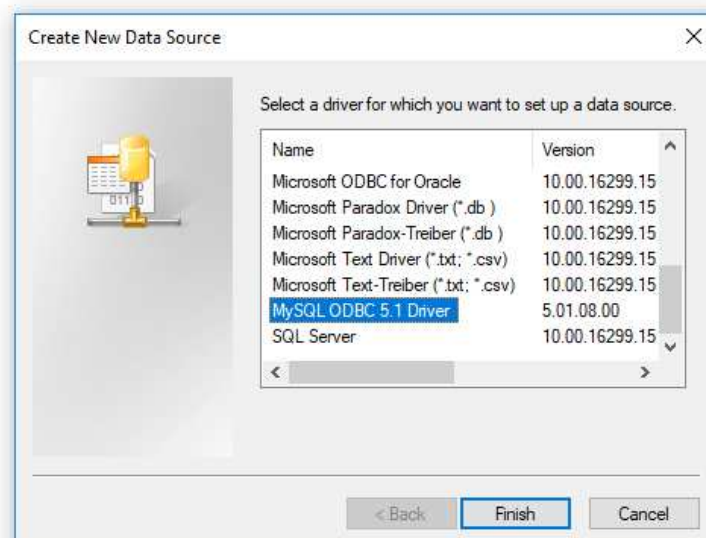
On the next page, enter a new data source name, which will be used by DiskBoss to connect to the database. Specify the name of the host where the MySQL server is running on and enter the MySQL user name and password that should be used by DiskBoss to connect to the database. Finally, select the name of the database that should be used to store disk space analysis reports. After finished specifying all the required information, press the 'Test' button to check the database connection.

Configuring DiskBoss Database Connection

In order to configure DiskBoss to use the installed MySQL database, open the options dialog and select the 'Database' tab. Enable the ODBC interface and enter the name of the ODBC data source, the database user name and password that were specified for the ODBC data source. Finally, press the 'Verify' button to check the DiskBoss database connection.
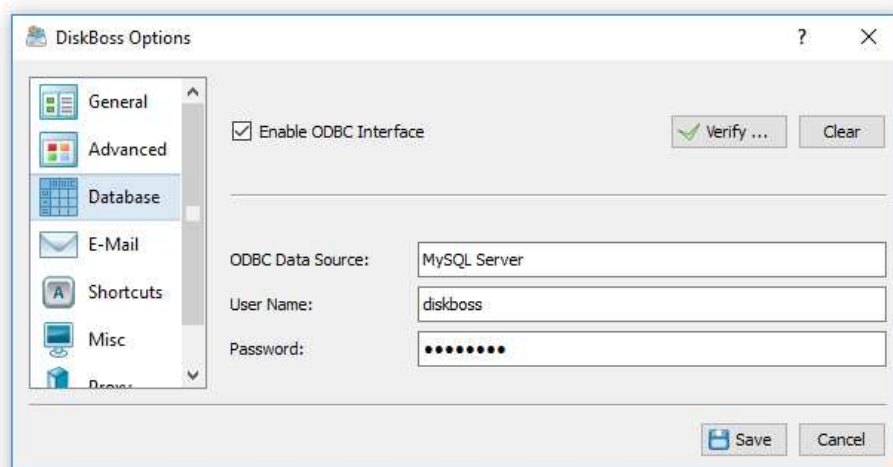
16.3   Supported Operating Systems and System Requirements

Supported Operating Systems

- Windows XP
- Windows Vista
- Windows 7
- Windows 8
- Windows 8.1
- Windows 10
- Windows 11
- Server 2003
- Server 2008
- Server 2008 R2
- Server 2012
- Server 2012 R2
- Server 2016
- Server 2019
- Server 2022

System Requirements

Minimal System Requirements

- 2 GHz or better CPU
- 2 GB of system memory
- 100 MB of free disk space
- Supported Operating System

Recommended System Requirements

- 2+ GHz dual-core CPU
- 4 GB of system memory
- 200 MB of free disk space
- Supported Operating System

DiskBoss Enterprise System Requirements

- 2+ GHz quad-core CPU
- 8 GB of system memory
- 1 GB of free disk space
- Supported 64-Bit Operating System

16.4   Default Keyboard Shortcuts

All keyboard shortcuts are fully customizable and may be changed on the DiskBoss options dialog. In addition, the user is provided with the ability to define custom keyboard shortcuts for file system location bookmarks and jump to any directory in a single key press.

Keyboard Shortcut	Operation
ESC	Clears current selection
HOME	Selects the first item in the main view
END	Selects the last item in the main view
UP, LEFT	Selects the previous item in the main view
DOWN, RIGHT	Selects the next item in the main view
ENTER, RETURN	Opens directory or file
F1	Opens online help
F2	Navigates to the Computer Home
F3	Starts search
F4	Starts file organizing
F5	Starts file classification
F6	Starts storage utilization analysis
F7	Starts duplicate files search
F8	Starts disk clean-up operation
F9	Starts Copy-To operation
F10	Starts Move-To operation
F12	Opens Advanced Commands Management Dialog (Ultimate Only)
CTRL + A	Selects all items in the main view
CTRL + U, Backspace	Navigates to the parent location (Go Up)
CTRL + B	Bookmarks the current location
CTRL + T	Opens a terminal window
CTRL + C	Copies the current selection
CTRL + X	Cuts the current selection
CTRL + V	Starts a copy or move operation (After CTRL ^ C or CTRL ^ X)
CTRL + O	Open Selected File With …
CTRL + P	Open the file properties dialog
CTRL + R	Refresh the current view
CTRL + N	Rename the currently selected file or directory
DEL	Starts delete operation