KillDisk - User Manual

Contents

Legal Statement

Introduction

As a relatively new technology, an overwhelming majority of people, businesses and organizations do not understand the importance of security in digital data storage. The average hard drive sees thousands of files written to it, many of which contain sensitive information. Over the course of a hard drives lifetime, the likelihood for **recoverable** remnants of sensitive information left on a hard drive at its' end of life is very high. To see this firsthand, simply try out `KillDisk`'s *File Browser* on page 74 on your system drive. You'll be surprised to see what you find!

Note: Additionally, try formatting a USB drive with files on it and browse it with `KillDisk`'s *File Browser* on page 74 as well. Data breaches are not limited to hard drives!

Advanced Data Recovery Systems

Advances in data recovery have been made such that data can be reclaimed in many cases from hard drives that have been wiped and disassembled. Security agencies use advanced applications to find cybercrime related evidence. Also there are established industrial spy agencies adopting sophisticated channel coding techniques such as PRML (Partial Response Maximum Likelihood), a technique used to reconstruct the data on magnetic disks. Other methods include the use of magnetic force microscopy and recovery of data based on patterns in erase bands.

Although there are very sophisticated data recovery systems available at a high price, data can also be easily restored with the help of an off-the-shelf data recovery utility like `Active@ File Recovery` (*http://www.file-recovery.com*), making your erased confidential data quite accessible.

Using `KillDisk`, our powerful and compact utility, all data on your hard drive or removable device can be destroyed without the possibility of future recovery. After using `KillDisk`, disposal, recycling, selling or donating your storage device can be done with peace of mind.

Erasing Confidential Data

Modern methods of data encryption are deterring unwanted network attackers from extracting sensitive data from stored database files. Attackers who want to retrieve confidential data are becoming more resourceful by looking into places where data might be stored temporarily. A hard drive on a local network node, for example, can be a prime target for such a search. One avenue of attack is the recovery of data from residual data on a discarded hard disk drive. When deleting confidential data from hard drives, removable floppies or USB devices, it is important to extract all traces of the data so that recovery is not possible.

Most official guidelines around disposing of confidential magnetic data do not take into account the depth of today's recording densities, nor the methods used by the operating system when removing data. For example, the Windows DELETE command merely changes the file name so that the operating system will not look for the file. The situation with NTFS is similar.

Removal of confidential personal information or company trade secrets in the past might have used the FORMAT command or the DOS FDISK command. Ordinarily, using these procedures give users a sense of confidence that the data has been completely removed.

When using the FORMAT command, Windows displays a message like this:

```
Formatting a disk removes all information from the disk.
```

The FORMAT utility actually creates new FAT and ROOT tables, leaving all previous data on the disk untouched. Moreover, an image of the replaced FAT and ROOT tables are stored, so that the UNFORMAT command can be used to restore them.

As well, FDISK merely cleans the Partition Table (located in the drive's first sector) and does not touch anything else.

Moreover, most of hard disks contain hidden zones (disk areas that cannot be accessed and addressed on a logical access level). KillDisk is able to detect and reset these zones, cleaning up the information inside.

International Standards in Data Destruction

`KillDisk` conforms to dozens of international standards for clearing and sanitizing data, including the US DoD 5220.22-M standard. You can be sure that once you erase a disk with `KillDisk`, sensitive information is destroyed forever.

`KillDisk` is a quality security application that destroys data permanently from any computer that can be started using a bootable USB or CD/DVD. Access to the drive's data is made on the physical level via the BIOS (Basic Input-Output Subsystem), bypassing the operating system’s logical drive structure organization. Regardless of the operating system, file systems or type of machine, this utility can destroy all data on all storage devices. It does not matter which operating systems or file systems are located on the machine.

KillDisk Overview

KillDisk for Industrial Systems

This edition of KillDisk is designed to provide a software solution for industrial workstations, configured to service disks in high volumes. KillDisk for Industrial Systems is distributed as a software package that may be installed on a disk erase workstation and used to examine, erase and even write images to individual or batches of disks. Highly customizable, the software is able to conform to any company standards - erasure standards, examination type, reporting, error handling are only a subset of the configurable settings KillDisk supports. All elements of KillDisk's operations may be documented in XML reports, PDF certificates, or even printable labels for erased hard drives. Versatile, easy to navigate and rich in features, KillDisk for Industrial Systems is the ideal KillDisk solution for recyclers and corporations to securely erase hard drives - simply and efficiently.

KillDisk is a powerful software that delivers the following main features:

- Erase data on the entire hard disk drive surface, supports parallel erasing of large numbers of disks (hardware-limited);
- Destroy data permanently with a choice of dozens of international disk sanitizing standards, including DoD 5220.22-M;
- Sanitize external disks (USB drives, external HDD/SSD) connected to both USB 2.0 and 3.0 ports;
- Examine disk integrity and overall stability, disk verification and detect bad sectors;
- Auto-erase mode sanitizes disks and prints certificates without of any user interaction;
- Hot-swap operations are fully supported, erase could be auto-initiated upon HDD plug-in;
- Browse file systems on disk volumes and inspect particular sectors Hex Viewer on a low level;
- Issue customizable certificates and detailed reports for disk erase and examination;
- Print different types of labels to be attached to hard disks after erase completion;
- Provides enhanced information about disks and their attributes including S.M.A.R.T. Monitoring;
- Export local erase history to the external databases;
- Wipe out unused clusters and metadata on live volumes, leaving existing data intact;
- and more...

KillDisk maintains the highest standards in disk erasure, and with that, provides extensive documentation options for its' operations through *Reports* and printable *Erase Certificates* on page 37 and *Erase Labels* on page 40.

Software Licensing

KillDisk is licensed **per concurrent use of the software** and **for each concurrent disk being erased or wiped**, outlined in the EULA. The maximum number of disks erased in parallel corresponds to the number of purchased licenses.

KillDisk Industrial is supplied with a security USB key that contains number of licenses being purchased (one license is required per slot where HDD/SSD is plugged into).

Figure 1: Security USB key containing licenses

This key must be inserted into any USB slot on the PC before running KillDisk software, otherwise authorization error appears.

Software Updates

KillDisk has a built-in update client to ensure you always have access to the latest version of the application. To update, use the file menu bar to navigate to **Help** > **Check for Updates**

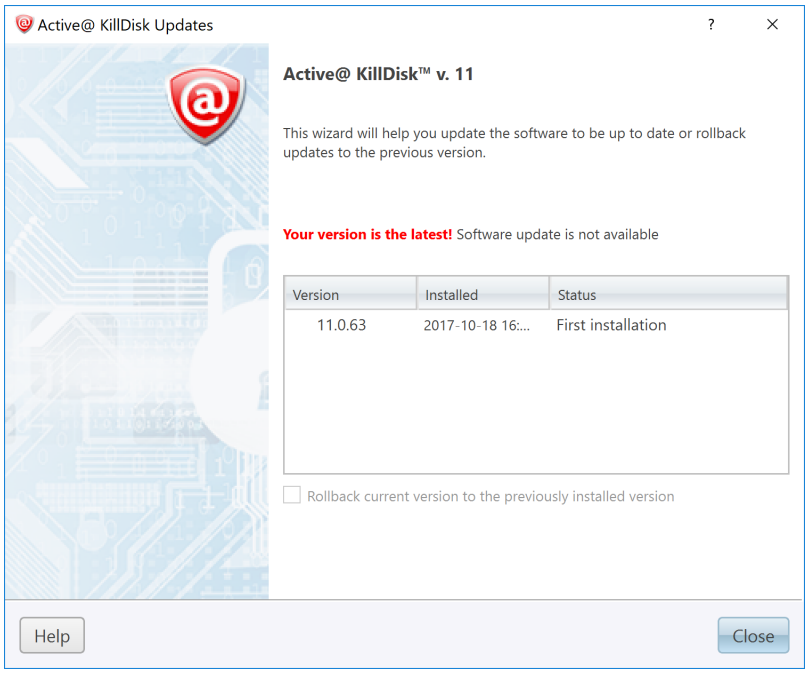


Figure 2: Checking for updates

Update dialog contains history of previously installed versions and updates.

If a new version or update is detected, it can be downloaded and installed on the next wizard steps.

Note: `KillDisk` stores your previously installed versions, so you may roll back to any of your older versions at any time.

System Requirements

KillDisk Industrial is design to run on Linux and Windows operating systems with the following minimum requirements:

Workstation:

- IBM PC compatible machine
- Intel Pentium or higher
- 2 Gb of RAM
- 100Mb of free disk space

Video:

- VGA (1024x768) resolution or better

Operating System:

- Windows XP or higher
- Linux Kernel 2.x or higher

Drive Storage:

- Disk types supported:
  - IDE
  - ATA
  - SSD
  - SATA
  - eSATA
  - SCSI
  - Removable media (memory stick, SD card, compact flash...)
- KillDisk Industrial supports all drives supported by the Operating System with read/write access

Security Hardware

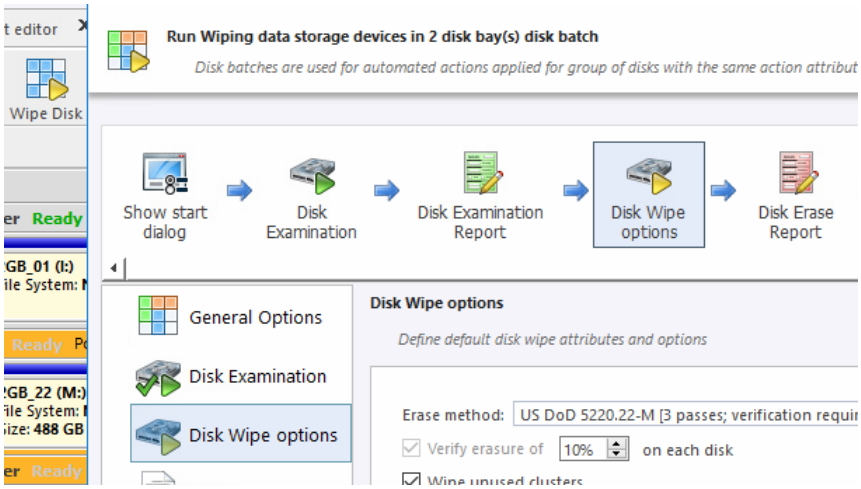
KillDisk authorization is provided by an external or internal removable USB key with license and user information. This USB key must be inserted all the times to make KillDisk software operable.

Figure 3: KillDisk's hardware activation dongle

New in version 2.0

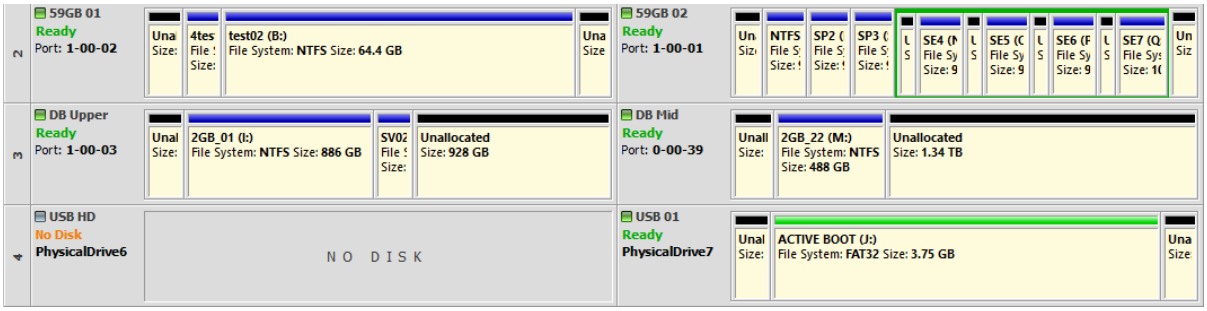
New functionality: Wipe

Now, `KillDisk Industrial` has the ability to sanitize free space on the hard drive with **Wipe**, leaving existing files intact. Careful not to confuse it with **Erase** which erases everything!

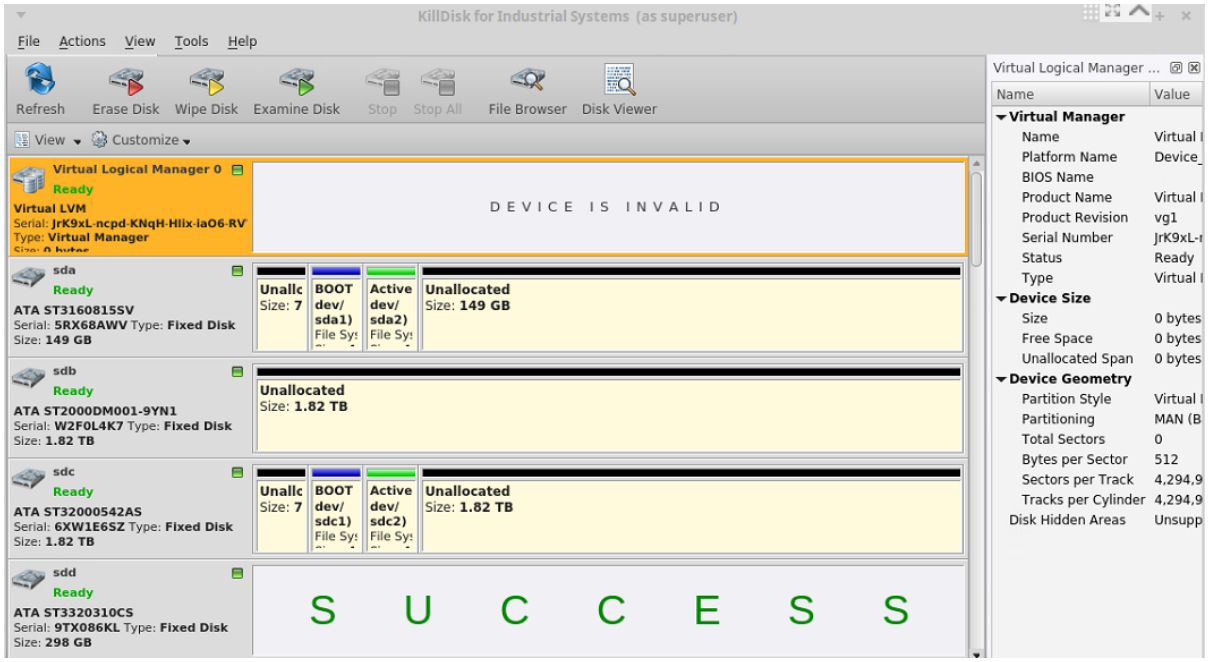


Advanced views

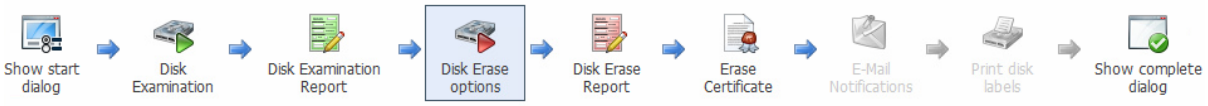
- Added an ability to toggle a view with complete partition information of your connected disks in the **Disk Explorer View**



- Revamped the local disks view to show more details, including partition information for all connected disks:



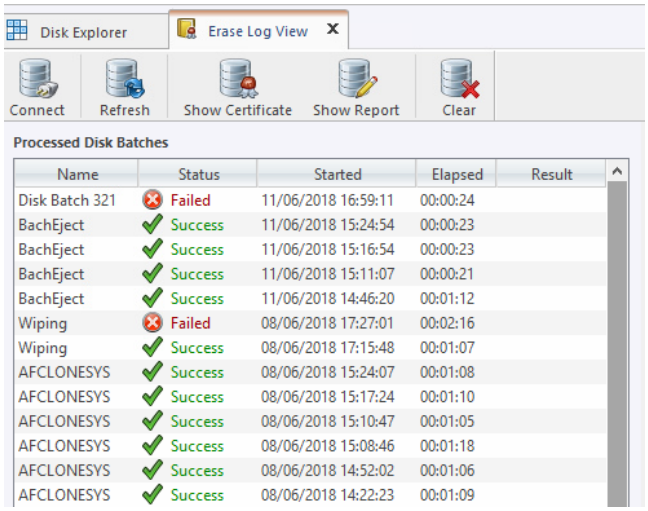
- ...and a new work flow view for managing your disk processes efficiently:



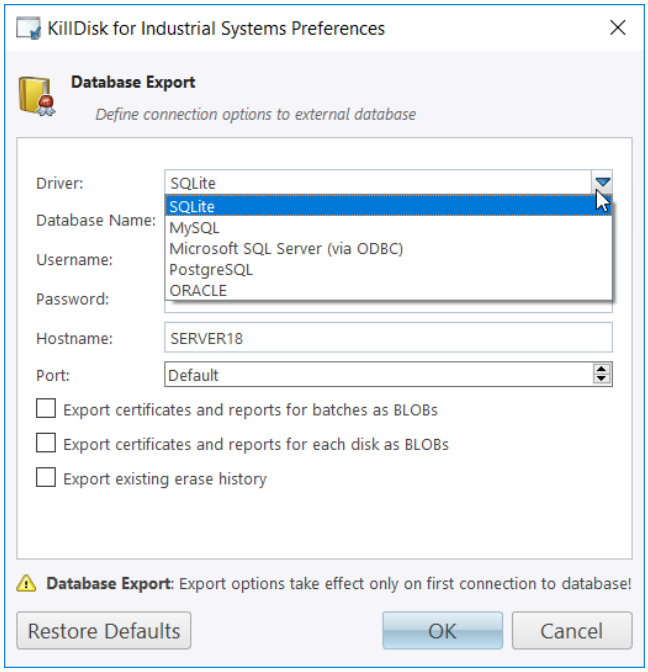
Erase History, Database Integrations and Email Notifications

`KillDisk Industrial` version 2.0 adds a number of features to simplify auditing and management pains, with the addition of:

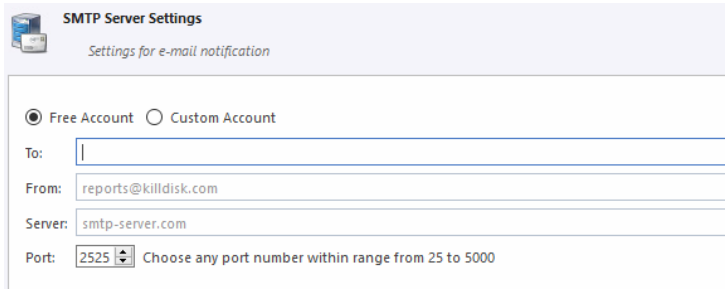
- The **Erase History** menu, allowing users to see the history of operations, with easy access to certificates from within the KillDisk application interface:



- ...these reports can now easily be connected and exported into your SQL database!

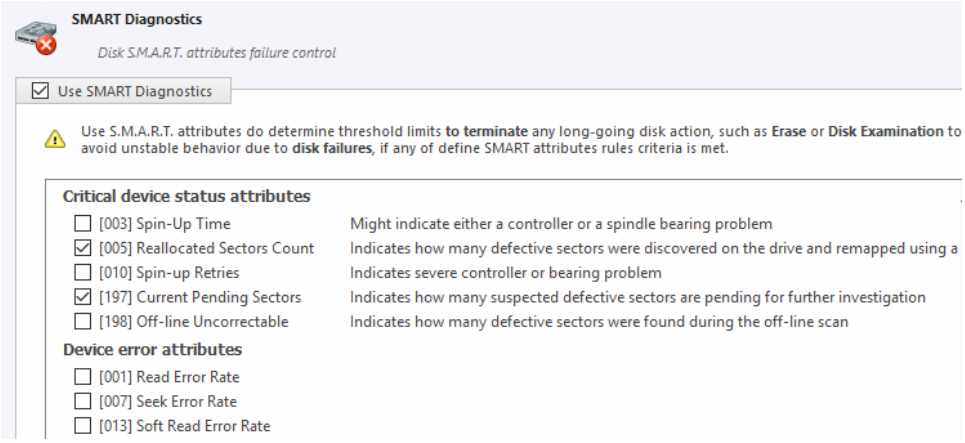


- Email Notifications for network-connected devices, allowing all certificates/reports/logs to be emailed to a central repository for record-keeping. All you need to do is put in your email address:



Disk Performance Monitoring

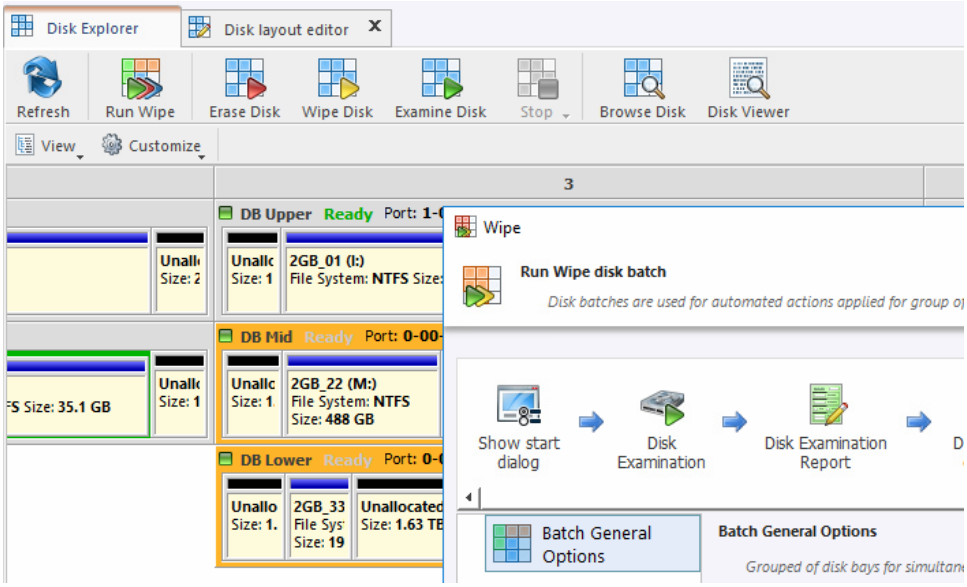
- Monitor SMART information throughout the erase operation and set thresholds to eject under-performing drives:



- Set minimum disk Read/Write speed for drives to be evaluated during erase

Batches, redesigned

- New wizard for creating batches
- Batches can be designated for **Erase**, **Wipe**, **Examination** and **Clone** with common parameters:



Getting Started with KillDisk

This section outlines the essential features of `KillDisk` and explains basic functionality to get you started.

KillDisk Installation and Distribution

KillDisk Industrial distribution overview

`KillDisk Industrial` is distributed as a software solution, with a DVD-ROM and security USB license. DVD-ROM contains two installations:

- `KillDiskIndustrial-Setup.exe` - installation for Windows OS
- `KillDiskIndustrial.run` - installation for the Linux OS

Simply install the application into your data erasure workstation environment and *configure it to your system*.

Launching and initial Configuration

Note: Before launching KillDisk make sure that security USB stick is plugged into the any USB slot on a workstation running the software.

Upon first launching the application you will encounter the **Disk Bay Layout Wizard**.

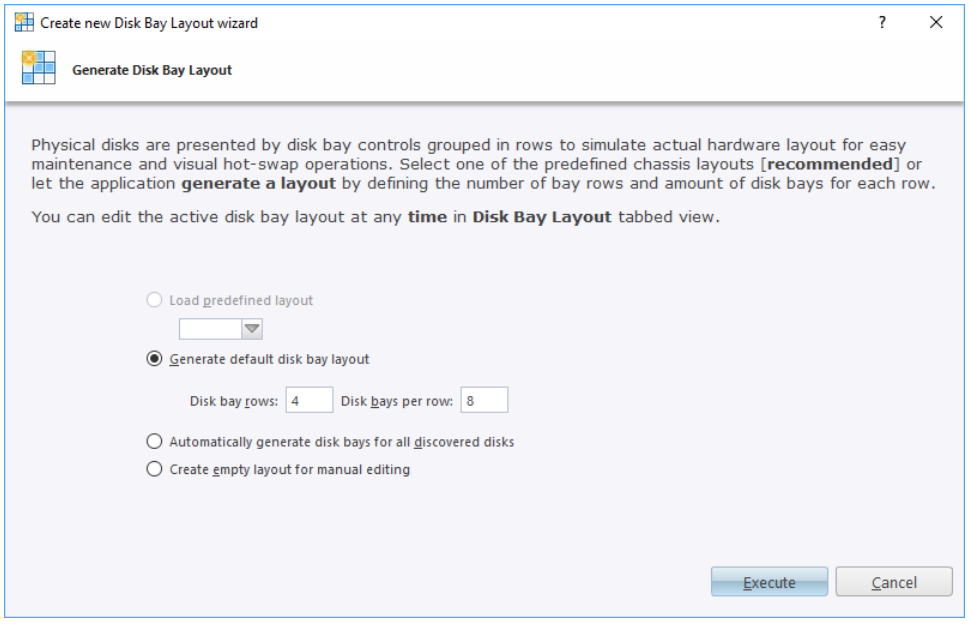


Figure 4: Disk Bay Layout Wizard

This menu allows you to initialize `KillDisk` to display your hardware in an intuitive way. To illustrate the purpose of this, read this section on *Disk Bay Layouts*. This initial configuration can be done in one of three ways:

Load predefined layout

Here you can find one of our predefined layouts that may fit your system. If an appropriate layout is not listed, you may try the next option.

Generate default disk bay layout

Define your systems in terms of a disk array, arranged in a X by Y grid of disks. You may make adjustments to this later, so this may just be a base to start from.

Automatically generate disk bays for all discovered disks

Defines your Disk bay layout based on the disks recognized by your system's device manager. The disks will be placed in their own individual row when the layout is generated.

Create empty layout for manual editing

Defines a blank layout with no disks, so they can be added in the *Disk Bay Layout* window later.

Navigating Killdisk

Once the `KillDisk` application is launched, you will be presented with the main `KillDisk` application dashboard. From here you can use any of `KillDisk`'s tools with your system. This section will outline the main components of the application. The full functionality and features of these components are discussed in their corresponding sections later in this documentation:

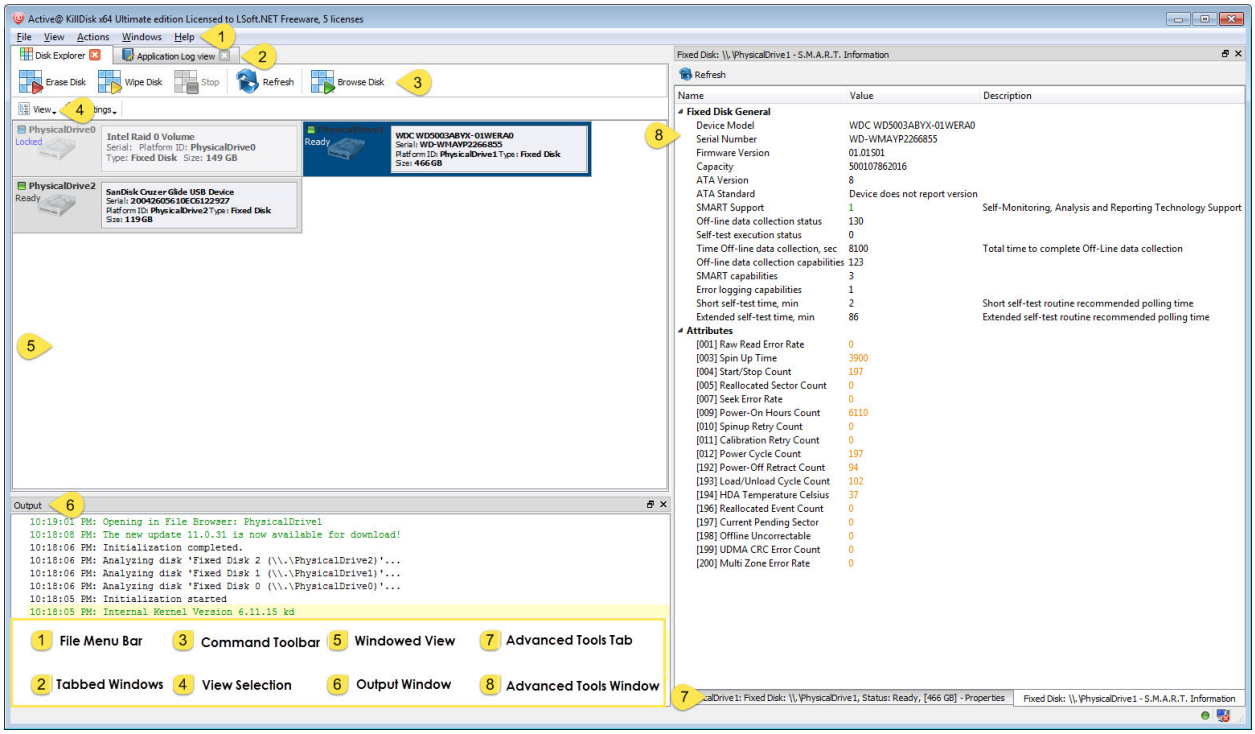


Figure 5: KillDisk application dashboard

File menu bar

The file menu bar contains can be manipulated to perform nearly any operation in `KillDisk`, such as accessing elements of the program such a settings and help, changing views and what is visible in the dashboard, opening tools, and navigating between KillDisk's windows.

Tabbed Windows

Here, you may move between `KillDisk` tabbed windows, the main windows being *Disk Explorer*, *Application Log* etc..

Command Toolbar

The command toolbar is a dynamic toolbar that allows the user to perform Tabbed Window-specific actions, depending on what window the user is in and what element is selected.

View Selection

Only available in the **Disk Explorer View**, this View Selection allows you to manipulate how the bays are displayed in the **Windowed View**, manipulating the type of graphics used to show the bays and the cardinality of the bays in the **Disk Bay View**.

Windowed view

Contains the window that is currently open.

Output window

Contains the log of operations `KillDisk` has performed.

Batch control window

The Batch control window is an easily accessible interface to create, delete and manipulate disk batches.

Advanced tool tabs

These tabs allow for navigation between the different advanced tool windows.

Advanced tool window

This window shows the data for the Advanced tool selected. The window can be moved, popped out and re-sized.

To browse through each of these views, click on the appropriate tab. You may also open a view from the **View** menu.

To close the current view at any time, press **CTRL+F4**. To open any closed view, select it from the **View** menu.

The status bar, at the bottom of the workspace shows the current status of the application or status of the activity in progress.

Disk Layout Overview

The purpose of **Disk Bay Layouts** is to match KillDisk's graphical representation of your disk configuration to your physical hardware configuration, making it easy to manage your disks for Erasure, Examination, Cloning and more. To illustrate this, let's look at an example, using the hardware below:

Figure 6: Example of a generic disk array

In the above example, we have a generic disk array consisting of 16 disks, arranged in a 4x4 grid. The machine using these disks would see the disks similarly to KillDisk's **Local Devices** view, as depicted in the Figure below:

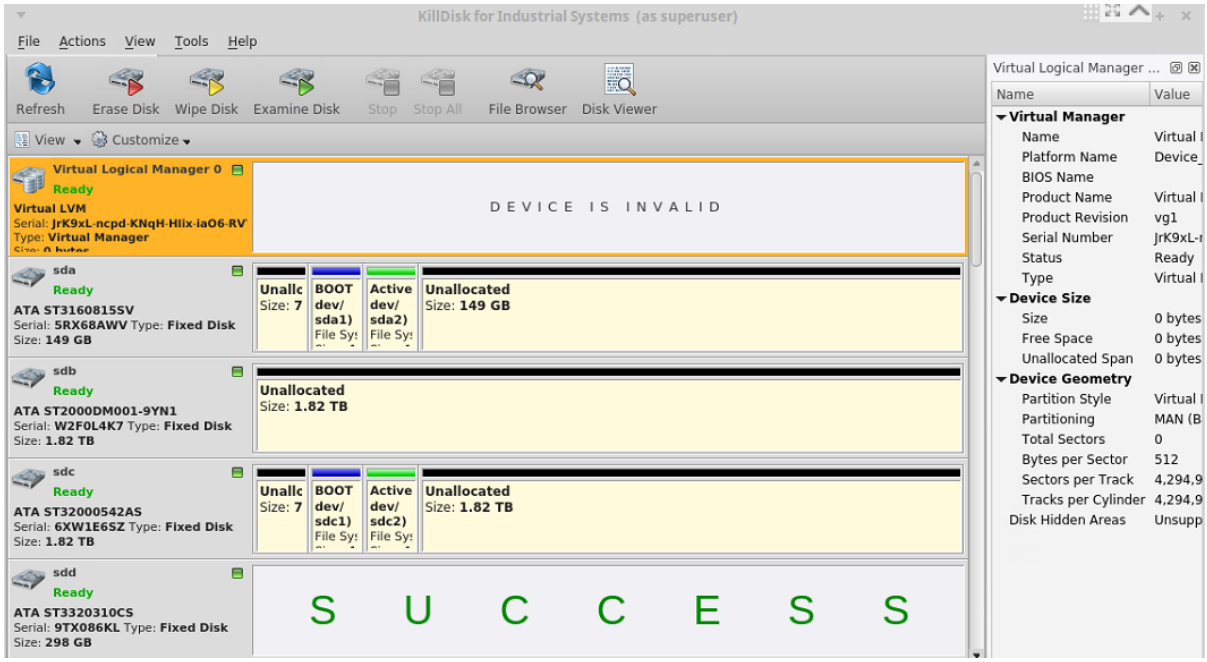


Figure 7: Local Devices view

Now imagine inserting a Hard Disk Drive into the bottom-leftmost bay of the disk array and wanting to perform an operation on it. Even finding the device in a list of 15 other disks would be tedious and not very intuitive. This is where creating a **Disk Bay Layout** is extremely useful. By creating a 4x4 **Disk Bay Layout**, we can map the physical ports to their corresponding Bay in KillDisk and visually see our disk array like this:

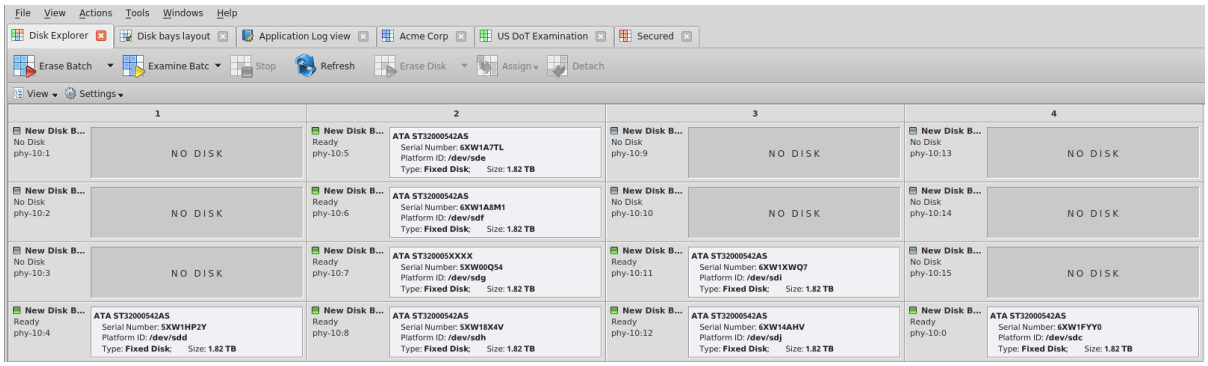


Figure 8: Disk Bays view

Assuming that the bays were mapped correctly, finding the correct disk to manipulate now much easier in the **Disk Bays** view than it would have been in a list view. You can now select the bottom-leftmost disk in the **Disk Bays** view and perform any necessary actions on it.

Create a new Disk Bay Layout

In the KillDisk toolbar, select **Tools** > **Disk Layout Editor**, or shortcut **CTRL + M**.

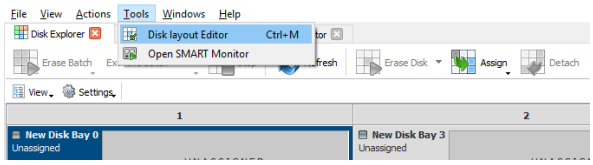


Figure 9: Opening the Disk bays layout tab

This will bring you to the **Disk Bays Layout** tab, where you can manipulate, save, import and create Disk Bay Layouts.

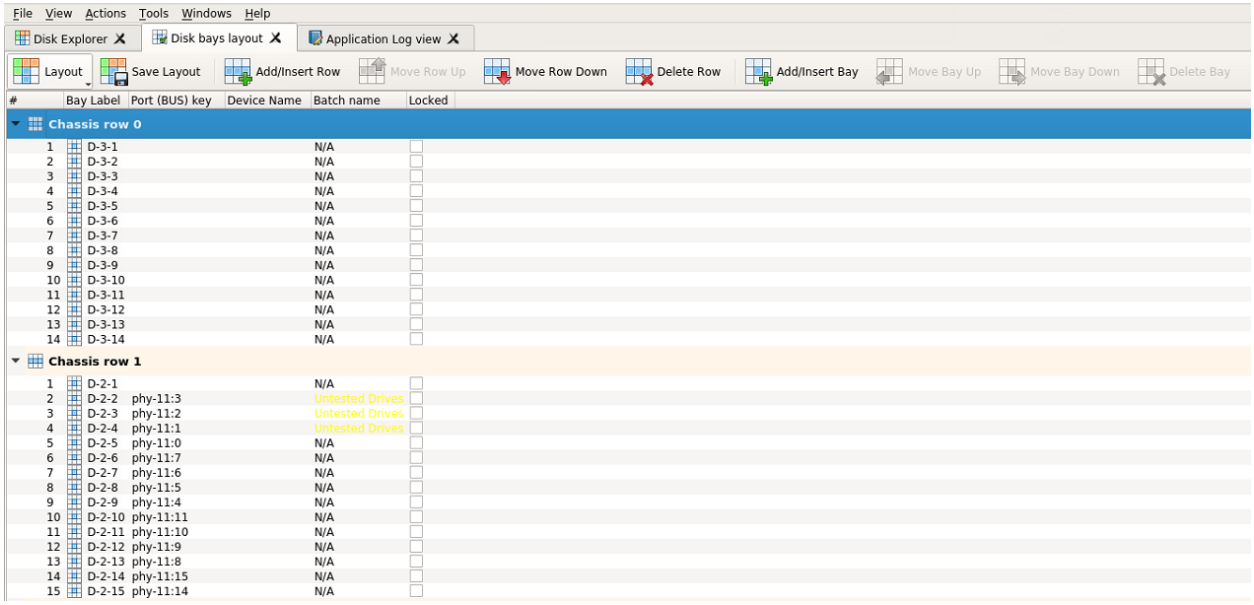


Figure 10: Opening the Disk Bays Layout tab

Here we are looking to create a new layout, so get rid of the current layout shown by clicking **Layout** > **New Layout Wizard** .

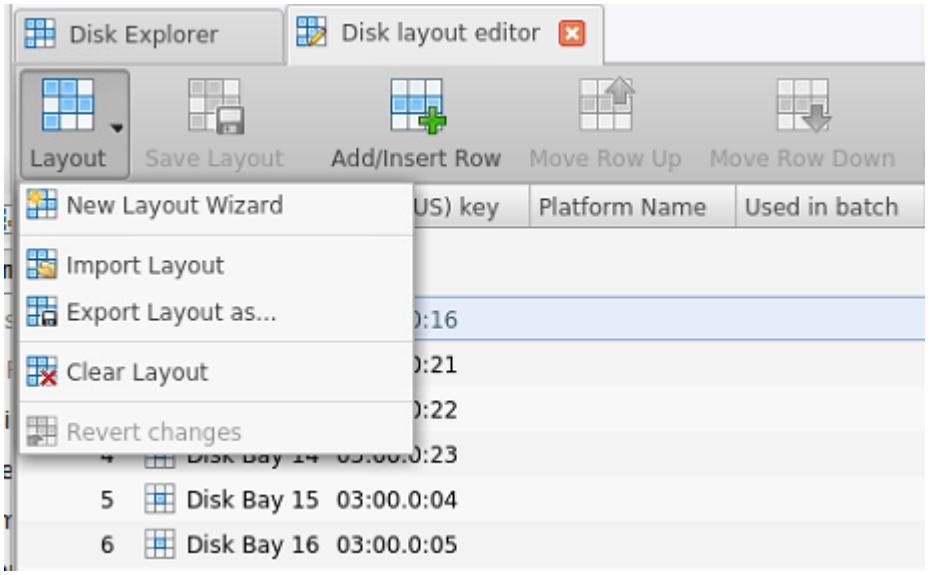


Figure 11: Creating a new layout

This will launch the **Disk Bay Layout Wizard**

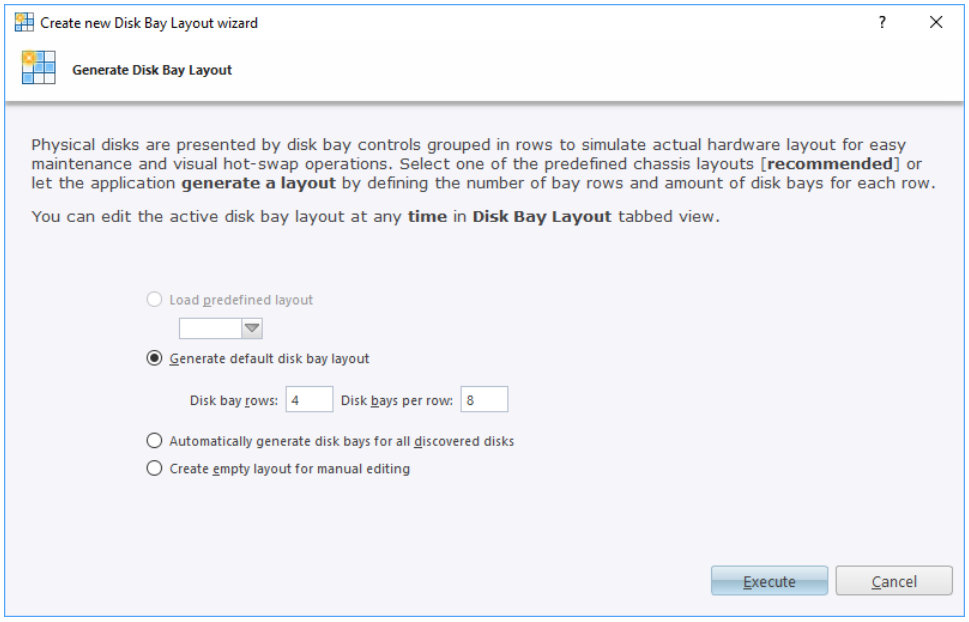


Figure 12: Disk Bay Layout Wizard

This configuration of a new layout can be done in one of three ways:

Load predefined layout

Here you can find one of our predefined layouts that may fit your system. If an appropriate layout is not listed, you may try the next option.

Generate default disk bay layout

Define your systems in terms of a disk array, arranged in a X by Y grid of disks. You may make adjustments to this later, so this may just be a base to start from.

Automatically generate disk bays for all discovered disks

Defines your Disk bay layout based on the disks recognized by your system's device manager. The disks will be placed in their own individual row when the layout is generated.

Create empty layout for manual editing

Defines a blank layout with no disks, so they can be added in the *Disk Bay Layout* window later.

Warning: Make sure to save the old layout by selecting **Layout** > **Save Layout** before creating the new layout, or your old layout WILL be lost.

With the old layout cleared out, you now have a new layout ready to be configured to your machine.

Adding and Deleting Rows and/or Bays

Disk bay layout consist of disk bays grouped by row to maximize mocking effect of an actual disk bay mounted in hardware unit. To design bay layout, simply use the **Add Row** or **Add Bay** buttons to create additional rows/bays to work with. When a bay is selected, the **Delete Bay** button can be used to delete the individual bay. When a row is selected, the **Delete Row** button will delete the row and all the bays contained within it.

Map disk bays to physical drives

In **Disk Layout Editor** you can map actual physical bay to its GUI representation (disk bay widgets) in two ways:

- Assign *platform name* to disk bay widget
- Assign *disk port* of physical disk controller to disk bay widget
- Assigh *bay* to a particular batch

Important: Due to different hard disk controller manufacture standards and platform limitations, physical disk port address format may vary.

Note: If both, platform name and disk port, are assigned to disk bay widget then platform name is used for disk bay mapping.

To make and assignment, double click in either **Platform Name** , **Port (BUS) key** or **Used in batch** column in correspondent disk bay line to initiate editing. Enter platform name as text or disk port as masked text. You can use drop down list of all detected physical disk controller ports for immediate port assignment.

You can also edit disk port in disk bay widget from *main view* by using context menu of disk bay widget.

Saving and Reverting changes

Use the **Save Layout** button to commit any changes to the layout to the application views.

Note: **Save Layout** will apply current change to the KillDisk session so the changes will be seen in the Disk Bays explorer views and even be loaded in upon future application launch. These changes will not affect the .dbl file, however, so be sure to commit any important changes using the ***Save Layout*** *command*.

Click **Layout > Revert Layout** to revert any changes you made to the layout.

Export and Import of Disk Bay Layouts

Once a disk bay layout is configured, it can be saved and later used with other KillDisk configurations. This is done with the **Export** and **Import** features.

Exporting a Disk Bay Layout

Layouts are saved using the disk bay layout command tool bar's commands. Select Layout, then **Export Layout as...** in the drop down list of commands. This will open a dialogue where the layout can be configured by setting the Title, description, file name and path to save the layout to. Once these settings are configured, click **Save** and the layout will be saved as a .dbl file in the specified location.

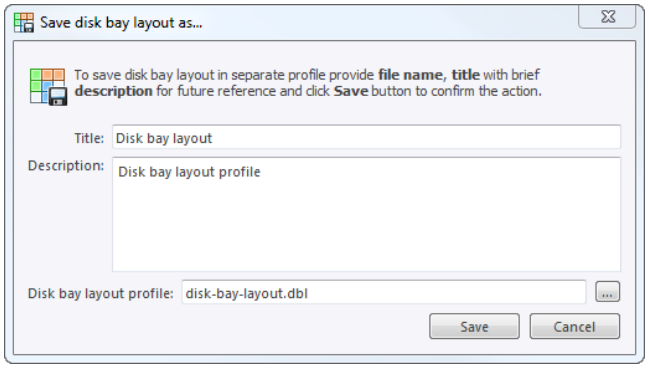


Figure 13: Export disk bay layout dialog

Title

Enter any label to distinguish newly created disk bay layout to differentiate it among other disk bay layouts.

Description

Describe any specifications, features or particularities of the new disk bay layout.

Layout profile name

Select the name of the file that the disk bay layout will be saved as. File extension should remain as **.dbl**.

Importing a Disk Bay Layout

Saved disk bay layouts are imported into separate KillDisk sessions using the import feature. In the command tool bar, select **Layout** and **Import Layout**. Select the desired disk bay layout (**.dbl** file) in the file explorer window and click **Open**.

This will import the disk bay layout into the current KillDisk session. Finally, click **Save layout** to update the disks in the **Disk Explorer** and the import should be complete.

Formatting Disk Bay Layout

Once a disk bay layout is created, there are a number of actions that can be performed to format or manipulate the layout and appearance of the disks in the KillDisk application.

Naming Disk Bays

To make disk bay widgets easier to navigate, they can be renamed by simply double-clicking on the existing bay label and typing in a new name, shown in the Figure below:

Figure 14: Renaming bays

Changing Row and Bay positioning

Configured bay widgets may be moved around to accommodate changes in physical configuration or fix mistakes in creating the layout. This is done quite simply by selecting the bay that needs to be moved, and clicking the **Move Bay Up** and **Move Bay Down** buttons. Similarly, bay rows can be manipulated by selecting the row in question and pressing the **Move Row Up** and **Move Row Down** buttons.

Adding more Rows and Bays

Click the **Add/Insert Row** or **Add/Insert Bay** toolbar buttons to add row or bay at current position.

Deleting Rows and Bays

Click the **Delete Row** or **Delete Bay** toolbar buttons to remove row or bay at current position.

Saving and Reverting changes

Use the **Save Layout** button to commit any changes to the layout to the application views.

Note: Save Layout will apply current change to the KillDisk session so the changes will be seen in the Disk Bays explorer views and even be loaded in upon future application launch. These changes will not affect the .dbl file, however, so be sure to commit any important changes using the ***Save Layout*** *command*.

Click **Layout > Revert Layout** to revert any changes you made to the layout.

Layouts Advanced Features

Once a disk bay layout is created, there are a number of actions that can be performed to format or manipulate the layout and appearance of the disks in the KillDisk application.

Locking Disks

In order to prevent accidental deletion of important disks, KillDisk supports locking of disks. Once a disk is locked, no write operations are allowed to be performed on the drive. To do this, simply find the disk that needs to be locked and execute **Lock** menu command from the **Edit** menu..

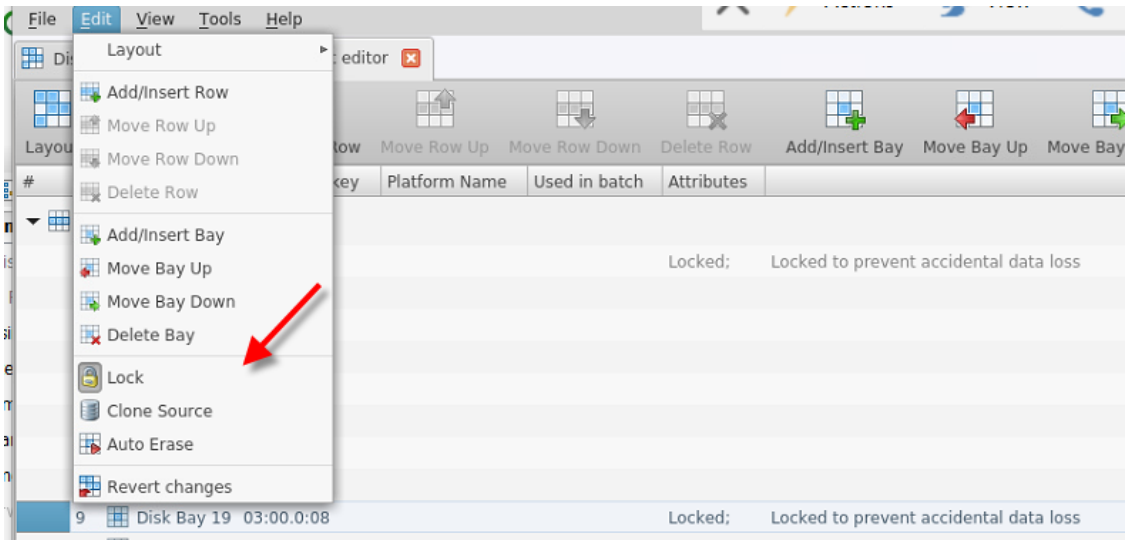


Figure 15: Locking a disk to prevent accidental destruction

Locking Clone Source

Disks that are planned to be used as master copy for *Disk Cloning* on page 34 could be marked in disk bay layout by selecting disk bay and clicking **Clone Source** from the **Edit** menu. Thus disks marked this way will be protected from accidental destruction and also will be available in list devices as source for disk cloning.

Auto Erase

Auto Erase feature designed to speed up disk wiping process in scenario when many disks must be erased with the same erase attributes with less user interaction. When disk is inserted in a bay marked as Auto Erase then disk erase procedure will start without any introduction or confirmation dialogs. However you will see 30 seconds countdown started on disk bay about to be erased and may cancel this action by selecting disk bay widget and clicking **Stop** button in view's toolbar or in context menu.

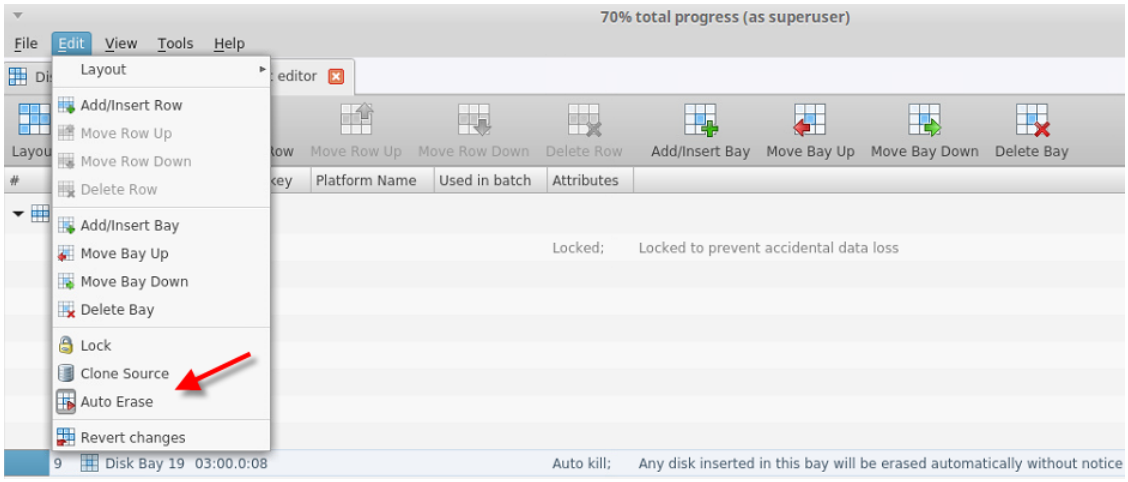


Figure 16: Enabling Auto Erase

Caution: Use this feature with extreme caution — be sure that inserted disk is intended to be erased and appeared in a right bay. You will have 30 seconds to abort disk erasure.

Saving and Reverting changes

Use the **Save Layout** button to commit any changes to the layout to the application views.

Note: **Save Layout** will apply current change to the KillDisk session so the changes will be seen in the Disk Bays explorer views and even be loaded in upon future application launch. These changes will not affect the .dbl file, however, so be sure to commit any important changes using the ***Save Layout*** *command*.

Click **Layout > Revert Layout** to revert any changes you made to the layout.

Disk Explorer

The **Disk Explorer** is the main interface for the KillDisk application. Here, disks are visualized, can be selected and manipulated. The status of any procedures performed on the disks can be seen here, new procedures like erasure can be initiated.

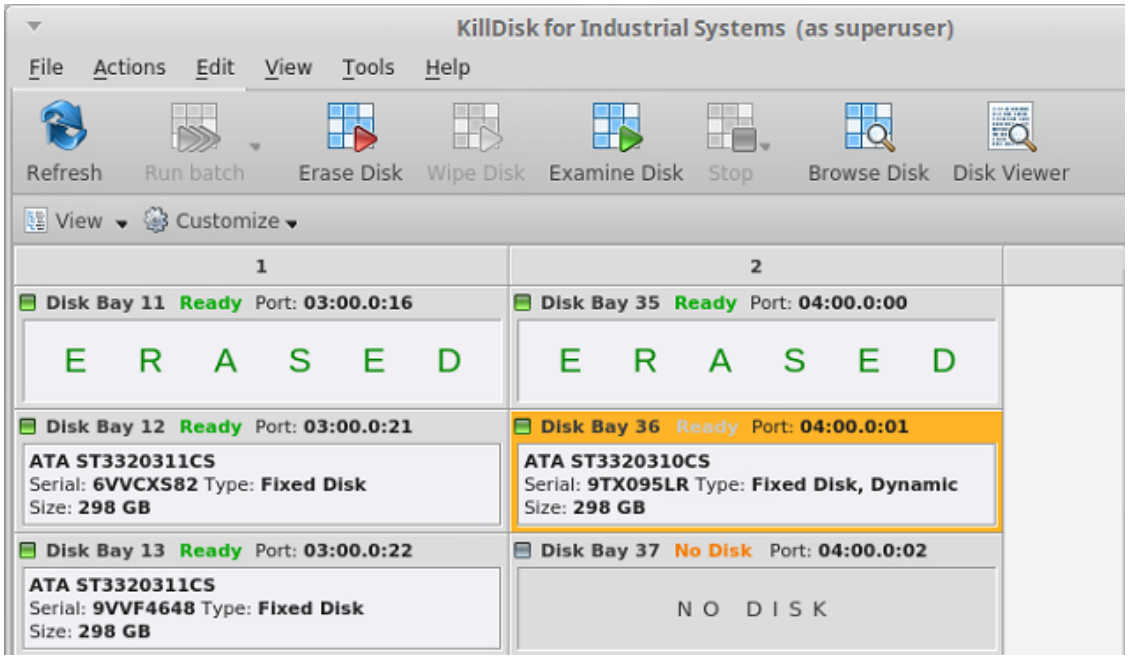


Figure 17: Disk Explorer

Supplementary toolbar helps to execute frequently performed tasks. It contains the following buttons with drop-down menus :

View

The disk explorer supports a range of different views to use when performing KillDisk's actions, each with their own customizable settings for different use cases.

Customize

These settings let you customize appearance for better experience for each view. Disk bay positioning and the type of information displayed, such as partition view, can be toggled here.

Disk Bays View

This view visually displays the disks configured in the **Disk Layout Editor**. The bays are grouped by their row, colored by the batch color, and show the current status of the disk. If any operations are being performed on the disk, the operation and progress are displayed.

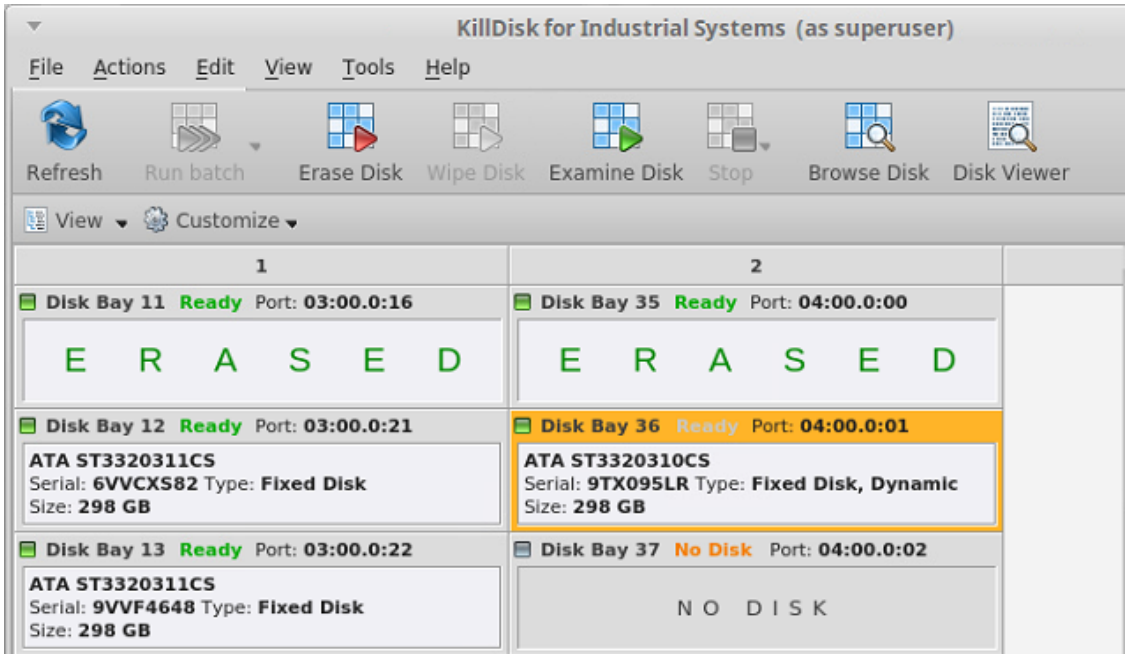


Figure 18: Disk Bays view

Customize menu

Show partitions

Show or hide additional layout for partitions and volumes.

Show removable devices

Show or hide additional layout row for removable devices.

Rows as Columns

This setting can be toggled on/off to display the rows (defined by the disk bay layout) as columns in the **Disk Bays** view.

Vertical Bays

This setting can also be toggled to change the orientation of the bays from horizontal to vertical and backward.

Show Disk Bays in Tree View

Switches **Disk Bays** view to tree view related to the one confifured in Disk Layout Editor.

Disk Layout Editor

Opens **Disk Layout Editor** in a separate tab for current layout customization or creating a new layout.

My Computer View

The **My Computer** view presents the disk bay layout in a standard list form, much like the disks would be shown in an explorer. Disk bays are grouped by row and can be colored according to their batch color. Information such as disk status, serial number, partitioning are shown in list form next to their respective disk bays. Properties window at the right side displays attributes of the currently selected object.

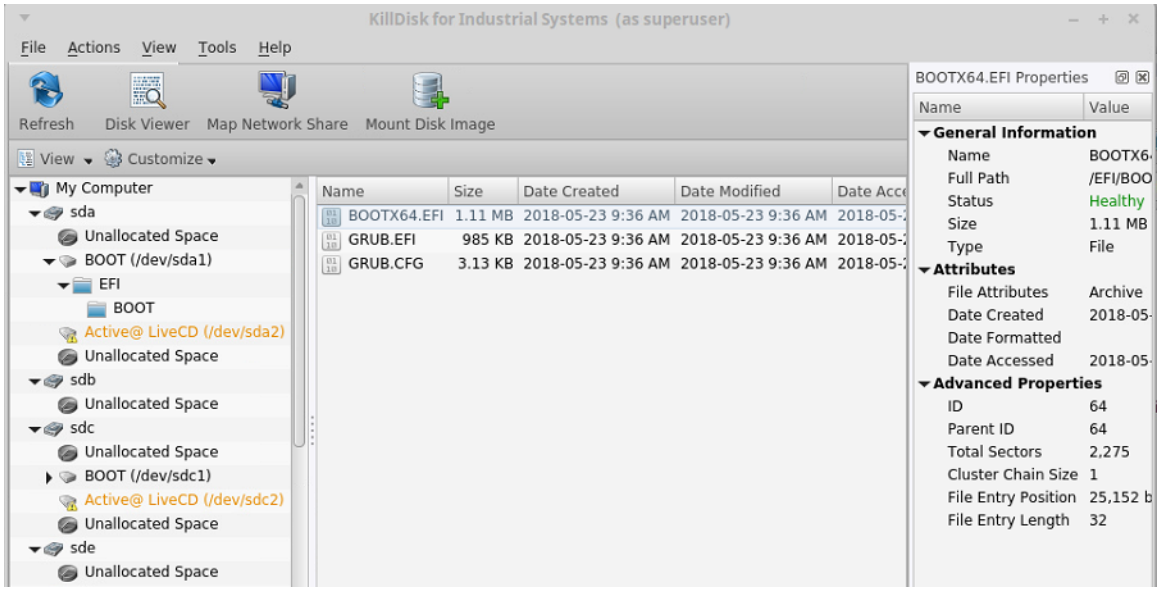


Figure 19: My Computer View

Customize menu

Show My Computer

Displays all devices that are detected by the system device manager.

Show System Disk

Displays the disk containing the Operating System. This is 'off' by default to prevent accidental erasure of the system.

Show Unallocated Partitions

Displays partitions that may not yet be formatted.

Show Devices

Switches between display of devices (physical disks containing volumes) and just volumes display.

Show Removable Disks

Displays removable media storage (USB Flash Disk, External USB,...).

Show Not Ready Devices

Displays devices that may not yet be initialized and accessible by the OS.

Navigator Pane

Toggle **Navigator Pane** (are on the left hand side of device view)

Local Devices View

Local Devices view shows all disks recognized by the system and available for application in a list view:

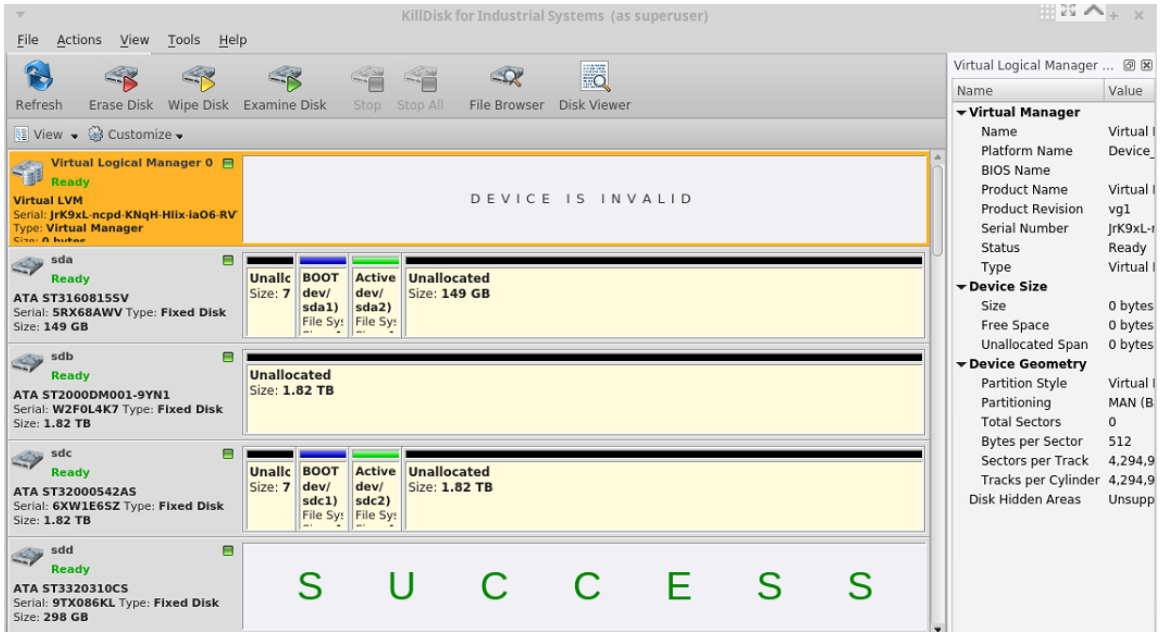


Figure 20: Local Devices View

Customize menu

Show System Devices

Displays the disk where Operating System installed.

Show Not Ready Devices

Displays devices not yet initialized and usable by the OS.

Show Removable Devices

Displays all removable disks, such as USB's and externally connected disks.

Compact View

Cleans up the disk view by hiding all partition information and only displaying key points of information about the disks.

Using KillDisk

`KillDisk Industrial` is a powerful industrial tool to provide disk erasure solutions for large workstations with many disks. The features in the KillDisk Industrial software are built with this goal in mind. This section outlines the key features of KillDisk and how they are used to erase single disks to large batches. Much of the software is highly customizable and this guide will help get you started with configuring KillDisk for your particular system, and using KillDisk to its' full potential.

Note:

It is important to properly set up your KillDisk layout before using any of the features, so read and follow the steps to do this in the *Disk Layout Editor* section, if you have not already.

Disk Erase

`KillDisk` is an extremely powerful tool for secure disk erasure. Individual disks or batches of disks can be erased to any desired standard with just a few clicks. The process to achieve this is outlined in this section.

1. Select a disks for erasure

   Use *Disk Explorer* on page 23 to select disk bays.

2. Open **Erase disks dialog** dialog using one of the following methods:

   - Click the **Erase** command in the action toolbar
   - Click **Actions** > **Erase Disk** command from main menu
   - Click **Erase Disk** command from context menu
   - Click **Run Batch** > **Named batch** command from toolbar or from **Actions** main menu to erase disks in predefined disk batch.

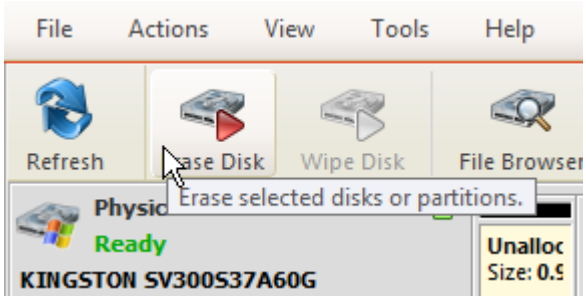


Figure 21: Initiating the Erase operation

3. Confirm erasure options

   Disk Erase options dialog pops up:

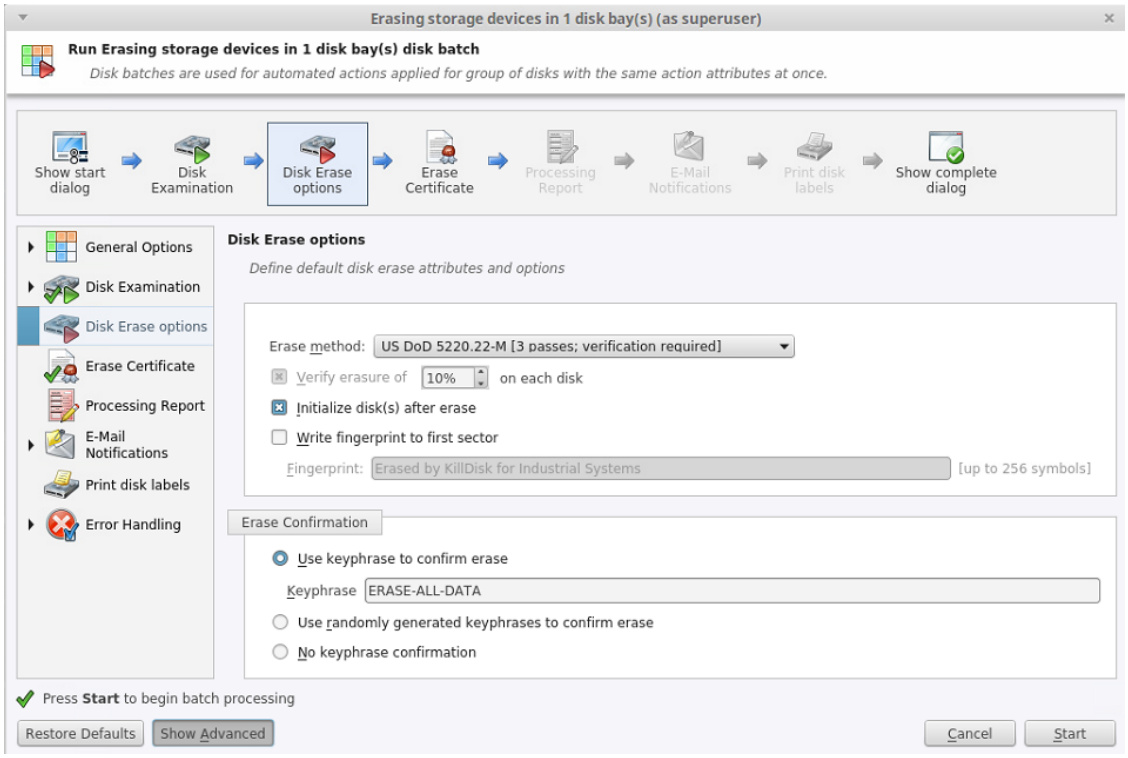


Figure 22: Disk Erase Options

Use tabbed views to adjust disk erasure options if necessary. Available options:

- *Disk Examination Options* on page 54 [optional in Industrial & Desktop only]
- *Disk Erase Options* on page 52
- *Certificate Options* on page 56
- *Report Options* on page 58
- *Email Notification Options* on page 65
- *Labels Options* on page 60
- *Error Handling Options* on page 63

Use *Disk Examination Options* on page 54 page in application preferences to specify disk grading attributes if necessary.

If single disk is selected for the **Erase Disk** command, disk area to be erase can be specified:

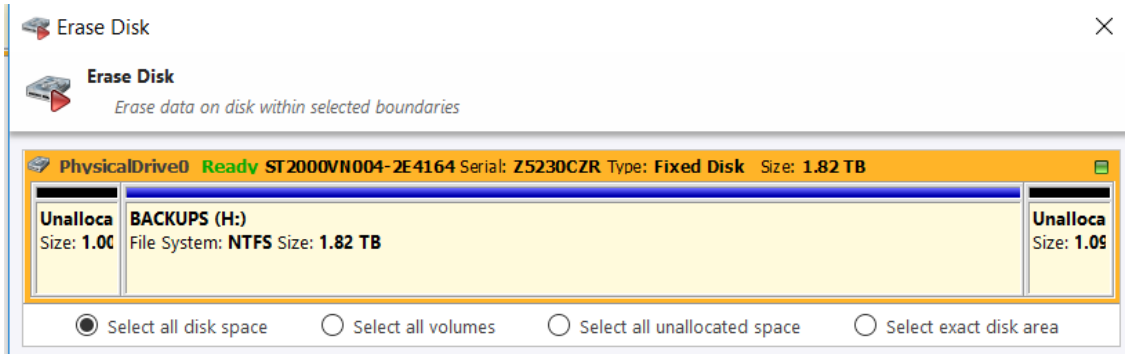


Figure 23: Erase Disk - Area Selection

Select all disk space

Entire surface of the disk will be erased

Select all volumes

Select for erase the only disk's space where live volumes located

Select all unallocated space

Select for erase the only disk's unallocated area, the space where no live volumes exist

Select exact disk area

Allows you to use the sliders on the visualization of your disk to select a particular range of sectors for erasure.

You may also click on individual partitions and the selected individual partitions will be erased.

Click **Start** button to go to the final confirmation dialog:

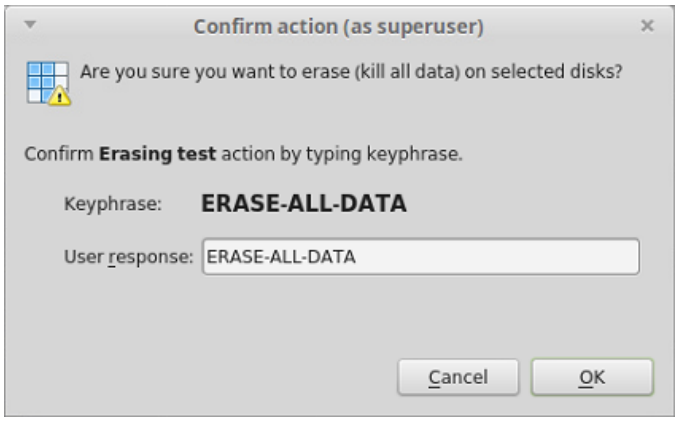


Figure 24: Disk Erase Confirmation

Click **OK** button to begin disk erase process.

4. Observe erase process

If *Disk Examination Options* on page 54 was selected then disk examination will started first. Depending on examination outcome at second stage - disk erase begins.

Once the Erase procedure begins, you will see the disk bay represented as a progress bar and it will show the erase method and progress of that disk operation. The progress bar represents the percentage of data left to erase on the drive, with the corresponding percentage shown. As the procedure progresses, the percentage will decrease, and the red bar will get smaller.

The remaining time will also be seen and progress in the operation will be displayed, as shown below:

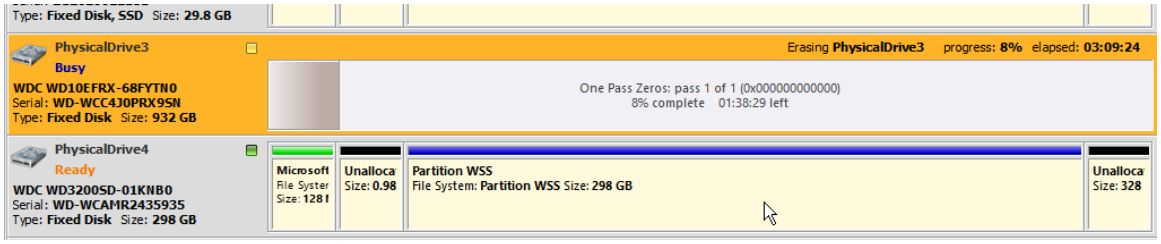


Figure 25: Disk Erase Progress

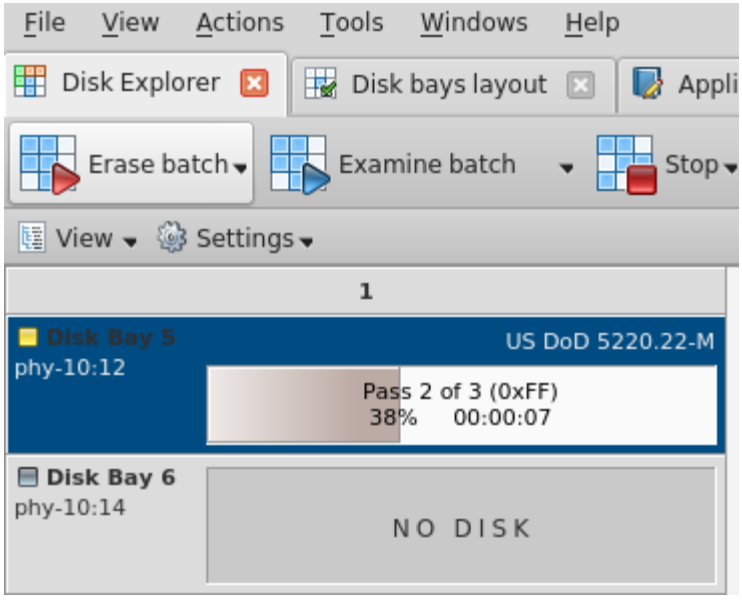


Figure 26: Disk Erasure in the Disk Bays View

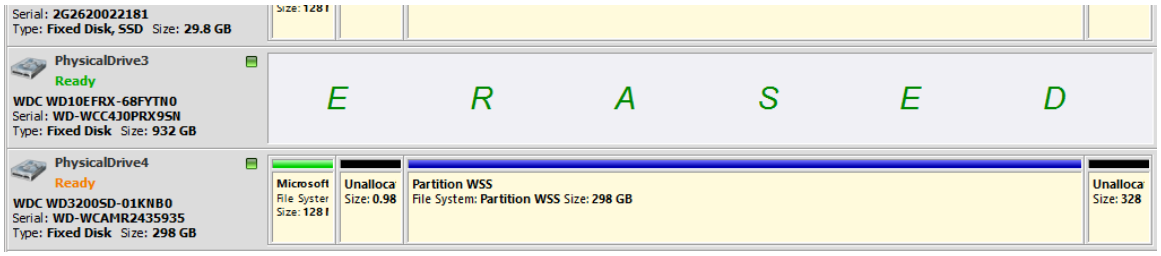


Figure 27: Disk Erase Completed

If *Disk Clone Options* on page 56 was selected then after erase the final stage of this task begins - clone data from source to all successfully erased disks.

When erasing completes you can review results and print an *Erase Certificates* on page 37 and *Erase Labels* on page 40 for processed disks.

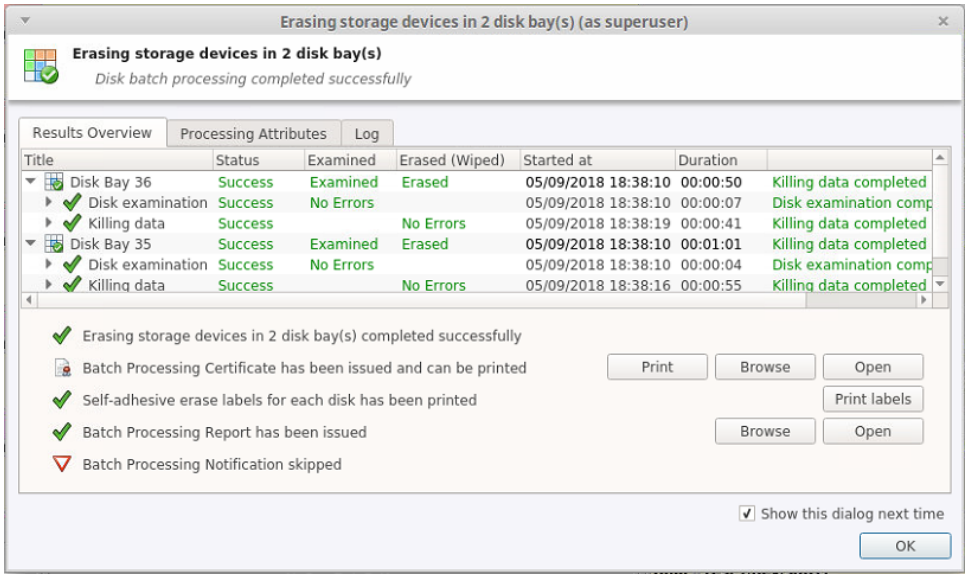


Figure 28: Disk Erase Summary

Disk Wipe

When you select a physical device, the **Wipe** command processes all logical drives consecutively, erasing the only data in unoccupied areas (free clusters and system areas), leaving existing data intact. *Unallocated space* (where no partition exists) has been erased as well.

Note: If you want to erase all data (existing and deleted) from the hard drive device permanently, see *Disk Erase* on page 27.

If KillDisk detects that a partition has been damaged or that it is not safe to proceed, KillDisk does not wipe data in that area. The reason it does not proceed is that a damaged partition might contain important data.

There are some cases where partitions on a device cannot be wiped. Some examples are an unknown or unsupported file system, a system volume, or an application start up drive. In these cases the **Wipe** button is disabled. If you select a device and the **Wipe** button is disabled, select individual partitions (drives) and wipe them separately.

1. Switch to **Local Devices** view
2. Select the device or a volume to wipe in the disk explorer view. You may select multiple devices/volumes to be wiped out simultaneously
3. Click the **Wipe** toolbar button to wipe out all data in unoccupied sectors on the disk or one of its' partitions. Alternatively you can execute **Wipe** command from **Actions** menu, or use the context menu

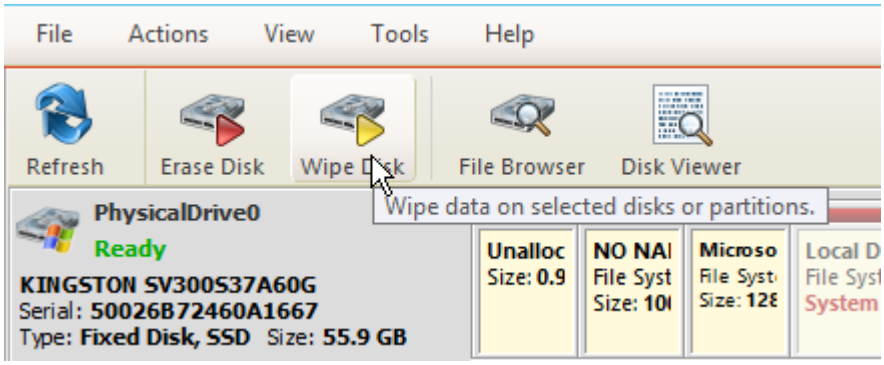


Figure 29: Initiating the Wipe operation

4. Confirm Wipe options

   Use tabbed views to adjust disk wipe options if necessary. Available options:

   - *Examine Disk Physical Integrity* on page 32
   - *Disk Wipe Options* on page 53
   - *Certificate Options* on page 56
   - *Email Notification Options* on page 65
   - *Labels Options* on page 60
   - *Error Handling Options* on page 63
   - *Report Options* on page 58

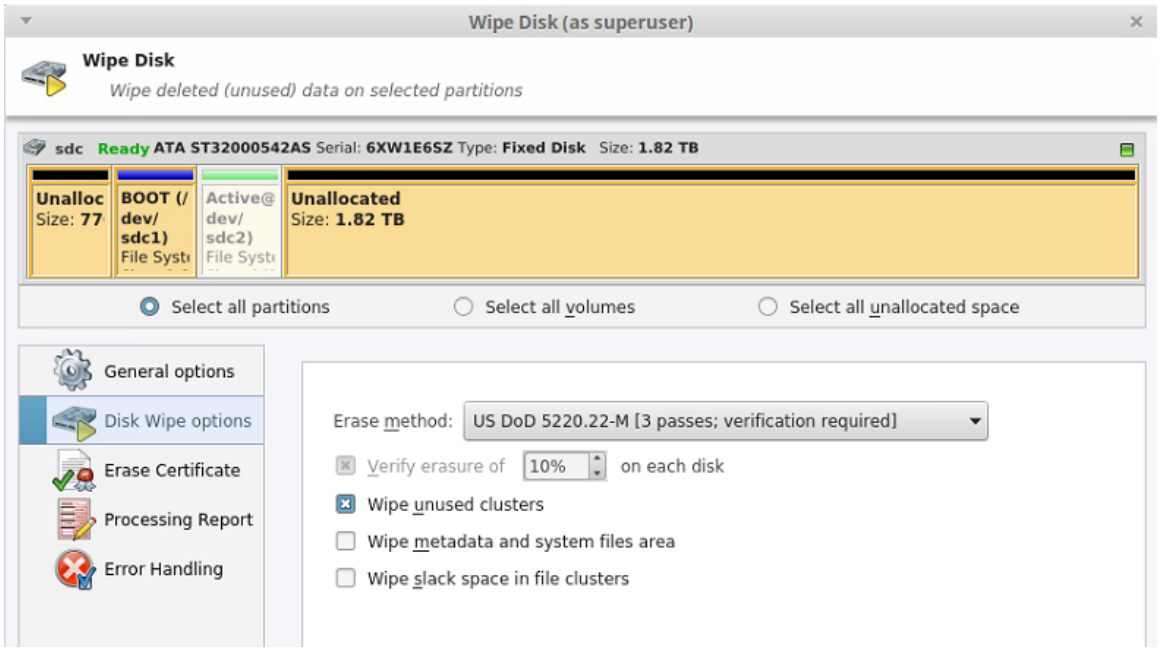


Figure 30: Selecting an an erase algorithm for the wipe

5. Select the areas of the disks to be wiped. With individual disks you may select individual partitions.
6. Click **Start** to advance to the final step before erasing data. The progress of the wiping procedure will be monitored in the Disk Wiping screen.

   To stop the process for any reason, click the stop button for a particular disk. Click the stop all button to cancel wiping for all selected disks. Note that all existing applications and data will not be touched. Data that has been wiped from unoccupied sectors is not recoverable.
7. Optional: Select the wiped partition click **File Browser** toolbar button to inspect the work that has been done.

   KillDisk scans the system records or the root records of the partition. The **Browser** tab appears. Existing file names and folder names appear with a multi-colored icon and deleted file names and folder names appear with a gray-colored icon. If the wiping process completed correctly, the data residue in these deleted file clusters and the place these files hold in the directory records or system records has been removed. You should not see any grey-colored file names or folder names in the wiped partition.

You will see a confirmation dialog when the process is complete, where you may and print an *Erase Certificates* on page 37

Note: If there are any errors, for example due to bad clusters, they will be reported on the Interactive screen and in the Log. If such a message appears, you may cancel the operation or continue wiping data.

Examine Disk Physical Integrity

The disk examination feature is designed to scan the physical integrity of the disks selected for this operation. `Disk Examine` step can be the preliminary step to `Disk Erase`, `Disk Wipe` and `Disk Clone` procedures.

To examine disks:

1. Select disks or volumes for examination

   Use *Disk Explorer* on page 23 to select one or more physical disks or logical volumes.
2. Open **Examine Disk** configuration dialog using one of the following:

   - Click the **Examine Disk** command in the action toolbar
   - Click **Actions** > **Examine Disk** command from main menu

- Click **Examine Disk** command from context menu
- Click **Run Bach** > **Named batch** command from toolbar or from **Actions** main menu to examine disks in predefined disk batch.

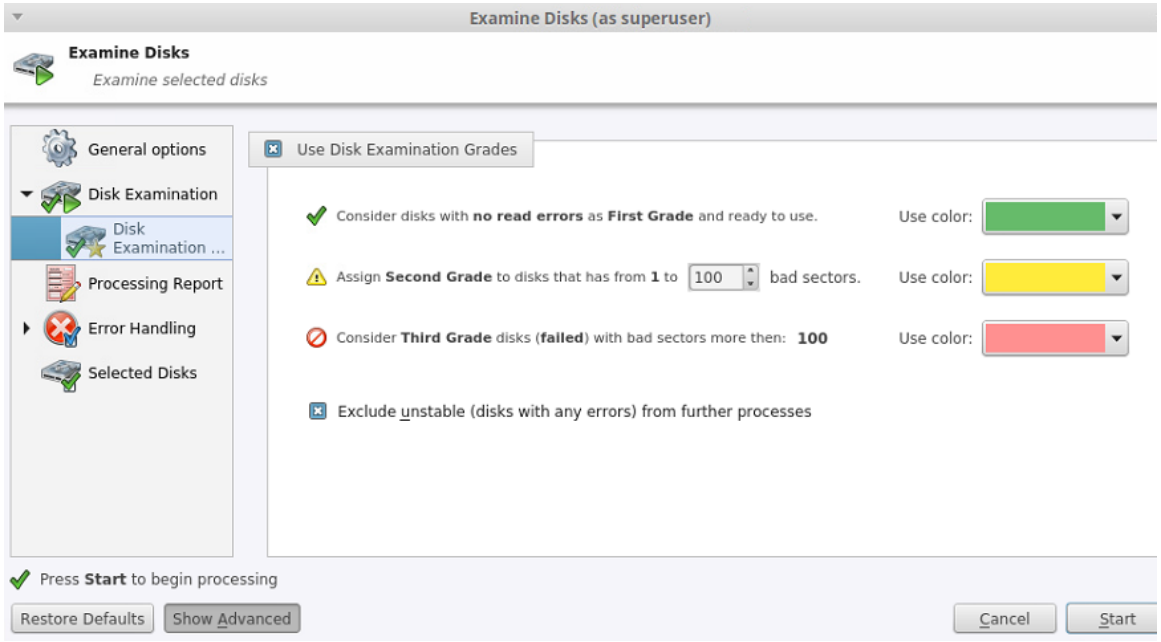


Figure 31: Examine Disk Options

3. Confirm examination options

   Use tabbed views to adjust examination options if necessary. Available options:

   - *Disk Examination Options* on page 54
   - *Error Handling Options* on page 63
   - *Report Options* on page 58

   Use *Disk Examination Options* on page 54 in application preferences to specify disk grading attributes if necessary.

   Note:

   If only one disk was selected for examination than you can specify boundaries of examined area for selected disk.

   Click **Start** button to begin examination process.

4. Observe examination process

   In the *Disk Explorer* on page 23, you will see the progress of the examination in the slot of the drive being operated on. The progress will be shown as a progress bar, seen below:

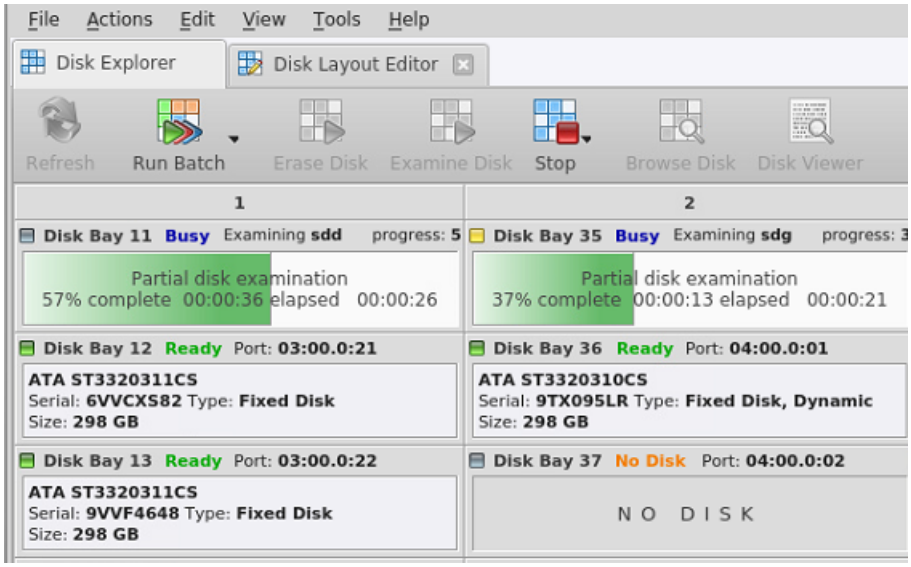


Figure 32: Disk examination progress

As seen in the image above, the green progress bar will fill the virtual drive slot in the KillDisk application. The percentage of the examination completed and the estimated completion time will also be shown in the slot. Once this process completes, the word **E X A M I N E D** will flash in the slot space.

When erasing completes you can review results for the processed disks.

Disk Cloning

In addition to securely erasing hard drives, KillDisk also allows you to write an image or copy a Master Disk to newly erased hard drives with its' cloning feature.

To clone a disk or image to a disk after the erase procedure is completed, navigate to the **Disk Clone** tab when you edit existing or create a new **Batch**, and check the **Use Disk Clone** box, as shown below.

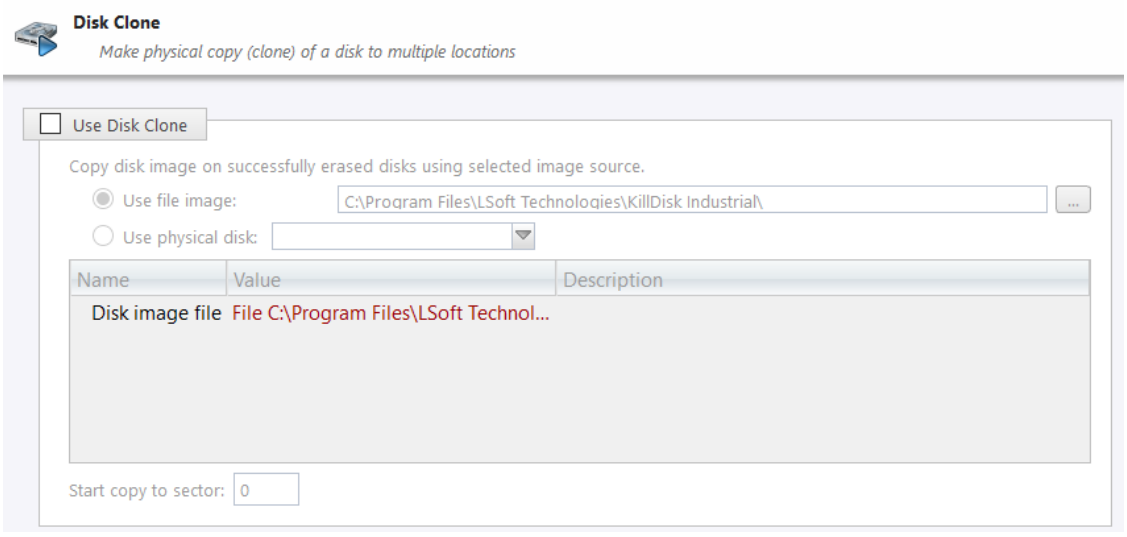


Figure 33: Disk Clone

An existing disk image, or physical hard drive can be used as the **Master Copy** to be cloned to the newly erased drive. For additional preferences and configuration see *Disk Clone Options* on page 55.

To configure a source image/disk for **Disk Clone** operation:

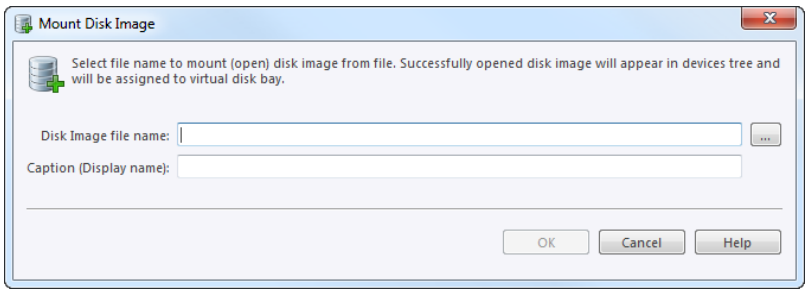
1. Navigate to the Disk Clone tab in the Batch settings, and check the Use Disk Clone checkbox
2. Select the disk image source from either image file or physical disk.
3. Specify which sector to start the copy to. If unsure, leave as '0'.

Disk cloning is now configured so that when an Erase operation has completed, the source image/disk will be cloned to the newly erased drive.

Mount Disk Image

To use file as a source of write a physical copy of file contents to one or several disks

1. To open the Mount Disk Image dialog, do one of the following:



File name

Full path to the disk image file

Caption

Enter any label to distinguish newly opened (mounted) disk image among other devices and disks.

Figure 34: Mount Disk Image dialog

2. Confirm and open disk image

   Click **OK** to mount a Disk Image.

If disk image opens successfully then disk image node appears in **Disk Explorer** view and will be available as clone source in *Disk Clone Options* on page 55 tab and in drop-down list of clone sources in task dialog.

Processing Summary

Once `KillDisk`'s finishes processing any task, such as disk erasure or disk examination, a task complete dialog will appear with a summary of the task, containing all of the information pertaining to the operation. For example, this includes information like disks operated on, status of erasure and all associated certificates and reports.

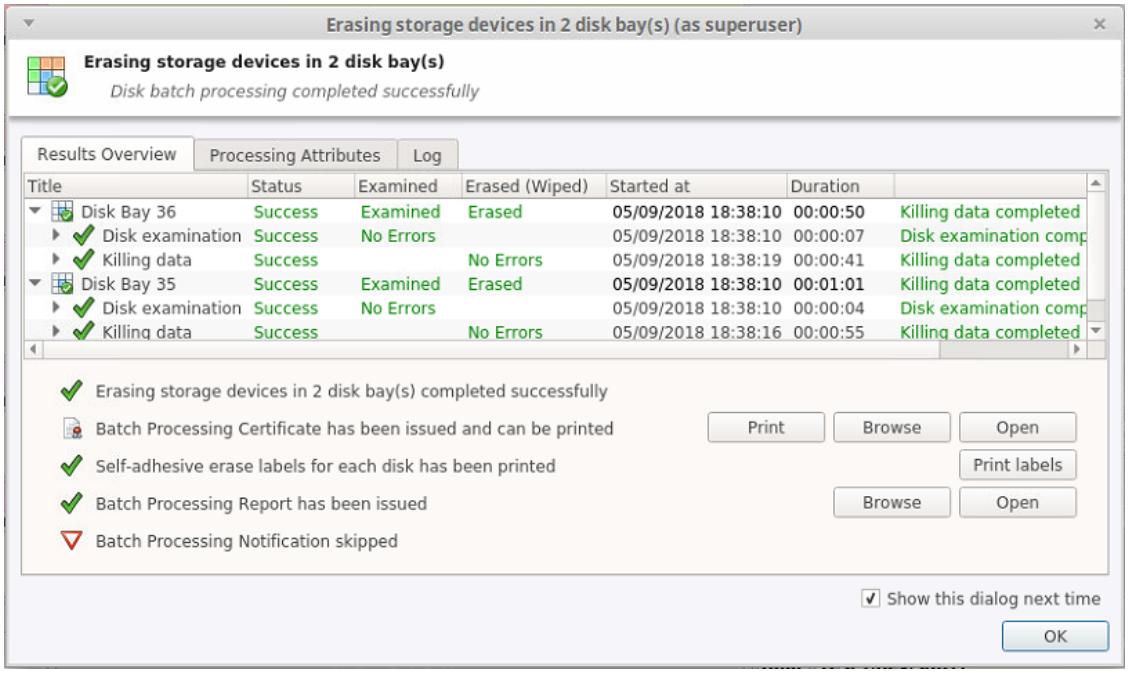


Figure 35: Example of task complete dialog after disk erasure

The successful erasure window contains the features of the successful erasure, discussed further in this section.

Devices

All devices erased are displayed with their erasure status in list format at the top of the notification.

Disk Examination Status

Specifications of the examination procedure are listed and the status of the examination is reported.

Disk Examination Report

Verifies that the examination report has been saved and specifies the path to the saved report. Allows user to examine the .xml examination report by pressing the **Browse** button.

Disk Grade Assignment Status

Confirms the inclusion of the disk grade assignment operation, based on disk integrity examination results.

Erasure Status

Details the status of the disk erase operation showing the erasure specifications and status with which the erasure was completed.

Disk Erasure Certificate

Verifies that the erasure PDF certificate has been saved and specifies the path to the saved report. Allows user to examine the certificate by pressing the **Open** button.

Disk Erasure Report

Verifies that the erasure report has been saved and specifies the path to the saved report. Allows user to examine the .xml erasure report by pressing the **Browse** button.

Note: The Wipe operation will produce a similar processing summary for the disk wipe

Certificates, Labels and Reports

KillDisk maintains the highest standards in disk erasure, and with that, provides extensive documentation options for its' operations through *Reports* , *Labels* and *Certificates*. This section will discuss these features in length.

Erase Certificates

Overview

`KillDisk` provides PDF certificates of erasure upon the completion of data erase operations. These certificates may be customized to include company-specific information and notes specific to the particular procedure. Configuring these custom settings is outlined in the *Certificate Preferences* section of this guide. A sample of the certificate is shown below:

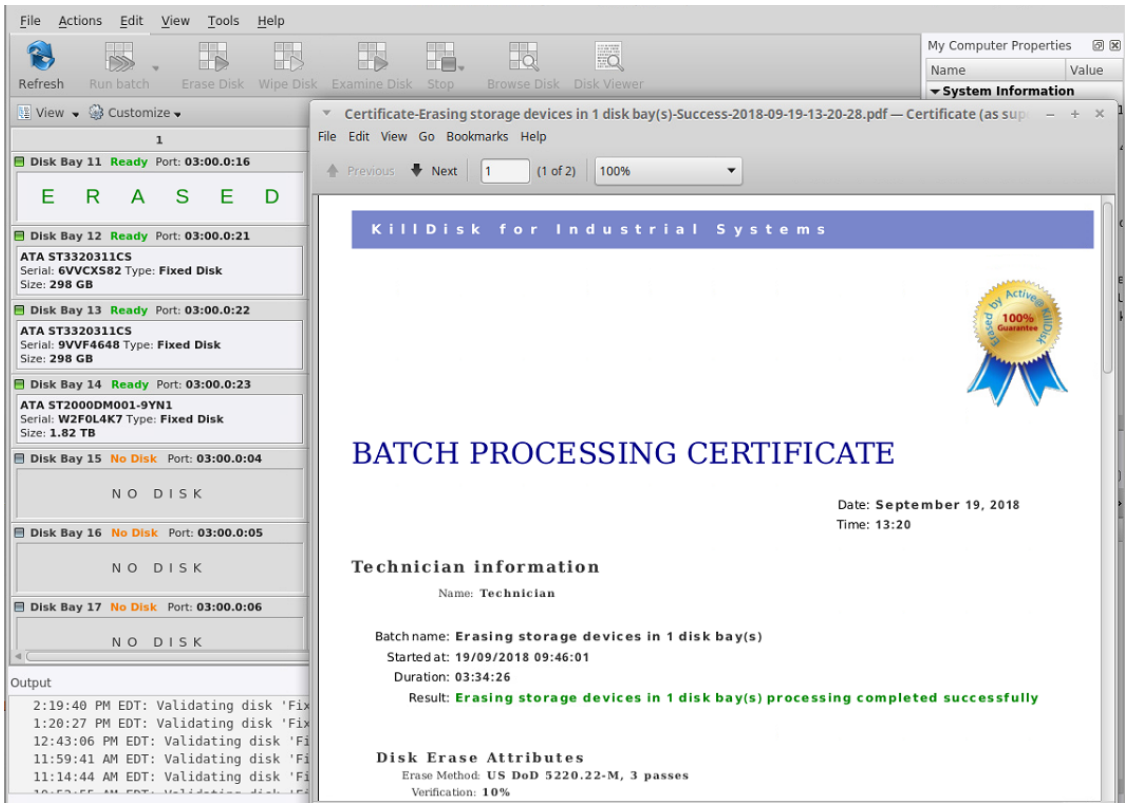


Figure 36: Disk Erase - Batch Certificate - First Page

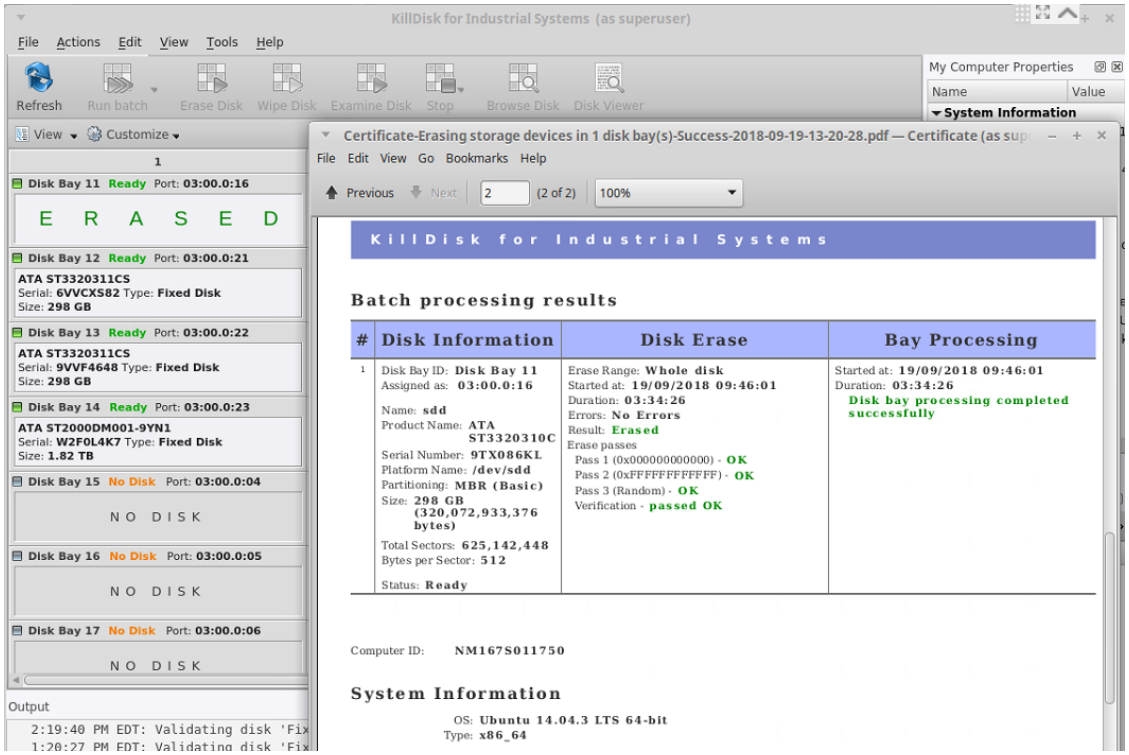


Figure 37: Disk Erase - Batch Certificate - Second Page

For group operations like **Batches** KillDisk can create both Batch Summary certificate as well as particular certificates for each disk in the Batch.

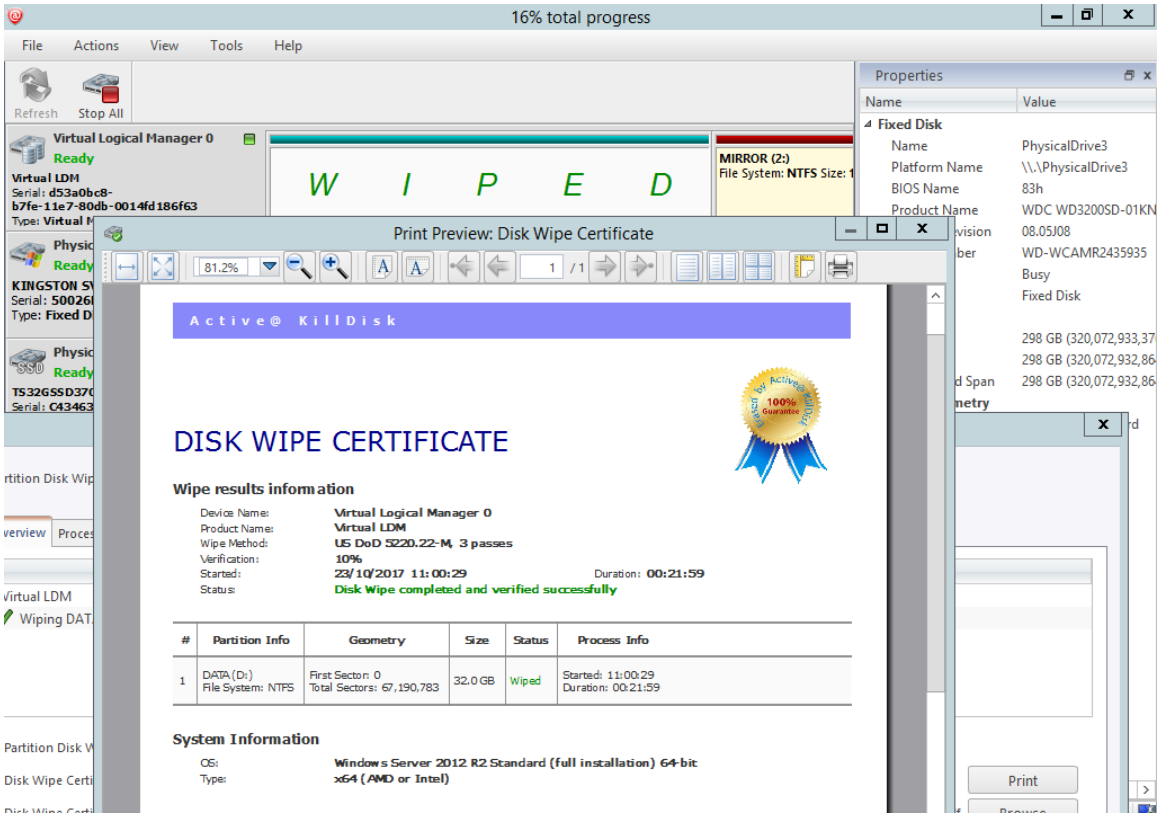


Figure 38: Disk Wipe Certificate

Certificate Elements

Company Logo

Custom company's logo can be placed to the certificate instead of the default KillDisk's logo at the top right corner

Company Information

Displays all company information provided in the preferences. The user in the above example only provided their business name, but other company information may also be included in the certificate

Technician Information

Displays the technician information provided in the preferences. Namely, this section is for the name of the operator and any notes they may want to include in the certificate report

Erasure Results Information

Displays information pertaining to the erasure procedure conducted on the hard drive(s). Type of erasure algorithm, custom settings, date and time started and duration of the erasure are all listed here

Disk

Uniquely identifies the disk that was operated on by the KillDisk application. Includes information like Name, Serial Number, Size and Partitioning Scheme

System Information

Provides details on the system used to run KillDisk, such as the Operating System and architecture.

Note: The system information here only applies to the system running `KillDisk`, not the system that was erased by the application! Provided `KillDisk` remains on one workstation, this information will stay consistent with all systems that the workstation erases.

Erase Reports

`KillDisk` gives you the option to save XML reports for any major operation it performs on a disk, such as **Examination**, **Erasure** and **Wipe**. These reports contain all the information pertaining to the `KillDisk` procedure. The contents of the report are outlined below.

Company Information

- Name
- License
- Location
- Phone
- Disclaimer

Technician Information

- Name
- Comments

System & Hardware Info

- OS version
- Architecture
- Kernel
- Processors
- Manufacturer

Erase Attributes

- Erase verify
- Passes
- Method
- Verification passes

Disks

- Device Size
- Device Type
- Serial Number
- Revision
- Product Number
- Name
- Geometric Information
- Partitioning Scheme

Batches

- Name
- Disks
- Time

Additional Attributes

- Fingerprint Information
- Initialization

Erase Result

- Bay
- Time and Date Started
- Disk Information

Error Handling Attributes • Errors terminate • Skip interval • Number of Retries • Source Lock • Ignore Write Errror • Ignore Read Error • Ignore Lock Error	• Status • Result • Time Elapsed • Errors • Name of operation

Erase Labels

Along with the PDF certificate, `KillDisk` allows you to print labels to place on erased disks with its Print Label features. These labels may be completely customizable to print on any sized sheet with any dimension. Simply specify the parameters and `KillDisk` will prepare the printable labels for you. The procedure is outlined in this section.

Accessing the Print Labels Option

Upon the completion of a major `KillDisk` operation, you will see a report dialog. In the list of completed tasks, you will see the **Print Labels** button, depicted below. Click it to enter the **Print Label Dialog**.

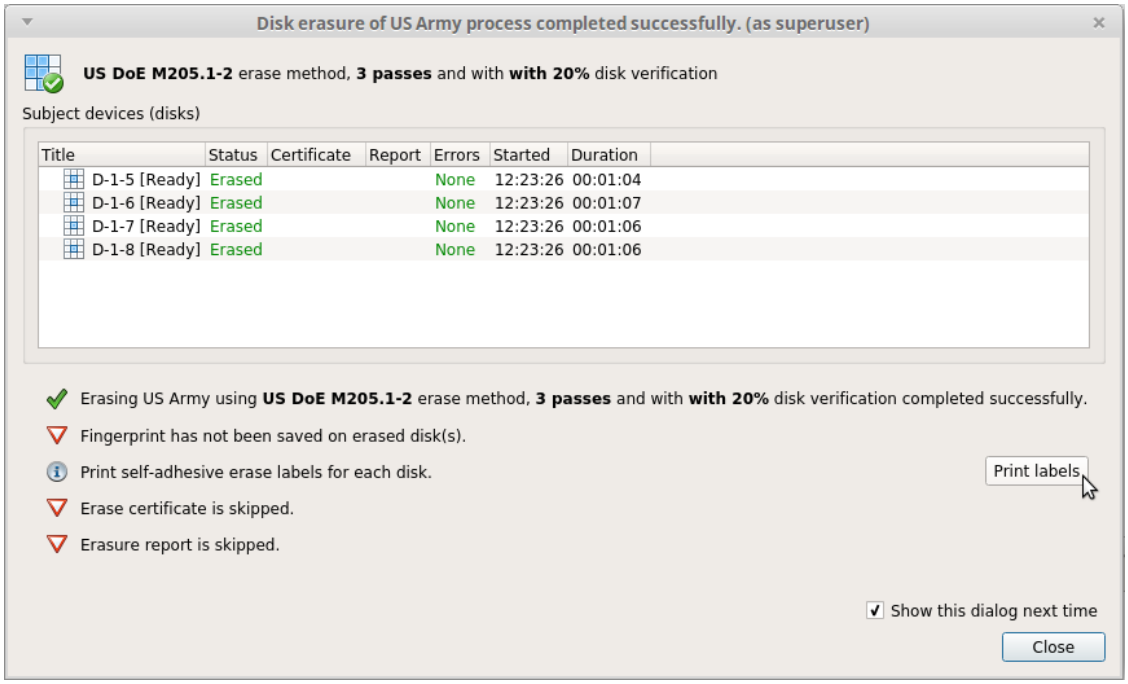


Figure 39: Opening Print Label Dialog

Print Label Dialog

This dialog will allow you to configure the labels and prepare them for printing. The top of the dialog will show you a list of the drives that will have labels generated for them. At any point in the operation, a sample of the label is shown in the **Label Preview** window on the left side. The right side of the dialog has the styling and template configuration options.

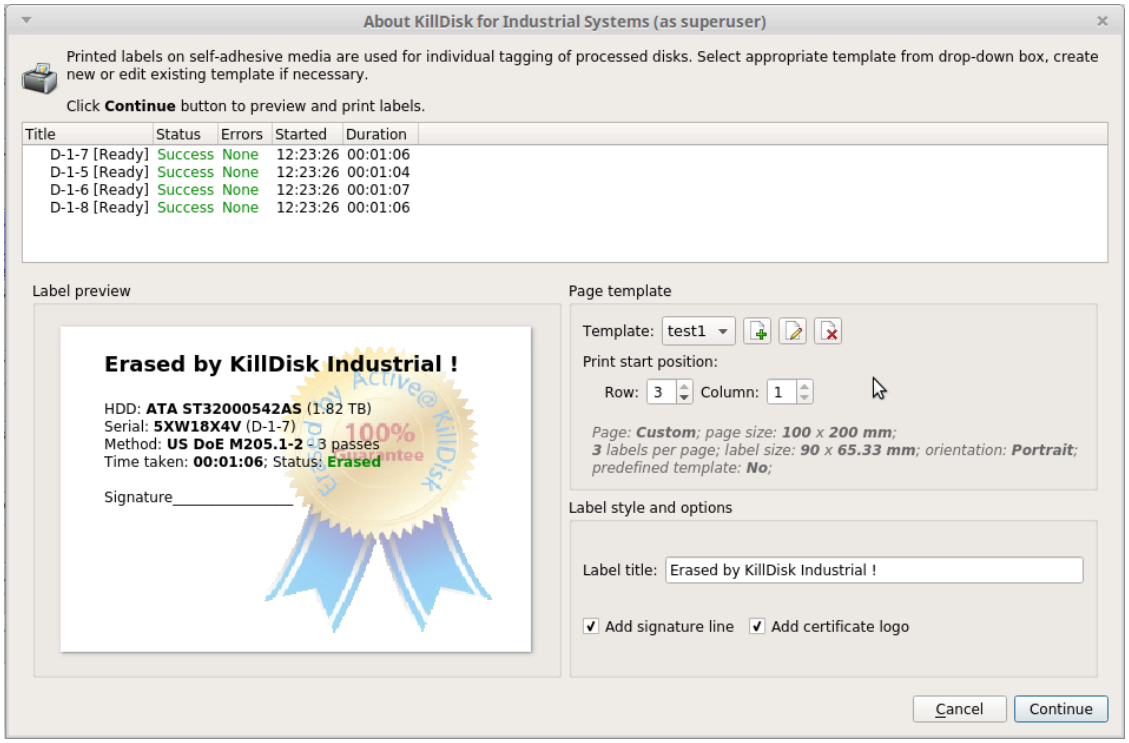


Figure 40: Print Label Dialog

Page template options

The print label dialog gives you access to a number of predefined standard templates and any custom templates you may create. These template may be easily selected without opening any additional dialogs and the details of the selected template will be displayed below the selection box. If your specific labels differ from any of the templates available, the  button allows you to create a custom template with your own specifications. Additionally, the  button allows you to modify an existing template and the  button deletes the selected template.

Creating a new template

Upon clicking the  button, the following template editor window will appear. Descriptions of the template editor options are listed below.

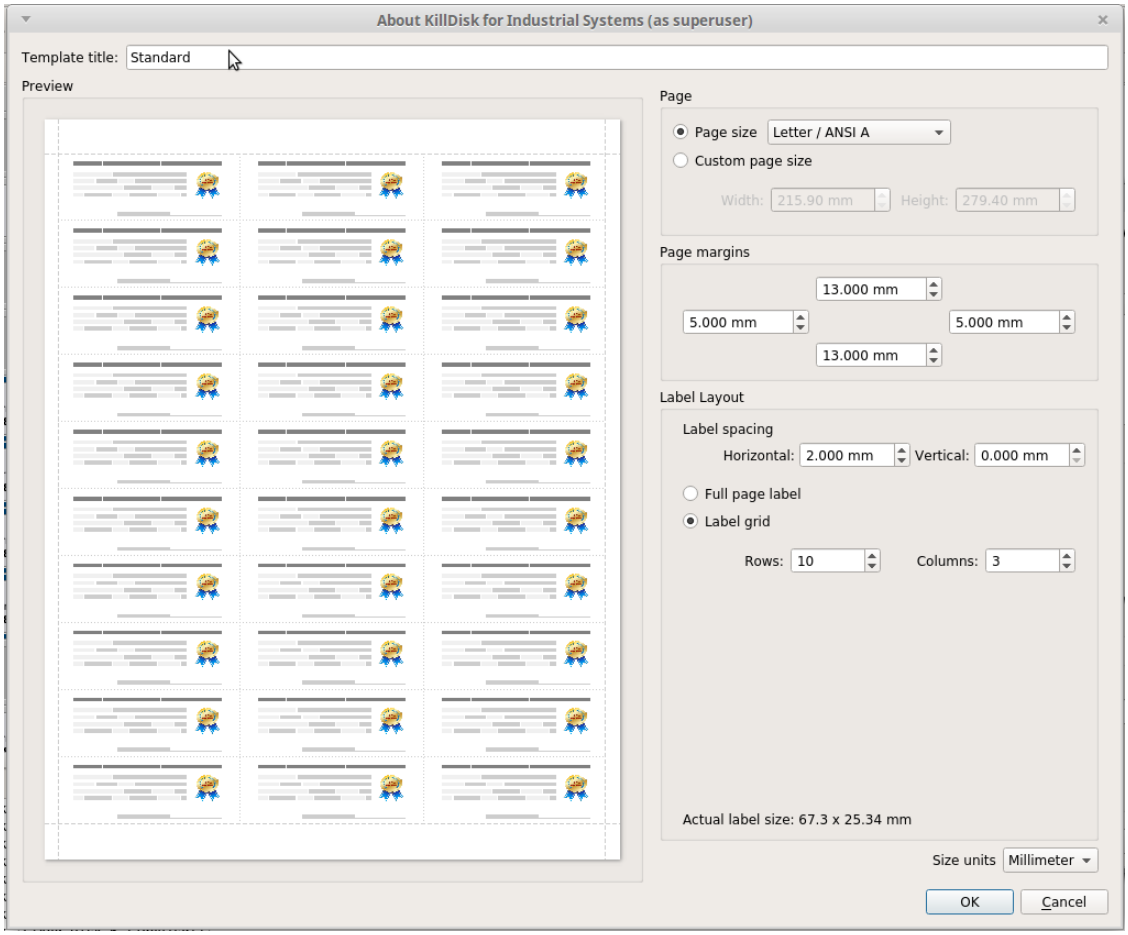


Figure 41: Template Editor

Template Title

Here you may create a custom title for your template. This is the name that will reference this template when selecting it in the **Print Label Dialog**

Page

Here you may specify the dimensions of the page used to print the labels. This may be selected from the list of standard sizes, or defined using exact measurements.

Page margins

Here, page margins are defined for the top, bottom, left and right sides of the page.

Label Layout

These settings define how the labels appear on the page. You may define the spacing in between labels on the page and the dimensions of the label grid. Once you've put in the proper measurements, KillDisk will take care of the formatting.

Unit size

The units of measurement may be manipulated between millimeters, inches, pixels and points. If a value in entered in one measurement and the unit size is changed, the appropriate conversion will take place.

Print Start Position

The print start position section of the dialogue allows you to select what label on the page the labels start printing from. As you use labels, the labels won't always start from the 1x1 position, so you can adjust this setting accordingly.

Label Style and options

These option allow you to change the styling on the labels with the following options:

Label Title

Allows you to set a title to be printed in bold at the top of the labels. This can be company name, batch name or any other descriptors you may consider useful to identify the operation

Add signature line

Toggling this on places a line at the bottom of the label for the technician to sign off on upon completion of the wipe

Add certificate logo

Includes the logo used in the certificate as a watermark background of the label.

Print Preview and Printing

Once all the settings are configured, you may see the print preview by clicking the `Continue` button. The preview displays what the print is going to look like and from here the print job can be sent to a printer that is configured with the system.

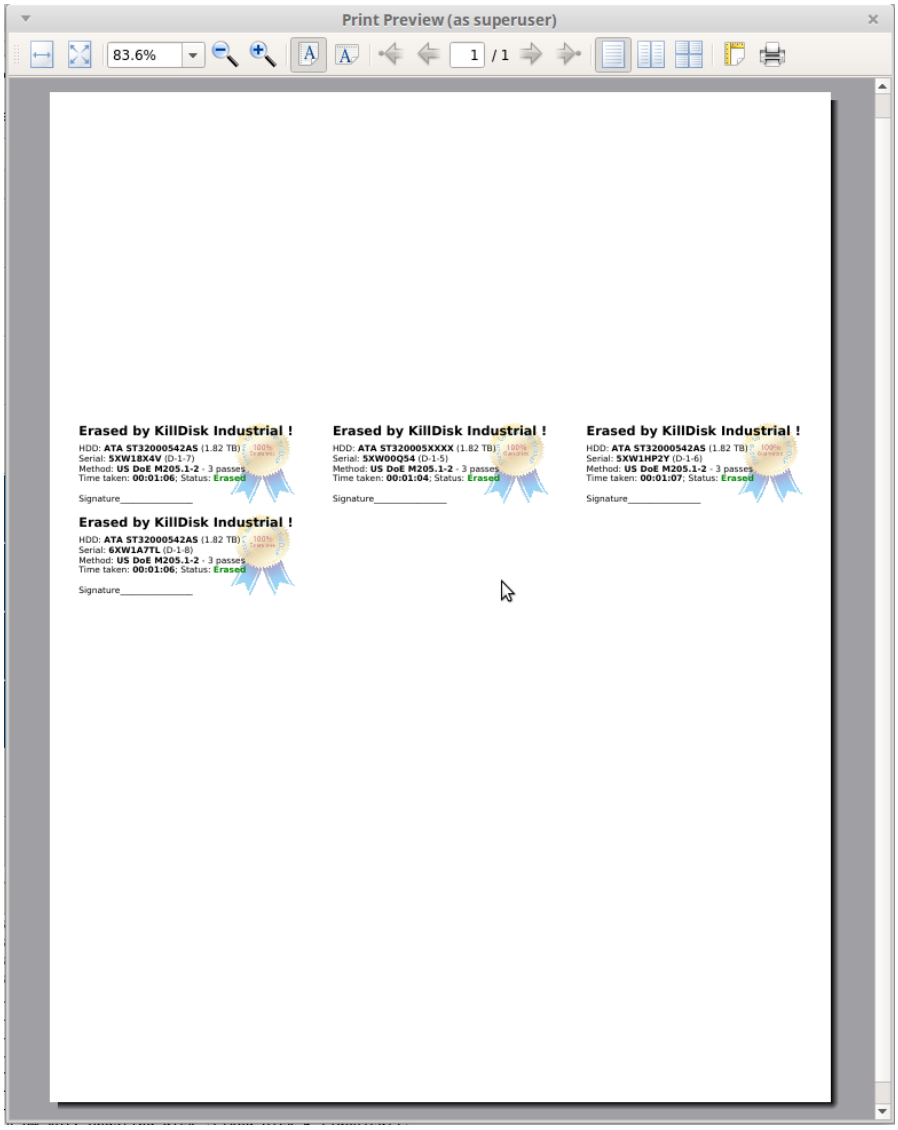


Figure 42: Example of a Print Preview

Additional Options and Features

`KillDisk` also has a number of supporting features to ensure the most complete sanitation operation, flexibility to meet the most stringent requirements and compatibility with a wide range of systems. This section outlines these features.

Mapping Network Shares

`Mapping Network Shares` is very useful, especially when booting from a boot disk and running the application in batch mode. It guarantees a specific drive letter to save logs and certificates to, as well as provides a central location for erase reports to be stored.

To map a network share:

1. In the menu bar, navigate to **File > Map Network Share...**
2. Configure your network drive and assign a letter to it, then press **OK**

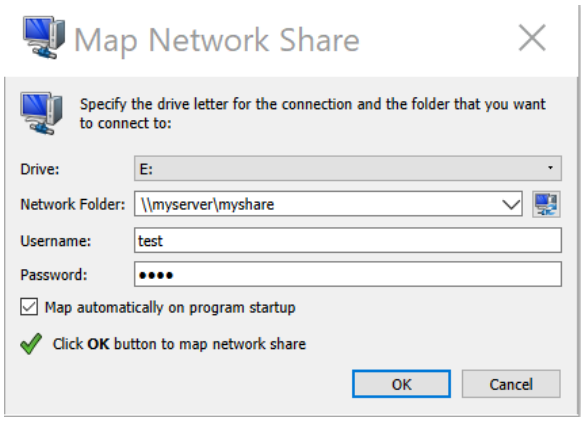


Figure 43: Mapping a network drive

Note: KillDisk will identify all connected network drives, so you may use the drop-down list to select the one you'd like to use

3. Now that your network drive is configured, you may select it as a destination for certificates and reports in the *Preferences*

Changing Disk Serial Number

In case you notice a disk serial number does not match the number on the disk, KillDisk supports several methods of detecting disk serial numbers, where it pulls it from various sources. To access this feature, right-click the disk in question and select **Set Serial Number..** in the context menu.

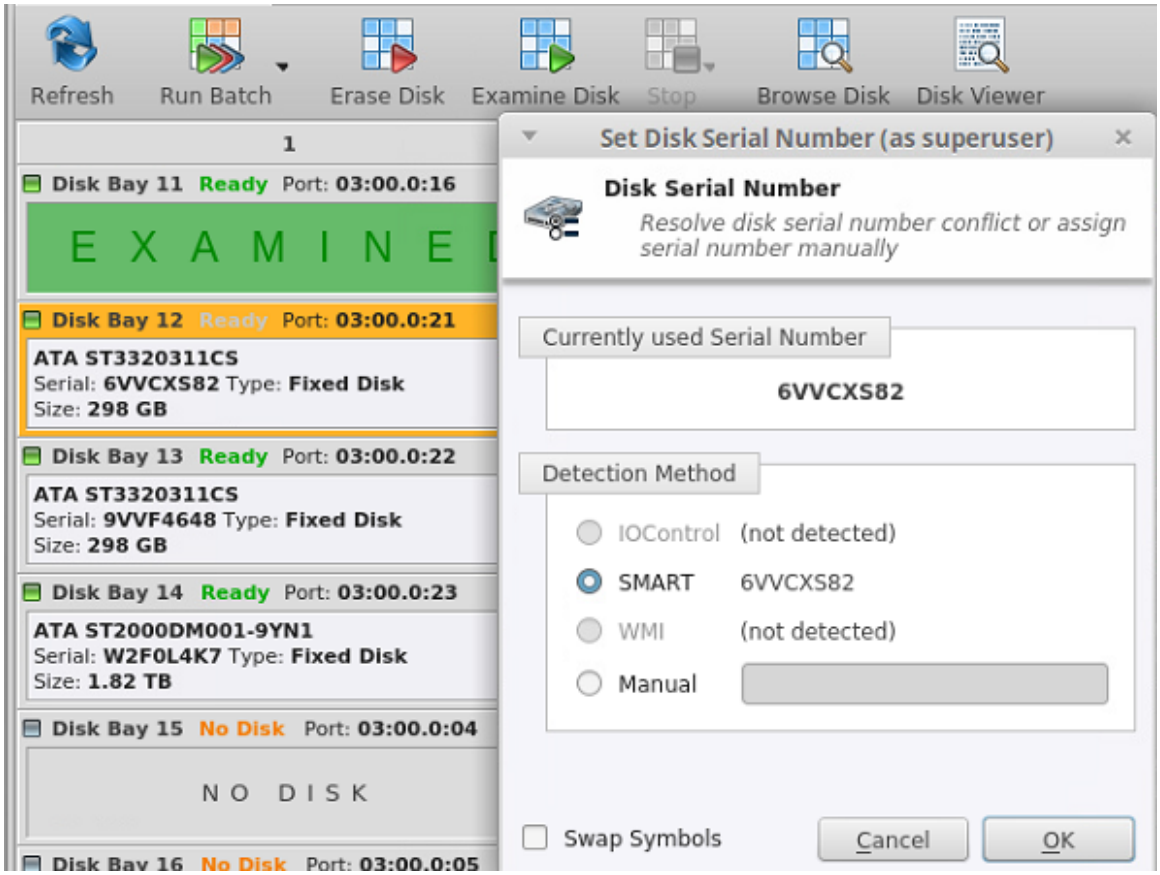


Figure 44: Setting the Disk Serial number

Note: If you don't see your serial number in any of the detection methods, try checking the **Swap Symbols** check box. If this doesn't help, input the serial number manually using the last option. The serial number you are looking for does not match the serial number stored by the disk (i.e. the sticker does not match the drive).

Reset Hidden Areas

KillDisk supports erasing hidden areas of the disk: **HPA** and **DCO**.

To perform this task on its' own, right click on the disk and select **Reset Hidden Areas...**

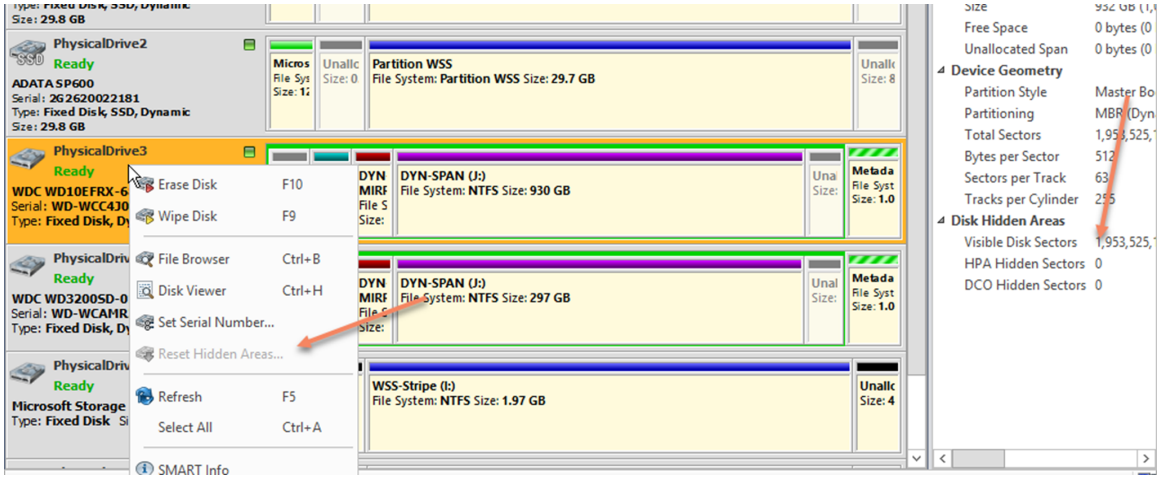


Figure 45: Resetting Hidden Areas

Property Views

To show detailed information about any subject of an application, such as disk, partition, volume, file etc., KillDisk uses information views. When open, they follow selected changes and show information about the selected item automatically.

Property view

To show property view for selected item do one of the following:

- Click **View** > **Windows** > **Properties**
- Click **F4** keyboard short cut or
- Use context menu command **Properties** for the same effect

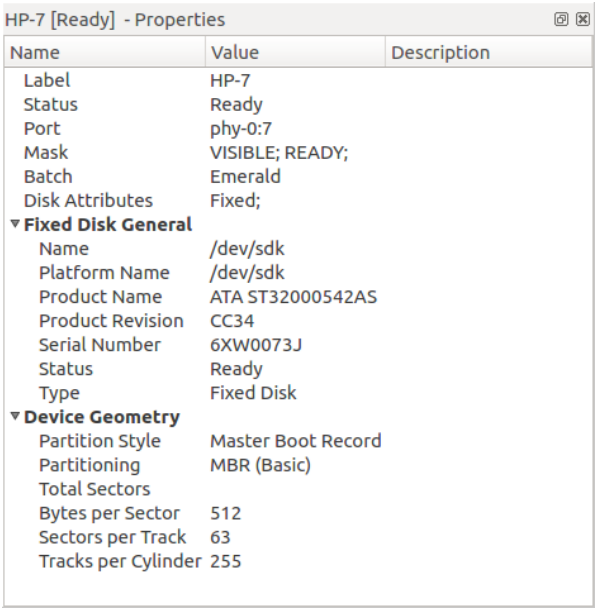


Figure 46: Property view example

Besides only displaying valuable data, they also allow you to copy that information onto a clipboard by using context menu commands.

Copy Value

Copy only value of selected field in the information view.

Copy Field

Copy formatted name and value field pair.

Copy All

Copy all information as formatted set of name and value pairs.

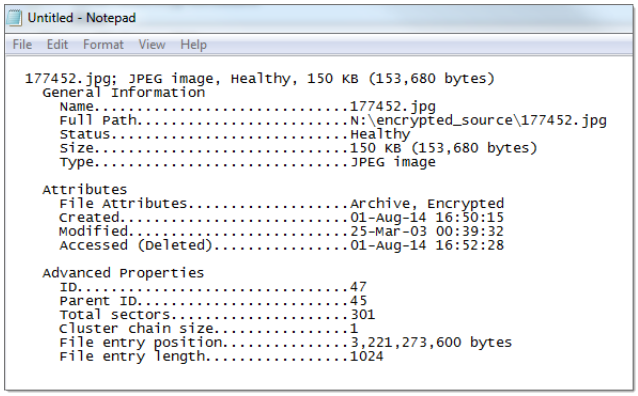


Figure 47: Example of Copied Information

S.M.A.R.T. Information

This is another information view, displaying SMART (Self-Monitoring, Analysis and Reporting Technology) data of the selected hard drive, if the device supports it. To show this view:

- Click **View** > **Windows** > **SMART Info**
- Use context menu command **SMART Info** for the same effect

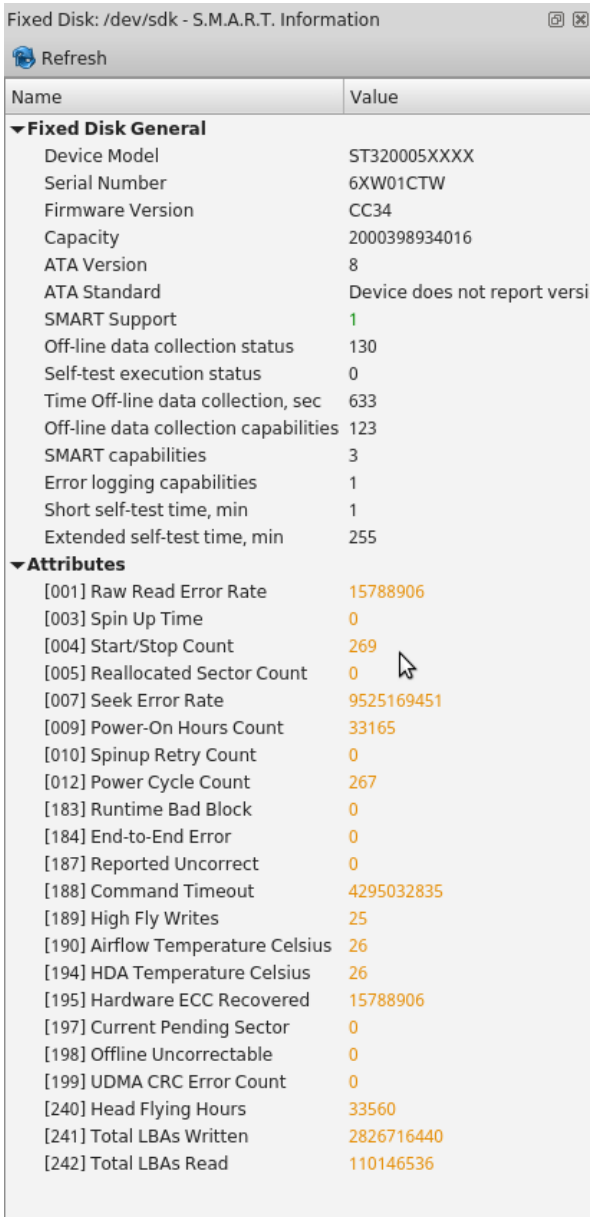


Figure 48: SMART information for physical device example

SMART data can be used to diagnose disks by showing important information such as Power-on Hours, Reallocated Sectors and Current Pending Sectors

Note: If the Current Pending Sectors parameter is not 0, the disk has bad sectors that will cause problems in the future. Dispose of these disks as soon as possible.

Dynamic Disks: LDM, LVM and WSS

Dynamic Disks - virtual disks being used by:

- **Logical Disk Manager** (LDM on Windows)
- **Logical Volume Manager** (LVM on Linux)
- **Windows Storage Spaces** (WSS on Windows)

Dynamic Disks are virtual operating system devices handling other physical disks and emulating different types of RAID not on a hardware level, but on an operating system level. These virtual devices are fully supported with

KillDisk. These disks will appear in the disk view as any other disks would, along with their component disks. When you launch an erase operation on the virtual disk, you will see it reflected on the components disks as well.

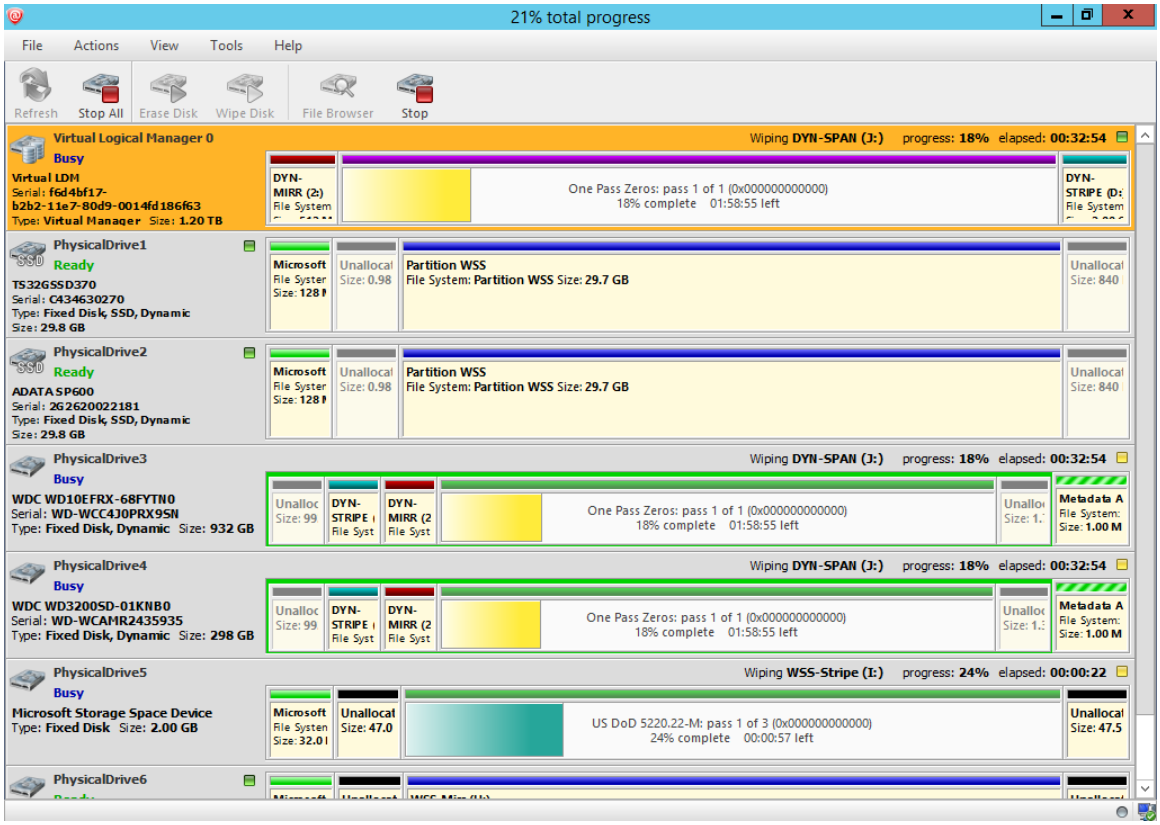


Figure 49: Virtual drive being erased in conjunction with a Windows Storage Spaces striped array

Preferences

KillDisk **Preferences** window is the central location where `KillDisk` features can be configured. These features are split up into several tabs.

To open **Preferences** dialog:

- From main menu choose **File** > **Preferences...** or
- Use **F10** keyboard shortcut at any time

Preferences dialog could be open from other task dialogs to change related settings.

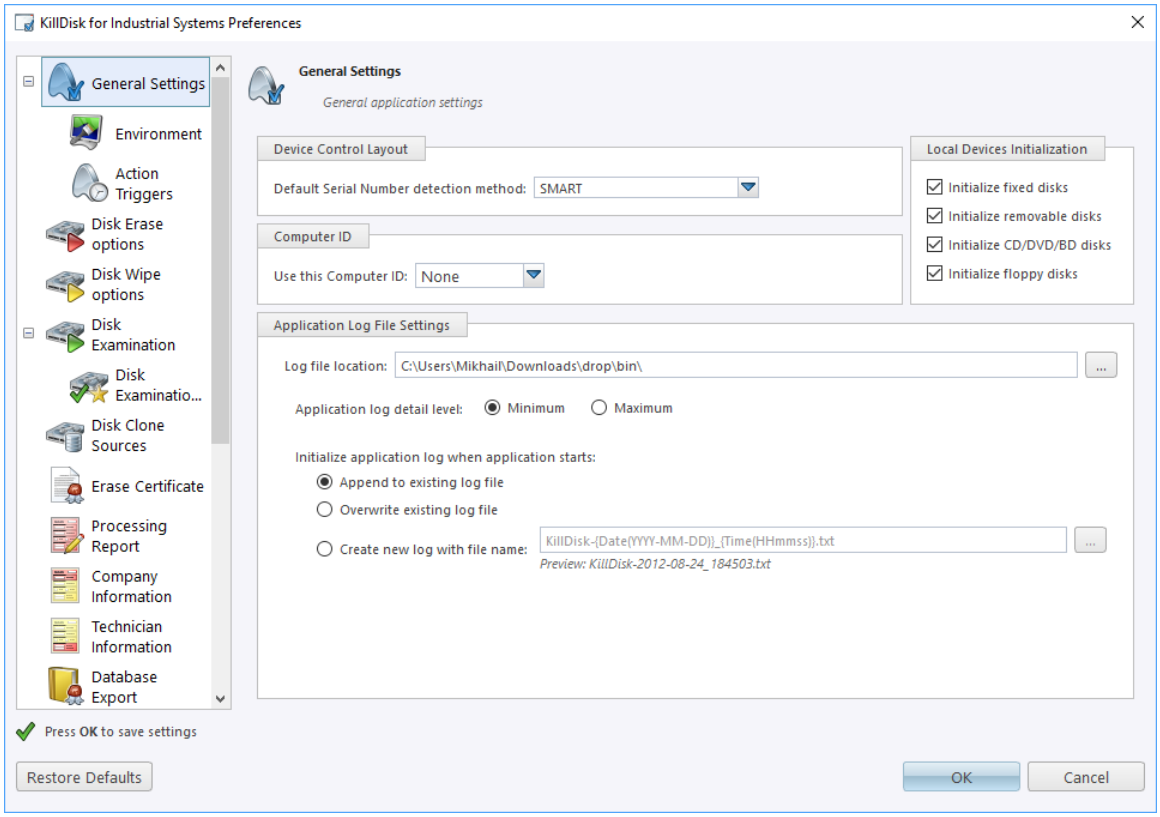


Figure 50: KillDisk Industrial Preferences dialog

Preferences allow users to configure all the global settings for the application.

When **Wipe** or **Erase** are initiated, smaller subset of these settings is available to modify, however global settings may be kept, pertinent to the particular job.

The functionality of the **Preferences** will be outlined in this section.

General Settings

The **General Settings** allow the user to configure general application settings, as well as the visual aspects of the application.

General Settings

These are configurable options pertaining to the applications functionality.

Device control layout

These settings controls disk bay layout behavior in main *Disk Explorer* on page 23

Default Serial Number detection method

Select how KillDisk retrieves the disk serial number by default. Valies are: **SMART**, **IOControl** & **WMI**

Local devices initialization

Select which types of devices appear in `KillDisk` by default: **Fixed disks**, **Removable disks**, **CD/DVD/BD** and **Floppies**

Computer ID

Configure how the KillDisk workstation is identified in logs & reports. Values are: **None**, **BIOS Serial Number**, **Motherboard Serial Number**

Application log file settings

These settings apply to the log file automatically generated by the application. Not to be confused with the erasure report or certificate. All operations performed in a `KillDisk` session will be saved in this log.

Log file location

Allows the user to specify where the application log file is saved. By default, this is set to KillDisk's location directory

Application log detail

Manipulate the amount of detail included in the logs. Values are: **Minimum** and **Maximum**

Initialize application log when application starts

This setting configures whether `KillDisk` generates a new log file for every session (erasing the log of the previous session), or appends new sessions to one log file. Moreover, logs can be placed to the files being named using naming pattern specified here

Environment

These are configurable options pertaining to the applications user interface and user experience.

Application style

Configures the color scheme used in the application. Values are : **None**, **Silver**, **Olive** and **Blue**

Toolbar style

Configures how icons are shown in the toolbar (shown below)

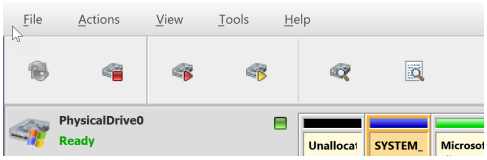


Figure 51: Small icons no text

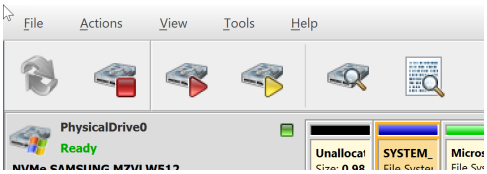


Figure 52: Large icons no text

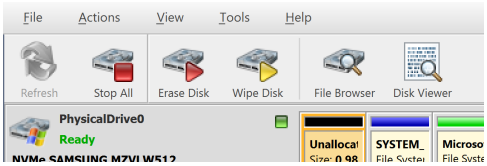


Figure 53: Large icons with text

Default help source

If available, user can select help documentation source to be addressed when requested. Values are: **PDF**, **CHM** and **Online web help**

Use sound effects on errors and notifications

Toggles sound tones being used for notifying the user of the completion of a task, errors and notification during an operation

Show notification dialog after process complete

Process complete dialog will be shown at the end of single or multiple disk processing, letting user print certificate, erase labels etc.

Action Triggers

Configure actions performed while application is running

Automatically check for software updates

If this option set, application will check for a new updates during every start

Action after all processes complete

Select either **None**, **Hibernate**, **Shutdown** or **Restart** system after all processes have been finished

Caution: You will have 30 seconds to abort system hibernation, restart or shutdown.

Export erase certificates and application log to all detected removable media

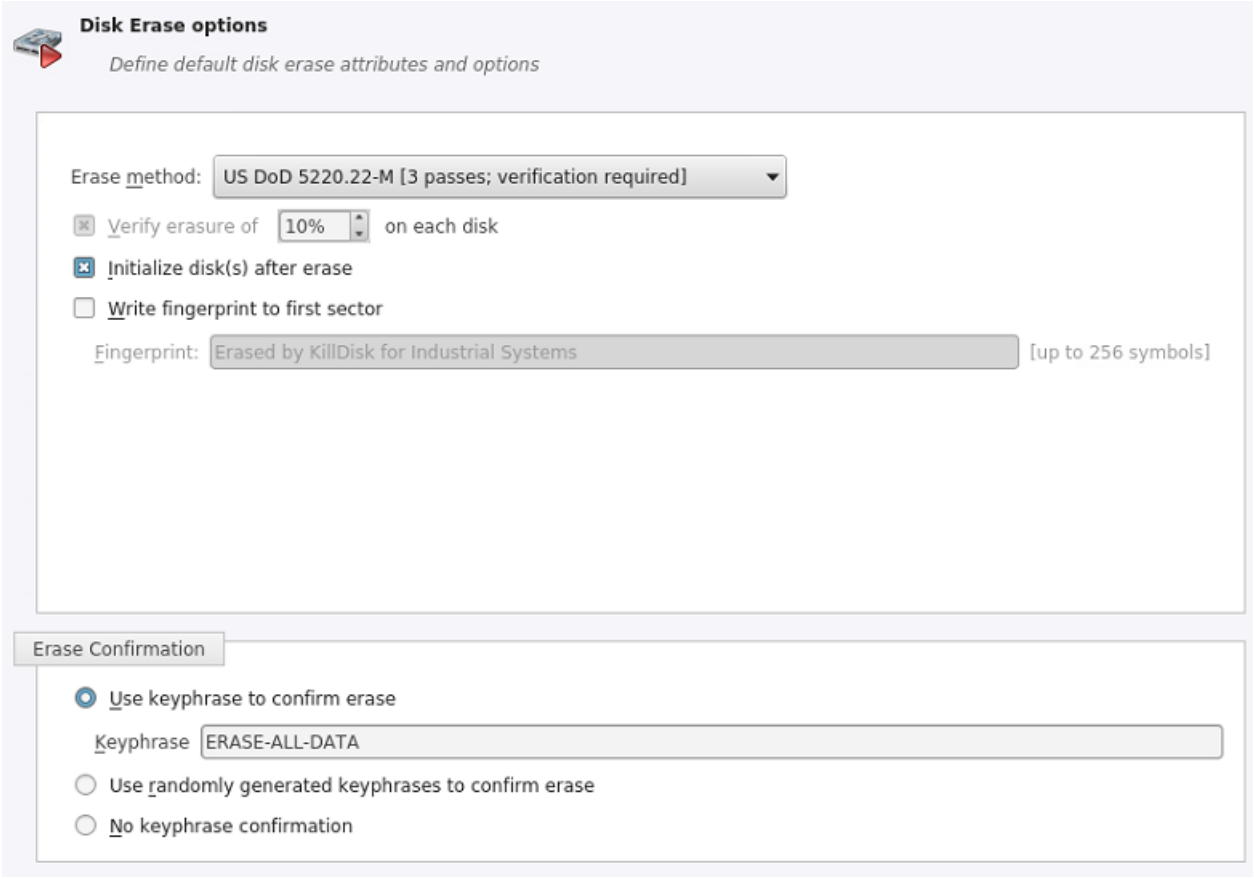
Any attached USB's will have the certificates and logs written to them upon completion

Disk Erase Options

The **Disk Erase Options** tab allows for users to configure settings for the `KillDisk` erase procedures.

The same erase options for each batch could be set through *Edit Batch Attributes* on page 71 dialog

Figure 54: Erase Options



Erase method

One of 20+ sanitizing methods, including many international standards and custom patterns *supported by KillDisk*

Erase verification

Percentage of disk to be verified after disk erasure

Note: In some erase methods such as the US DoD 5220.22-M, this option is mandatory. After the erase operation has completed, this option will scan the entire drive evenly and verify the integrity of the erase operation. The percentage indicates the percent of the sectors that are checked, spread across the disk. Most standards specify 10% as an accurate sample size for the verification.

Initialize after erase

Initializes the first disk's sector (MBR) after erasure, for the disk to be visible and accessible by Operating System

Write fingerprint

This feature will write the specified fingerprint to the first sector of the erased drive. If erased disk is plugged into the system and system boots from this disk, the user will see this fingerprint as a message on the screen

Erase confirmation

As a safety precaution to prevent accidental destruction of hard drives, KillDisk has the user type a key phrase before the erase procedure is initiated (figure below). By default this precaution is set with the key phrase **ERASE-ALL-DATA**. This key phrase can be modified, set as a randomly generated set of characters, or disabled in these settings

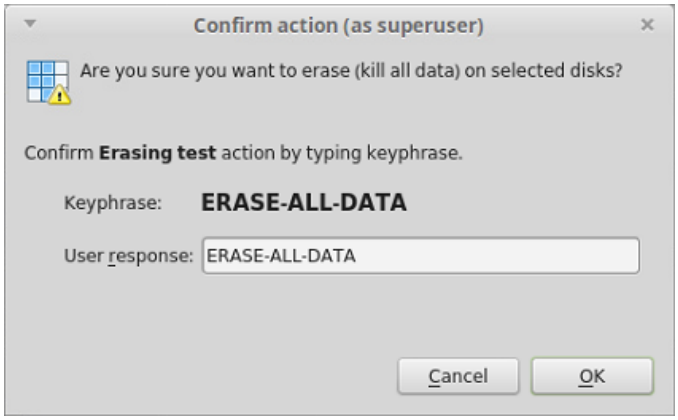


Figure 55: Sensitive action confirmation dialog

Disk Wipe Options

The **Wipe Disk** procedure, like with the erase procedure, allows you to specify the erase method used, as well as a few additional wipe-specific options.

Erase method

One of 20+ sanitizing methods, including many international standards and custom patterns *supported by KillDisk*

Erase verification

Percentage of disk to be verified after wiping out unused clusters

Wipe unused clusters

Erase areas of the hard drive that are not formatted and not currently used by the operating system (data has not been recently written there unless this is a recently deleted partition)

Wipe metadata and system files area

Erase areas of the disk containing information about previous files on the volume and prevents recovery of files using past records of them

Wipe slack space in file clusters

Erase slack space within files. Files are allocated a set amount of space by the OS, in certain increments (depending on the file system). Because files are usually never *exactly* the size of the space allocated to them,

there may be unused space within a file that may contain traces of data. This algorithm wipes this space to remove these data traces.

Disk Examination Options

KillDisk offers different **Disk Examination Options**, depending on user needs. Each examination type has its' own strengths and weaknesses, mainly tradeoffs between time and thoroughness. Any of the examination types can be performed on an entire disk, or a selected segment.

Examination options are required for disk integrity examination and optional for disk erasure but can be used to sort away faulty disk from following processing in sequence.

To examine disk integrity the following three algorithms are used:

Partial Examination

Examines a percentage of the disk, equally segmented in a selected area

Partial Random Examination

Examines a set number of randomly distributed sections of the disk within the selected area

Read Each Sector in Selected Area

Examines the entirety of a selected area, set for examination. Because this reads every sector in the selected area, this is the most lengthy, but thorough of the disk examination procedures.

Disk Grading

Based on examination results disks could be "graded" depending on amount of failed sectors. Specific grade attributes can be set on **Disk Examination Grades** page of application preferences. Further **Disk Erase** command can be executed or canceled based on current disk's grade.

For each grade, you may select the Green, Yellow, or Red to represent the disk grade visually. Multiple grades may share the same color

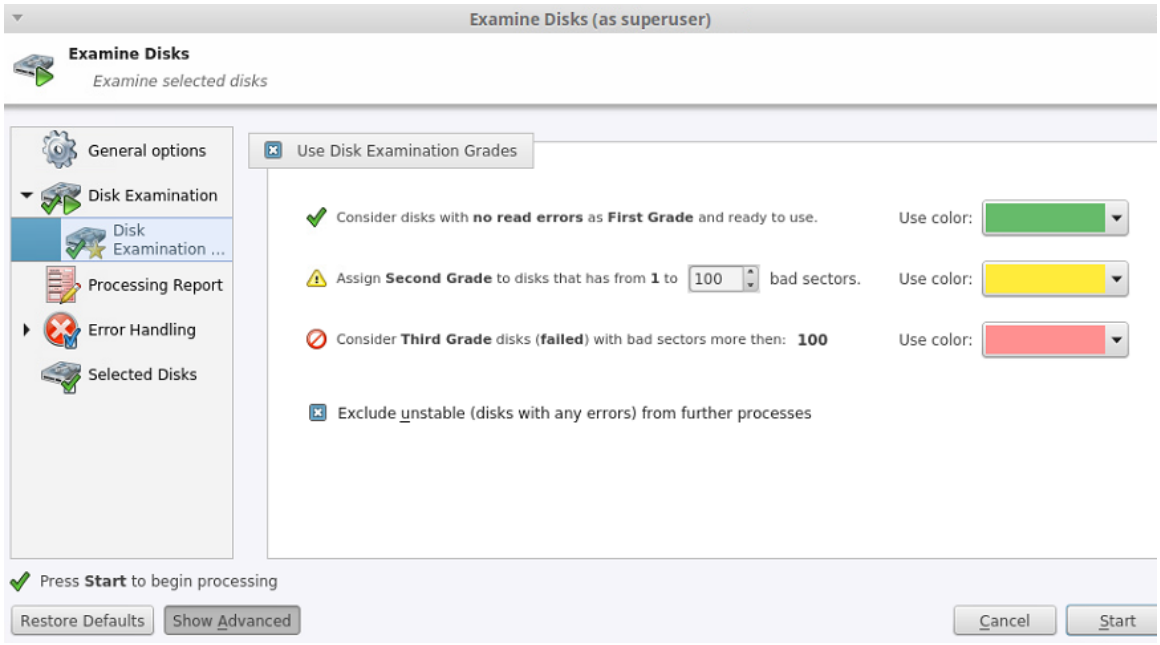


Figure 56: Disk Examination Grades

Limits for errors

Defined under the second grade disks section, the maximum read errors settings allows the user to define the maximum read error tolerance before a disk is categorized as a third grade disk. Third grade disks are the worst grade level, and are considered unreliable for use.

Exclude unstable disks from further processing

If this option is turned on, all disks having any type of errors will be automatically excluded from further batch operations.

Disk Clone Options

This preferences tab allows you to select a master-copy disk to use for cloning on other disks after they have been erased.

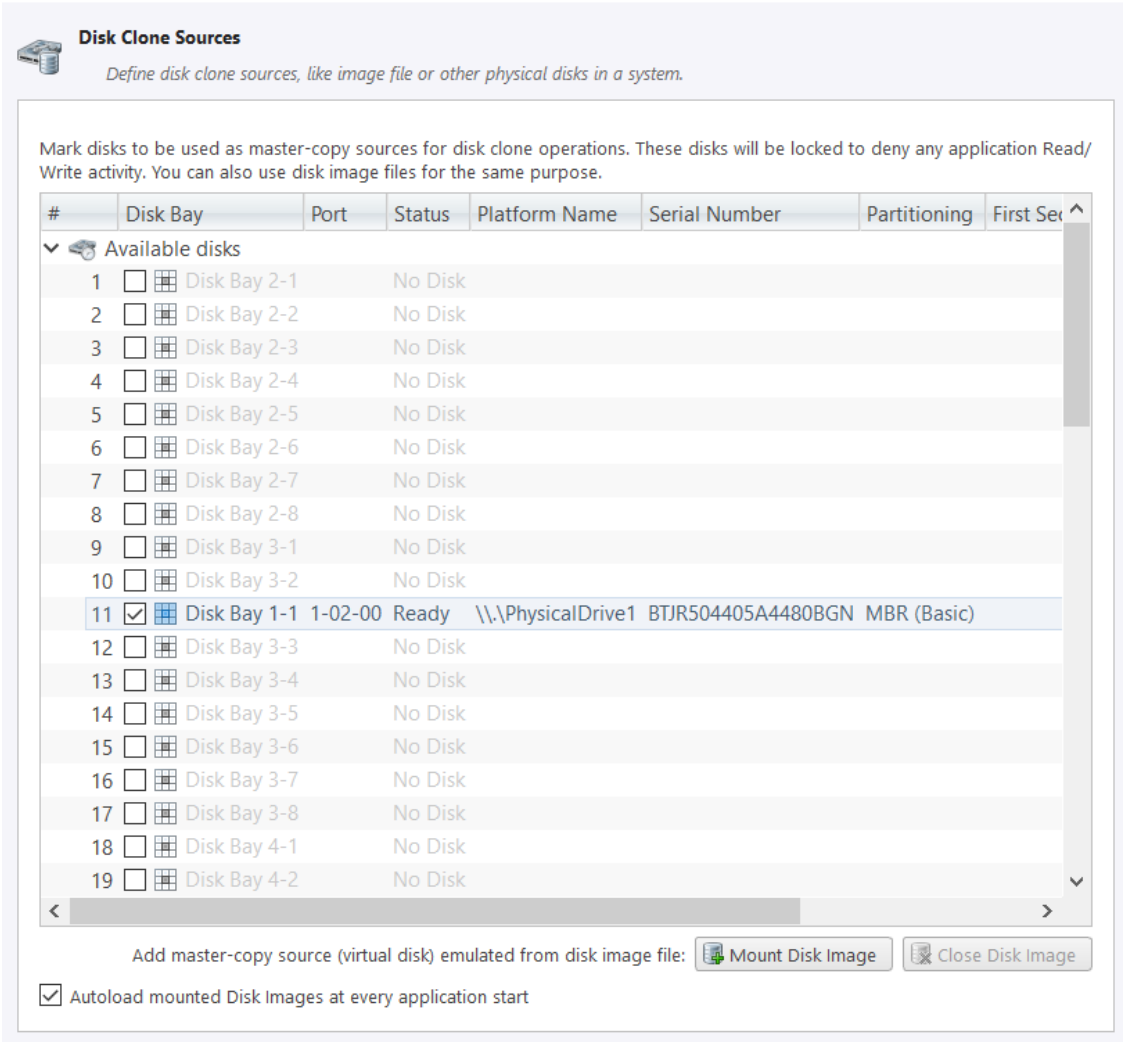


Figure 57: Disk Clone Options

Selecting a Disk for cloning

Any disk recognized by KillDisk may be used as a master-copy for Cloning. Simply find the disk under the "Available Disks" column and check the box next to the desired Disk Bay. This disk will be locked and read/write operations will be restricted from the disk until the cloning operation is complete.

Selecting a Disk Image for cloning

Additionally to cloning from a disk, cloning can be done from a mounted disk image. This is done using the following procedure in the Disk Clone preferences tab:

1. At the bottom of the dialog, click **Mount Disk Image**
2. To the right of the "Disk Image file name field" click the **...** button

3. Find the desired disk image in the file explorer and click `Open`
4. Fill in the "Display name" text box with a desired name for the image and click `OK`
5. The mounted disk image should appear under "Disk Images" in the Master-copy sources window. Check the box next to it and

Note: To avoid repeating steps 1-4 above every time the application is launched, check the "Autoload mounted Disk Images at every application start" box. This will complete the mounting process automatically in the future.

Note: Cloning is only available as an operation when working with a Batch of disks, as an option after erasure.

Disk Clone Options

Note: This feature is only available when working with a Disk Batch, after an erase. Operations on single disks will not be able to use these option.

Copy disk image

When selected, this enables the copy feature. This will copy a disk image from a selected source to all disks that were erased in the batch.

Use file image

Allows you to specify a disk image file to write to the other disks.

Use physical disk

Allows you to specify one disk from the batch to act as the "master disk". This disk will not be erased, but rather be cloned to the other disks in the batch after they are erased.

Start copy to sector

You can specify which sector the copy starts from on the source disks. If you don't know what this is for, leave as 0.

Certificate Options

These preferences allow the user to customize the erasure certificates with company specific information, technician information, and additional certificate options.

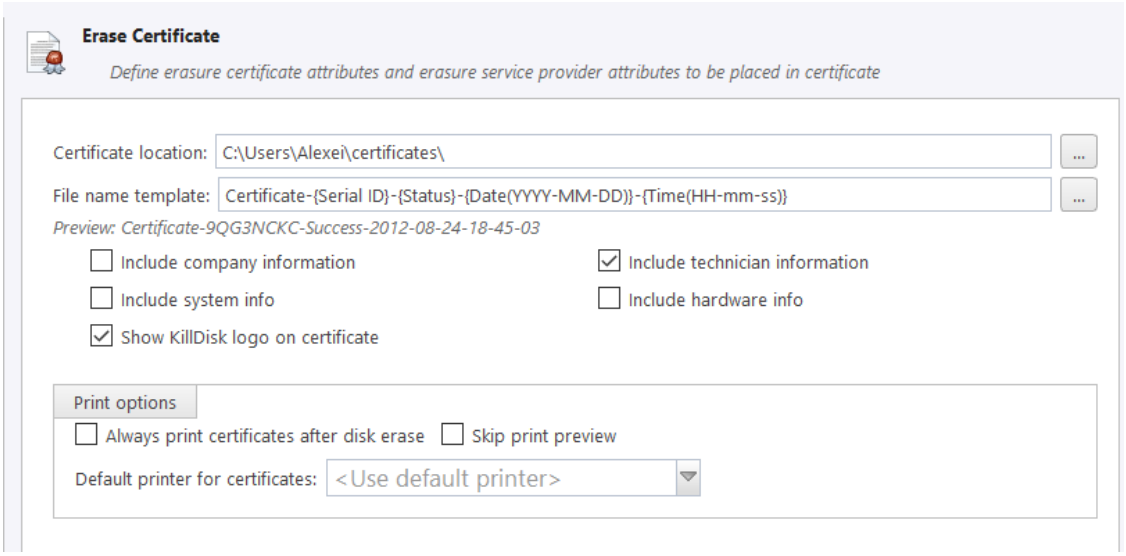


Figure 58: Certificate Options

Certificate location

Use this option to save erase certificate as file in PDF format to selected location.

File name template

Here you may specify the name template for the erase certificate. To see additional file name tags available, see the *File name tags section* in the Appendix.

Include company information

Use this option to include all company's information (see section below)

Include technician information

Use this option to include all technician's information (see section below)

Include system info

Ensures that the Operating System-specific information is saved, such as:

- Operating system
- Kernel version
- Architecture

Include hardware info

Ensures that the Chassis-specific information is saved, such as:

- Motherboard manufacturer
- Motherboard description
- Number of processors

Show KillDisk logo on certificate

Displays "Erased by Active@ KillDisk" logo in the certificate at top-right corner

Print Options

Always print certificate after disk erase

Prints erase certificate after erase completion automatically

Skip print preview

Prints erase certificate skipping certificate preview step

Default printer

Select a default printer for printing erase certificates

Company information

This section allows for the user to customize company features like:

- Licensed to
- Business name
- Location
- Phone
- Disclaimer
- Signature field for a company supervisor (optional)

Additionally, custom logos can be added by clicking **Set** and selecting an logo through the file explorer. The logo will be previewed in the Company logo space above. Most image formats are supported: JPEG, TIFF, BMP, PNG, etc.

Tip: It is recommended for better results to use company logo with resolution suitable for printing (300dpi) with a side not exceeding 300px.

Technician Information

This section allows for the user to customize technician information:

- Operator name
- Comments

- Signature field for a technician (operator)

Report Options

These settings allow you to configure the XML reports generated by different `KillDisk` commands.

Report Location

User may configure where XML erasure reports are saved

File name template

Here you may specify the name template for the XML reports. Because every erase operation will generate a separate report, KillDisk saves the date and time in the default settings to keep reports. The main tags available are:

Table 1: Default file name template tags:

Available file name element:	Tag:
Serial ID	{Serial ID}
Erasure Status	{Status}
Date of Erasure	{Date(YYYY-MM-DD)}
Time of Erasure	{Time(HH-mm-ss)}

To see additional file name tags available, see the *File name tags section* in the Appendix

Include system and hardware info

Ensures that the system-specific information is saved in the XML report, such as:

- Operating system
- Kernel version
- Motherboard manufacturer
- Motherboard description
- Processors count
- Architecture (x86, x64)

Include company and technician information

Optionally place the technician information (defined in the *Certificate Preferences*) into the XML erasure report

Include SMART information for each disk

Additional information about particular disk health based on SMART attributes can be placed to XML.

The `KillDisk` XML report contains the following parameters:

Table 2: XML Report Parameters

Type of Information	Specific data
Company Information	*Name*
	License
	Location
	Phone
	Disclaimer
Technician Information	*Operator Name*

Type of Information	Specific data
	Comments
System Information	*OS version*
	Platform
	Kernel
Hardware Information	*Motherboard Manufacturer*
	Motherboard Description
	Number of Processors
Erase Attributes	*Erase Verify*
	Passes
	Method
	Verification Passes
Error Handling Attributes	*Errors Terminate*
	Skip interval
	Number of Retries
	Lock
	Source?
	Ignore Write?
	Read?
	Lock?
Disks	*Device Size*
	Device Type
	Serial Number
	Revision
	Product Number
	Name
	Geometric Information
	Partitioning Scheme
Additional Report Attributes	*Fingerprint Information*
	Initialize disk?
Result	*Bay*
	Time and Date Started
	Disk Information
	Status
	Result

Type of Information	Specific data
	Time Elapsed
	Errors
	Name of operation

Labels Options

These preferences help you globally adjust label settings for the KillDisk system. These labels may be configured to any printer, page or label type using KillDisk's highly customizable labels features.

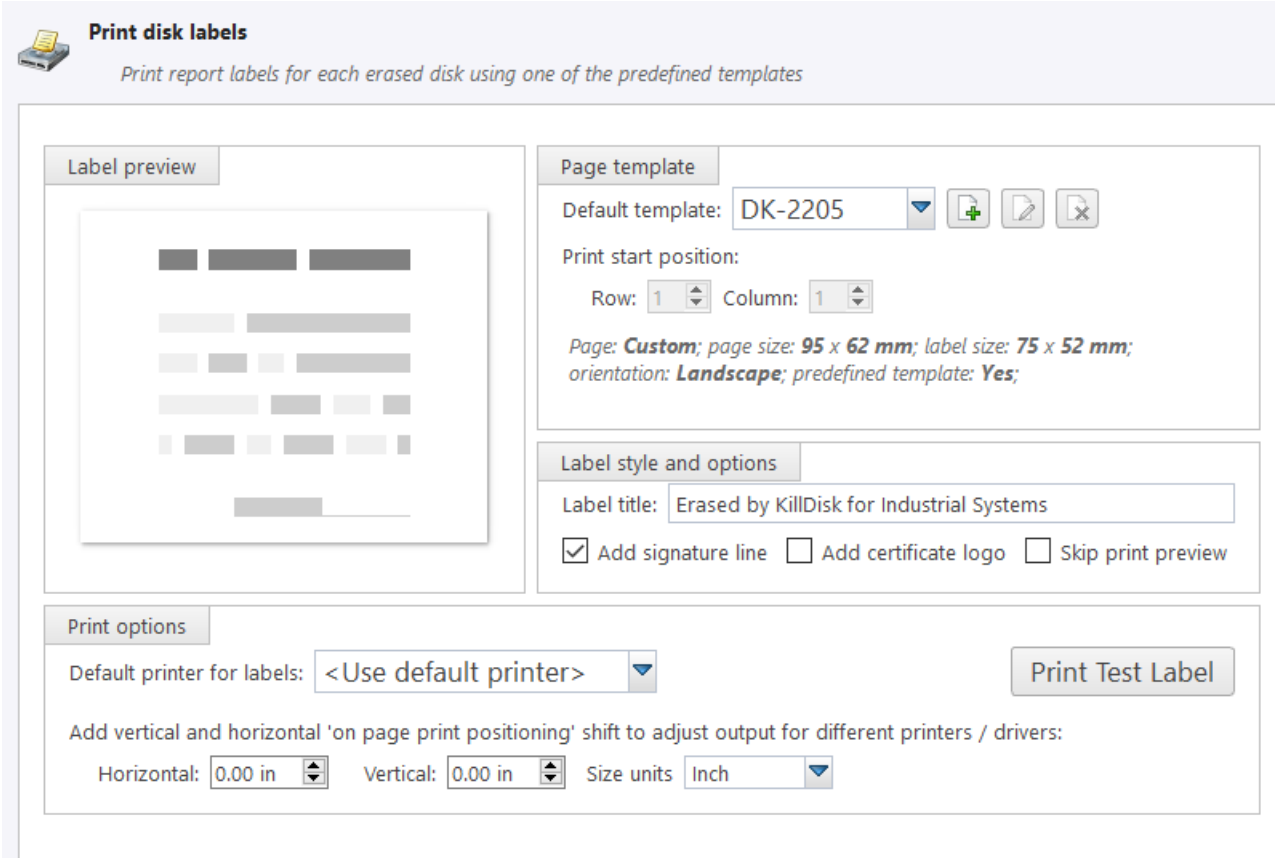


Figure 59: Label Options

Label preview

Displays a preview of one label, given the current inputted settings. Refreshes as adjustments are made to the settings.

Page template

The print label dialog gives you access to a number of predefined standard templates and any custom templates you may create. These template may be easily selected without opening any additional dialogs and the details of the selected template will be displayed below the selection box. If your specific labels differ from any of the templates available, the button allows you to create a custom template with your own specifications. Additionally, the button allows you to modify an existing template and the button deletes the selected template.

Creating a new template

Upon clicking the  button, the following template editor window will appear. Descriptions of the template editor options are listed below.

Template Title

Here you may create a custom title for your template. This is the name that will reference this template when selecting it in the Print Label dialog.

Page

Here you may specify the dimensions of the page used to print the labels. This may be selected from the list of standard sizes, or defined using exact measurements.

Page margins

Here, page margins are defined for the top, bottom, left and right sides of the page.

Label Layout

These settings define how the labels appear on the page. You may define the spacing in between labels on the page and the dimensions of the label grid. Once you've put in the proper measurements, KillDisk will take care of the formatting.

Size units

The units of measurement may be manipulated between millimeters, inches, pixels and points. If a value in entered in one measurement and the unit size is changed, the appropriate conversion will take place.

Print Start Position

The print start position section of the dialogue allows you to select what label on the page the labels start printing from. As you use labels, the labels won't always start from the 1x1 position, so you can adjust this setting accordingly.

Label Style and options

These option allow you to change the styling on the labels with the following options:

Label title

Allows you to set a title to be printed in bold at the top of the labels. This can be company name, batch name or any other descriptors you may consider useful to identify the operation

Add signature line

Toggling this on places a line at the bottom of the label for the technician to sign off on upon completion of the wipe

Add certificate logo

Includes the logo used in the certificate as a watermark background of the label

Skip print preview

Disable in-build system print preview dialog and print labels immediately when requested.

Print options

Define options for erase label printing, including special label printers line Brother QL-570 and others:

Default printer

Select printer to be used exclusively to print erase labels from the list of installed printers

Print output adjustments

The print output adjustments section of the dialogue allows you to **vertically** or **horizontally** displace the position measured in specific **units** of the print to adjust to different printers.

Print test label command will let you print erase label sample to verify your settings and selected layout attributes.

Database Export Options

KillDisk Industrial's `Export` feature allows to send out all current logs, certificates and reports from locally stored database over the network to the external SQL database. Both local Erase History and all future transactions can be exported after connection to database is established.

Connection to SQL Databases supported:

- Microsoft SQL Server
- ORACLE
- PostgreSQL
- MySQL

To connect to the external SQL database do one of:

1. Navigate to **File** > **Preferences** or press **F10**. Then click **Database Export** tab on the left
2. `Database Export` dialog appears:

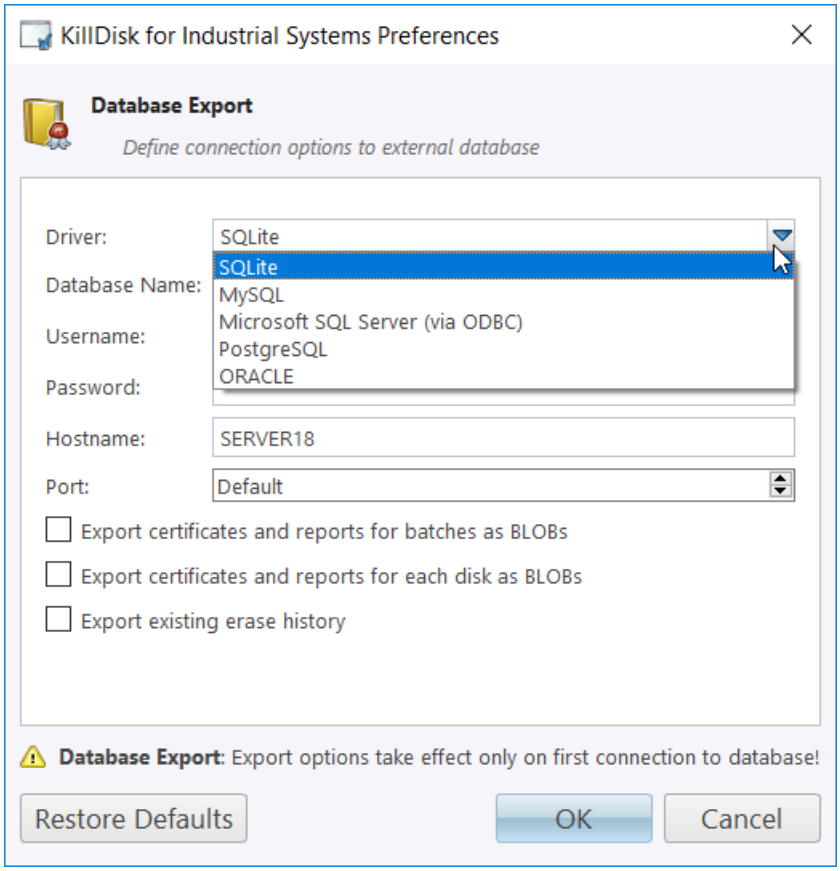


Figure 60: Database Export Dialog

3. Select Driver for the particular database you want to connect to from the list of databases
4. Type in the Database Name on the remote end
5. Type in the database Username for the connection
6. Type in the database password for the selected user
7. Type in the Hostname (which can be IP address or local Network Server Name)
8. Select a TCP/IP Port to use, if it is different from the defaut value for the particular database
9. Set check marks, if needed, for the additional export options:
    - Export certificates and reports for batches
    - Export certificates and reports for particular disks
    - Export existing erase history (can be done the only once per a new connection)

10. Click **OK** to test connection and store connection parameters in settings for future use

Once a connection to the external SQL database established, KillDisk Industrial starts exporting all information related to the current operations automatically.

Note:

For the database export to be successful you need to provide a database user with privileges enough for creation two tables (**DISKS** and **BATCHES**) and populating these tables with current operation's parameters.

Disk Viewer Options

These settings allow user to set hexadecimal view settings, font and interaction.

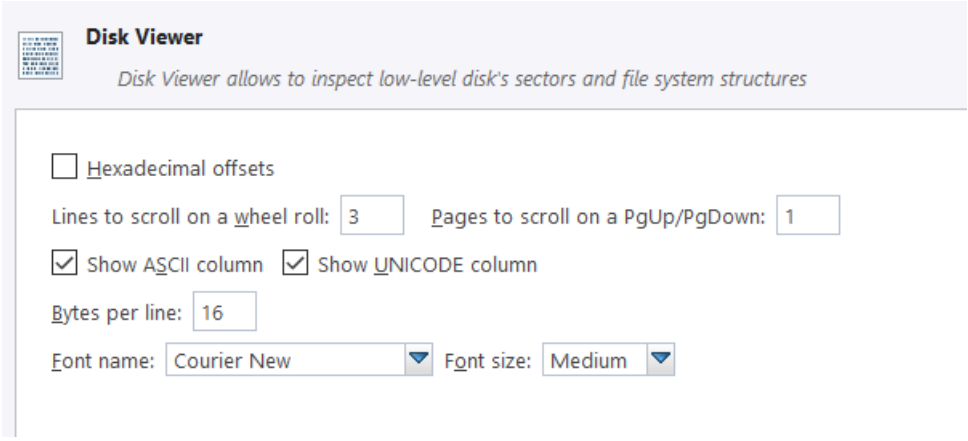


Figure 61: Disk Viewer Options

Hexadecimal offsets

Toggles offset format between decimal and hexadecimal.

Show ASCII column

Toggles display content in ASCII format

Show UNICODE column

Toggles display content in UNICODE format

Lines to scroll

Number of lines to scroll for a single mouse wheel sweep

Pages to scroll

Number of pages to skip for a single **PageUp** or **PageDown** click

Bytes per line

Defines amount of bytes per line in binary display

Font name

Select any monospace font available for better experience

Font size

Font size to be used in binary view

Error Handling Options

`KillDisk` has a broad capabilities to handle errors encountered during continuous disk processing. This is an advanced preference that allows for the configuration of `KillDisk`'s error handling of continuous processes.

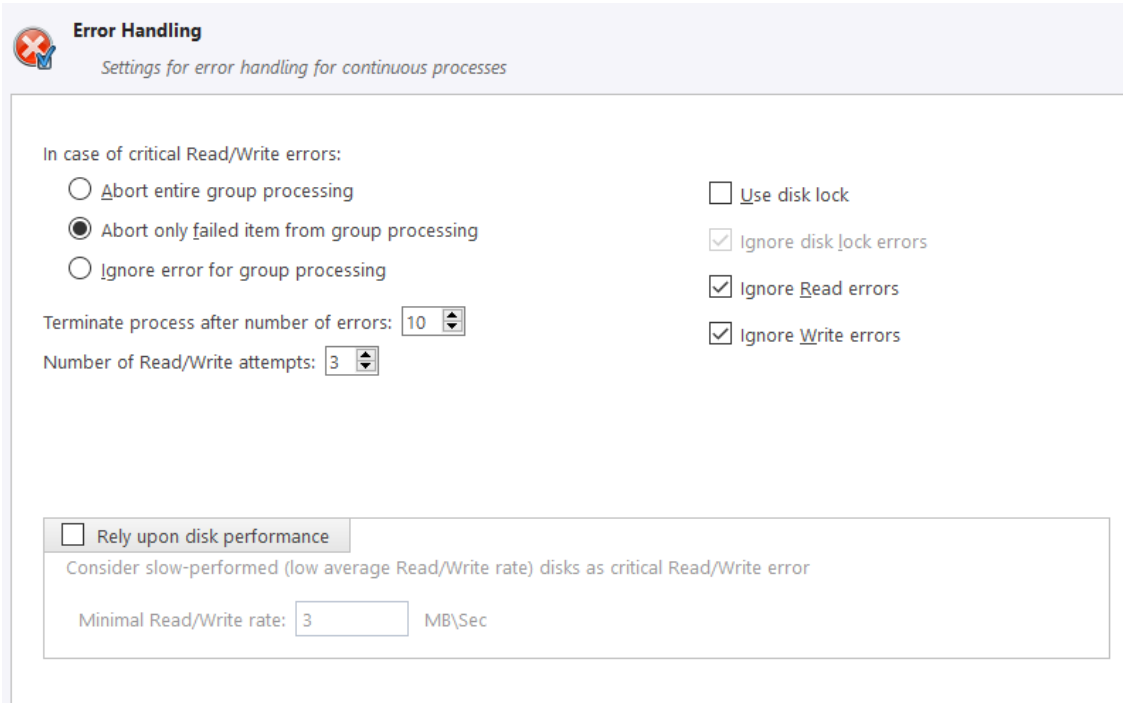


Figure 62: Error Handling Options

Error handling attributes

`KillDisk` allows you to select one of three ways to handle Read/Write Errors:

Abort entire disk group processing

This means that if you're running a batch erase and one of the disks has errors, the erase process for ALL the disks in the batch will be terminated

Abort only failed disk from group processing

This is the suggested setting. Failed disks will return an error and terminate the erase process, but other disks in the batch will not be interrupted from completing the erase operation

Ignore error for disk grouping

Ignores the read/write error and continues erasing wherever is possible on the disk. No active or forth going operations are terminated

Terminate process after number of errors

Sets the error threshold to a certain amount before the disk operation is terminated and deemed unsuccessful

Number of Read/Write attempts

Sets the number of attempts KillDisk make to perform an operation when an error is encountered before it stops command execution

Use disk lock

Locks disks from being used by any other applications

Ignore disk lock errors

Errors encountered with KillDisk not being able to access locked disks are ignored

Ignore read/write errors

Toggle whether errors should appear for read and/or write errors.

Rely upon disk performance

Set a minimum acceptable read/write speed in megabytes per second for disks to flag underperforming drives.

SMART Diagnostics

SMART attributes may also be used in error handling, so threshold limits may be set on some or all of the disks SMART parameters. This may speed up processing by immediately terminating operations with unusable drives.

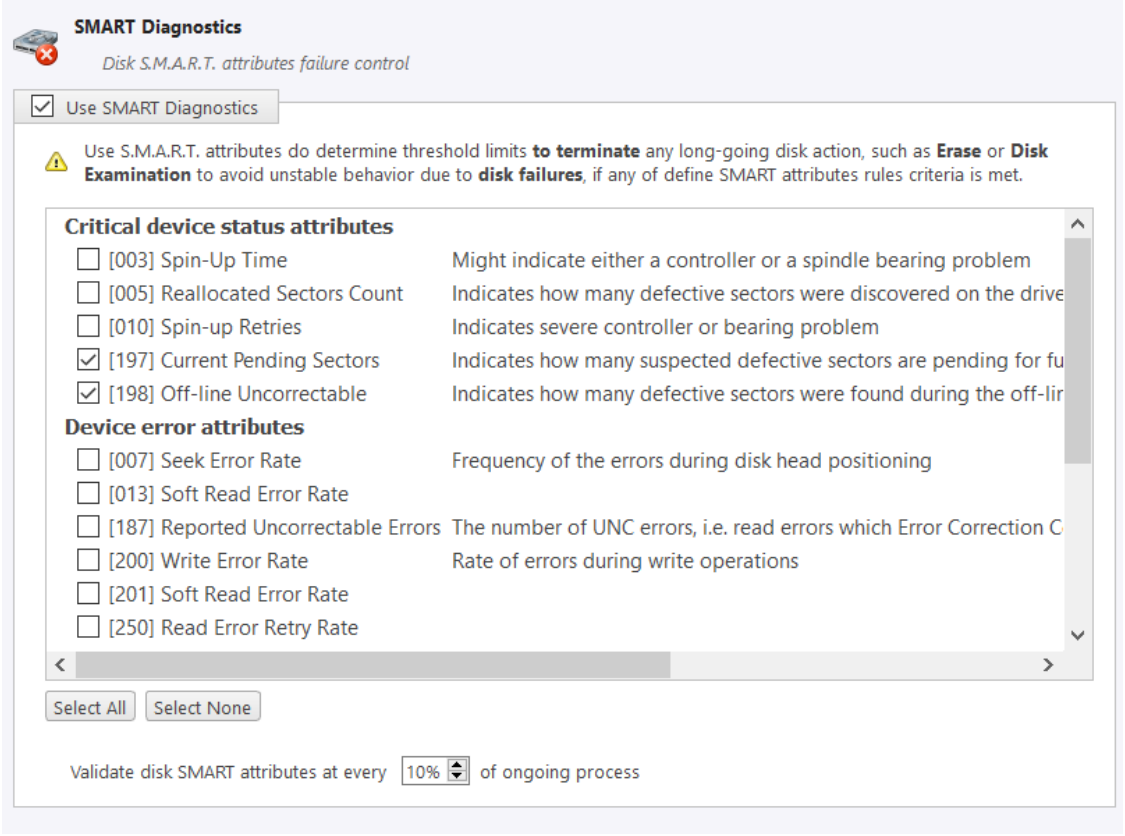


Figure 63: SMART Diagnostics

Note: Query execution for SMART attributes is very time and resource consuming operation. It can pause disk erasure procedure for several seconds. Thus it is recommended to validate these attributes not very frequently.

Email Notification Options

Email Notifications

`KillDisk` can deliver results of its sanitation process by e-mail.

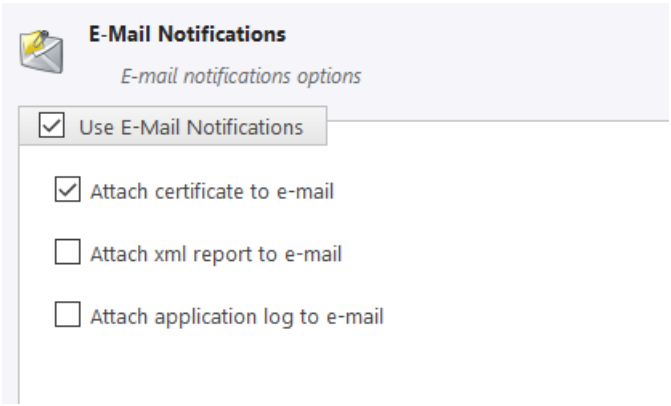


Figure 64: Email Notification Options

Certificate, XML Report or Application log can be emailed to the client, just check the related option.

When you check **Use E-Mail Notifications** option, the next set of options: **SMTP Server Settings** will be available for configuration.

SMTP Server Settings

These settings allow configuring mailer settings for delivering erasing/wiping reports to your mailbox. Simple Mail Transport Protocol (SMTP) is responsible for transmitting e-mail messages and needs to be configured properly.

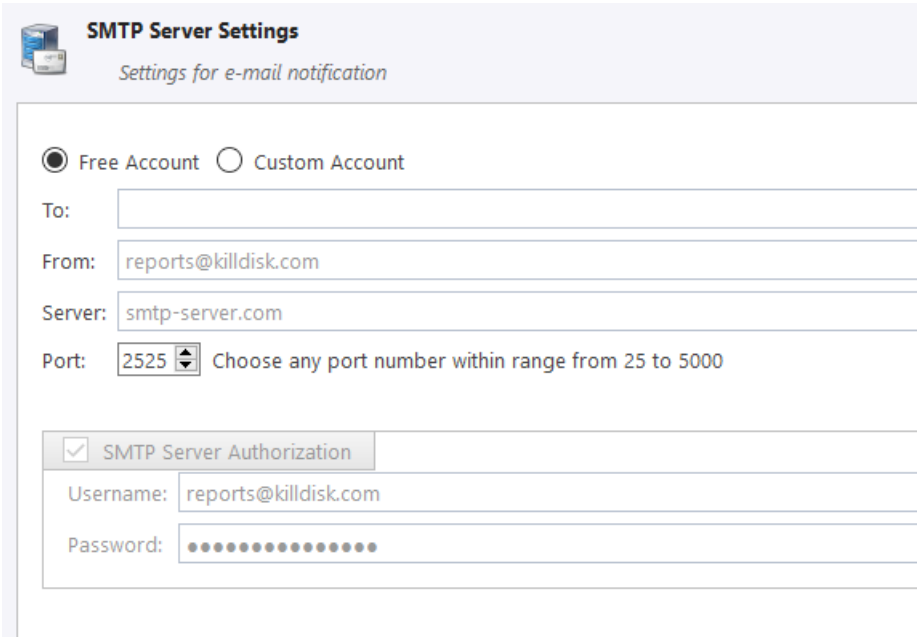


Figure 65: SMTP Settings

Account Type

`KillDisk` offers you a free SMTP account located on `www.smtp-server.com` that can be used for sending out reports. By default all required parameters are pre-filled and configured properly. The only field you need to type in is the e-mail address where reports will be sent to. If your corporate policy does not allow using services other than its own, you need to switch this option to Custom Account and configure all settings manually. Ask your system/network administrator to get these parameters.

To

Type the e-mail address where erasing/wiping reports will be sent to

From

Type the e-mail address which you expect these reports to come from

SMTP Server

`KillDisk` offers you the use of smtp-server.com for a free SMTP account. This account is pre-configured for KillDisk users. Ask your system/network administrator to get the SMTP server name to be used in the Custom Account

SMTP Port

For the free SMTP account, `KillDisk` allows you to use `smtp-server.com` on port 80. This is a standard WWW port being used by all web browsers to access the internet. This port most likely will be kept open on a corporate or home network. Other ports can be filtered by and closed on a network firewall. Ask your system/network administrator to set proper SMTP port for the related SMTP server.

SMTP Server requests authorization

To avoid spam and other security issues, some SMTP servers require each user to be authorized before allow sending e-mails. In this case a proper user name and password are required. Ask your system/network administrator to get proper configuration settings.

Disk Batches

Disk Batches are used to organize disks into groups, depending on what the disks are being used for, type of disk, or the desired operation to be performed on them: **Examine**, **Erase**, **Wipe**, **Clone** and combinations. The user has complete freedom to use disk batches however is most convenient for their particular use case. Disks can be added or removed from a particular batch at any time.

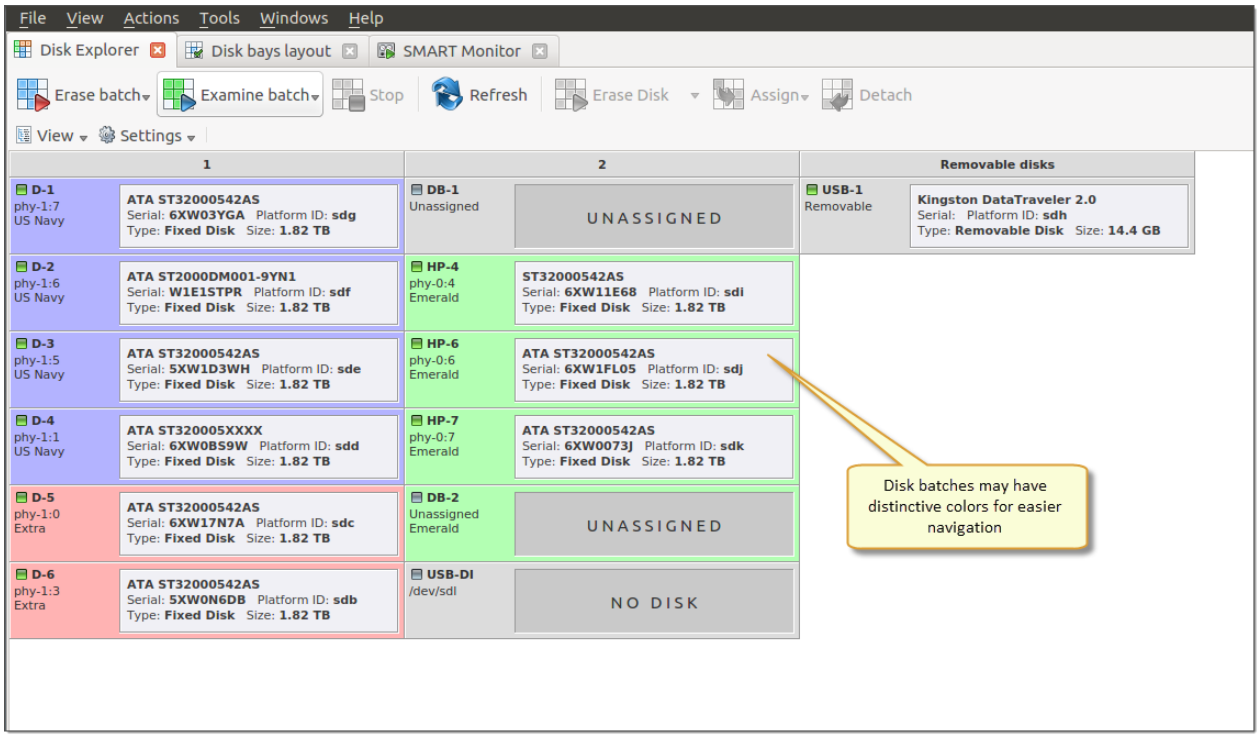


Figure 66: Disk Batches distinguished by color

Once disks are batched together, they may be treated as a group and similar settings may be set for this batch. Likewise, operations may be performed on these batches — initiating the operation on a batch will perform the operation on all the disks belonging to the batch.

Create Batches

Create a Disk Batch

Disk batches are created using the **Batch Control** toolbox.

Note:

If you can't find the Batch Control toolbox when you run KillDisk, make sure that you have the view activated. To do this, navigate to the file menu bar, click **View** > **Windows** > **Batch Control** There should be a check mark next to the Batch Control view.

In the **Batch Control** toolbox, click **New batch**. This will open the **Create a New Batch** configuration wizard. After *configuring batch settings*, click **Finish** and the new batch will appear in the batch control window.

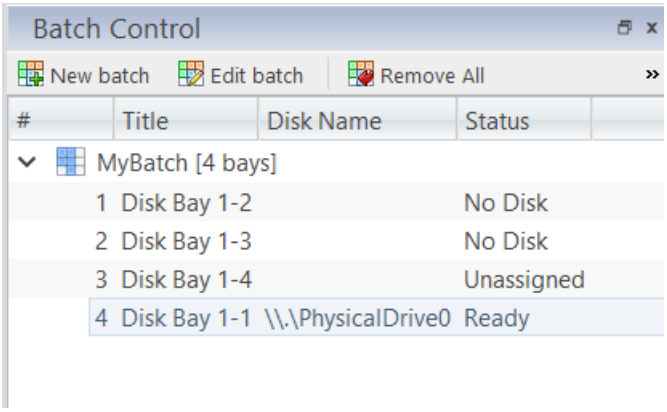


Figure 67: Batch Control Toolbox

Adding disks to a disk batch

Disk bays can be added to batches in several ways:

- From **Disk Bays** view
- From **Edit** menu

Read *Add Disks to Batches* for more information.

Removing disks from a disk batch

Disks are removed from a batch in a very similar way to the way they are attached. Follow the same steps as with Adding Disks, only select bays that are attached to batches and select the **Detach** command.

Deleting batches

Batches can be deleted by selecting the batch in the **Batch Control** toolbar and selecting the **Delete** command.

Edit batch attributes

Batch attributes can be edited at any time after batch created. See: *Edit Batch Attributes* on page 71

Note:

Disk batch attributes changed every time if altered in confirmation dialog before executed.

Add Disk Bays to Batches

Disk Bays can be assigned to existing disk batches in order to apply same batch attributes for selected tasks (disk examination, erasure, etc).

Note:

Single disk bay can only belong to the one batch.

Once a new batch is created, a new message will appear at the top of the **Disk Bays** view of the Disk Explorer window, prompting you to add disks to the new batch.

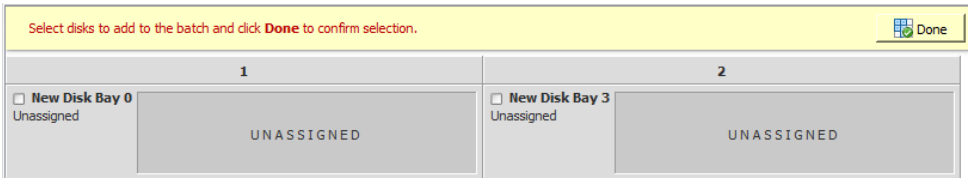


Figure 68: Adding disks to a batch in the Disk Bays view

Click on disks to select them and/or click on selected disk to remove them from the batch disk selection. Once the desired disks are selected, click **Done** in the message toolbar and the selected disks will be added to the new batch.

Alternatively, disks can be added to a batches in one of several ways:

From Disk Bays view

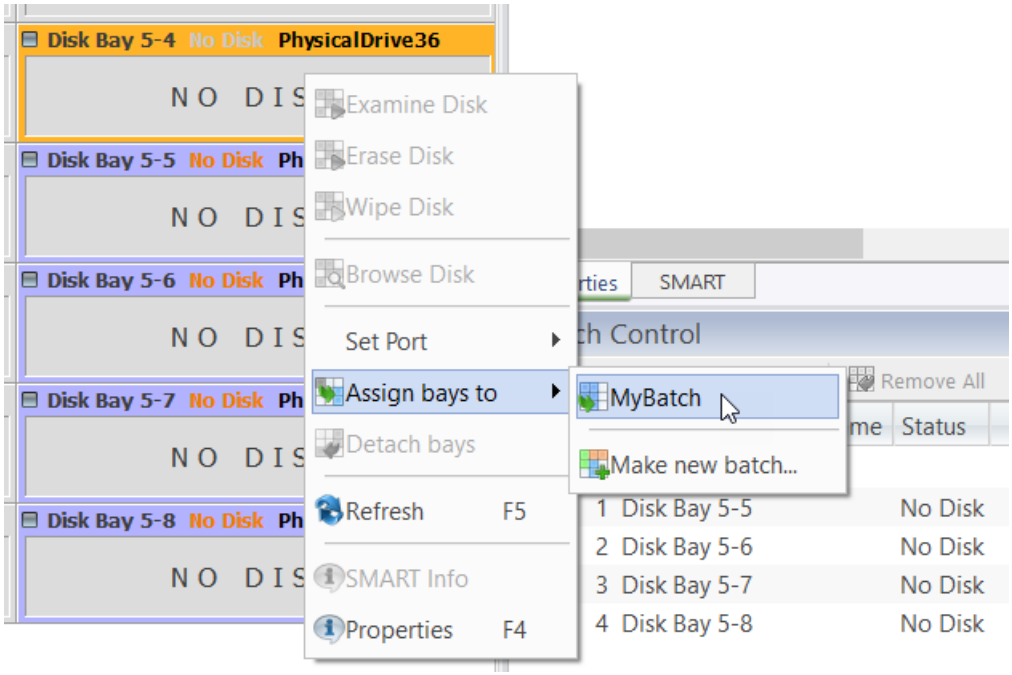


Figure 69: Assign Disk through the Disk Bays View

1. In the disk bays view, select the disk(s) that you'd like to place in a batch.
2. Right-click on the disk.
3. Hover over the **Assign bays to** option to see a list of available batches.
4. Select the desired batch from the list to place the selected disk into.

From Edit menu

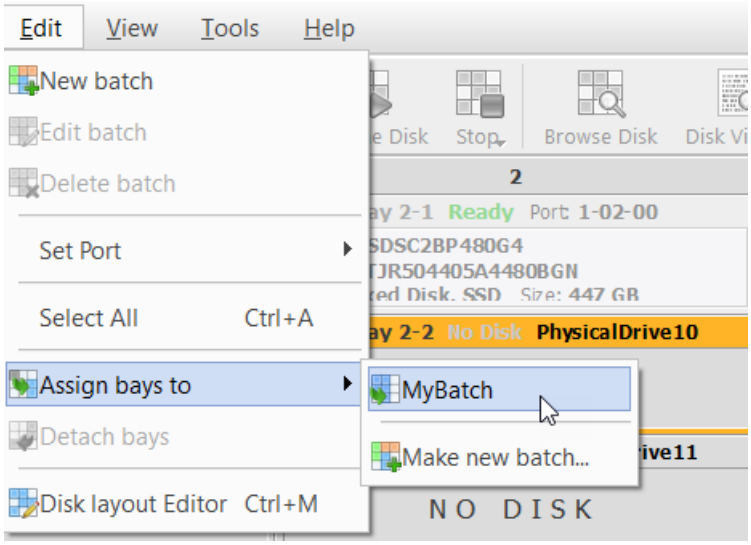


Figure 70: Assign Disk through the Edit menu bar

1. In the Disk Explorer, select the disk bay(s) that needs to be assigned
2. Click **Edit** menu bar
3. Hover over the **Assign bays to** action to see a complete list of available batches
4. Click on the desired batch. The selected bay(s) will be assigned to that batch.

Edit Batch Attributes

When you create a new disk batch, you will encounter the **Edit Batch** window, where disk batch settings may be set. For existing disk batches, you may access this window by selecting the desired batch in the **Batch Control** toolbox and clicking **Edit Batch** toolbar button.

Batch Attributes

These are **General Settings** for the batch, such as Title, Color, how the batch is displayed, and more.

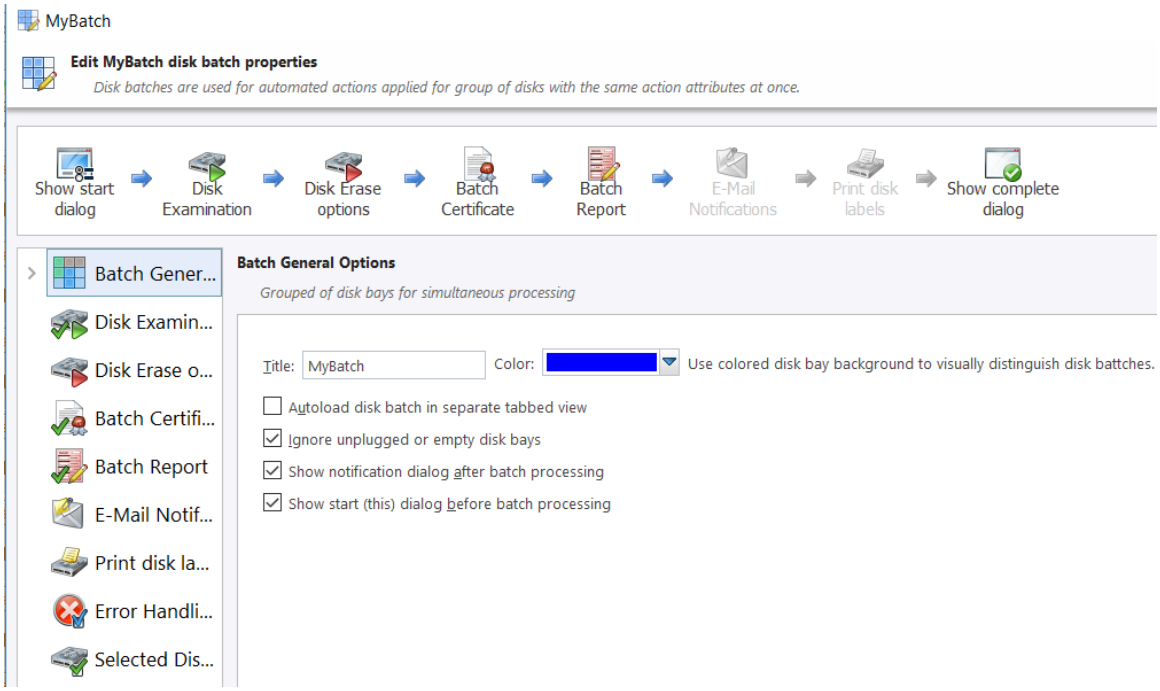


Figure 71: Batch Editor - General Settings

Disk Examination

These settings allow you to configure the optional Disk Examination feature, toggling it on/off, method of examination, setting disk integrity thresholds and how these reports are saved.

Read *Disk Examination Options* on page 54 for description of each attribute.

Disk Erase

These settings configure the disk erase settings for the batch. Erase methods, verification, and report settings can be changed here. Additional options can be individually configured here by clicking **Show Advanced** button.

Read *Disk Erase Options* on page 52 for description of each attribute.

Disk Wipe

These settings configure the disk wipe settings for the batch. Erase methods, verification, and report settings can be changed here.

Read *Disk Wipe Options* on page 53 for description of each attribute.

Disk Clone

This feature allows the user to configure either a disk or disk image to write to all the disks in the batch.

Read *Disk Clone Options* on page 55 for description of each attribute.

Batch Certificate

These settings give you the option to toggle whether or not to issue an erasure certificate upon erase and configure the options to include, like name, destination, details and comments. Options for printing and issuing individual certificates for the particular disk in the batch can be configured.

Read *Certificate Options* on page 56 for description of each attribute.

Batch Report

These settings give you the option to toggle whether or not to issue an erasure XML report upon erase and configure the options to include, like name, destination, SMART details. Options for issuing individual XML reports for the particular disks in the batch can be configured.

Read *Report Options* on page 58 for description of each attribute.

Email Notifications

User can turn on email notifications for batch operations and attach a Certificate, XML Report and Erase Log to the email.

Read *Email Notification Options* on page 65 for description of each attribute and SMTP settings configuration.

Disk Labels

User can turn on displaying and printing disk labels after batch operation completion, as well as configure default printer and customizing label templates.

Read *Labels Options* on page 60 for description of each attribute.

Error Handling

For each batch error handling attributes can be set individually.

Read *Error Handling Options* on page 63 for description of each attribute.

Advanced Tools

KillDisk offers a number of advanced tools to work in conjunction with the software to make operations easier to perform and the disks easier to navigate. KillDisk give you the power to browse through disks on both a file level and a low, hexadecimal (HEX) level. Disk health analysis with its' SMART monitor as weell as logs/reports export to the external databases fully supported in KillDisk Industrial version. This section describes each of these features at length:

- *File Browser*
- *Hexadecimal Viewer*
- *SMART monitor*
- *Erase History and Export to Database*

File Browser

KillDisk also includes a built-in file browser for examining the contents of disks for verification purposes of the procedure and that correct hard drives are being selected, and validation that erased files have been overwritten after erase and wipe. Details on using this feature will be discussed in this section.

Note: KillDisk **will** detect existing files, as well as files that have been deleted, but **not** sanitized. They will appear grey and indicate deleted files with a high probability of being recovered with file recovery tools.

Opening the Browsing View

To browse the contents of a specific disk from the Disk Bay layout view, simply select the desired disk and click **Browse Disk** in the action toolbar or select related command from the context menu.

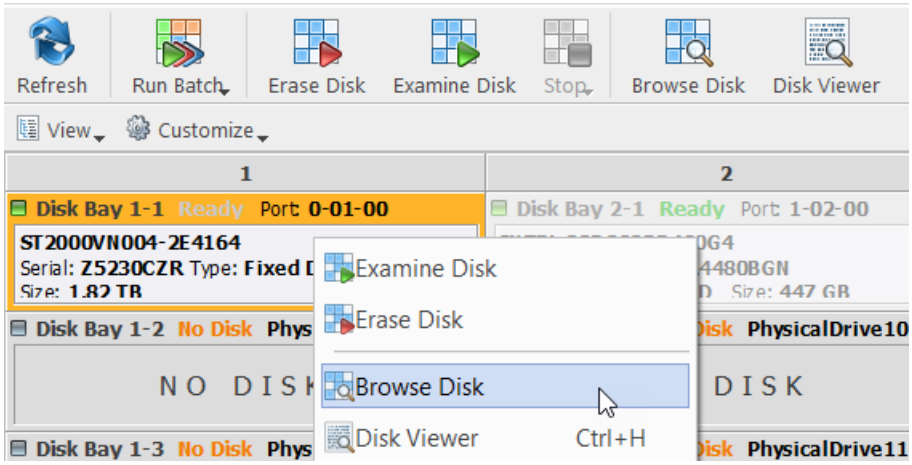


Figure 72: Launching the File Browser

This will launch the file browser window, seen below.

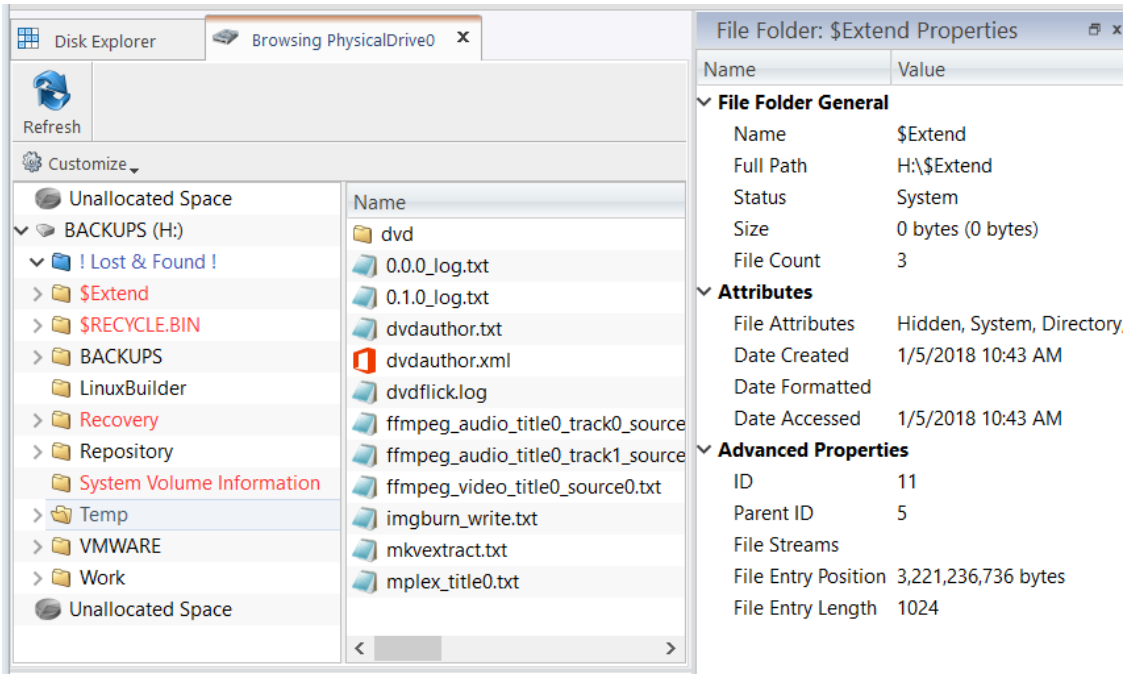


Figure 73: File Browser Window

The file browser window displays the disk selected. The file explorer windowed view may also be manipulated by navigating to the **Customize** button at the top. Here, you can you have options to manipulate the elements below.

Show System Files

Toggles advanced disk information (system files) being shown

Show Unallocated Partitions

Toggles the unallocated disk partitions being shown

Navigator Pane

Toggles the `Navigator Pane` view on and off.

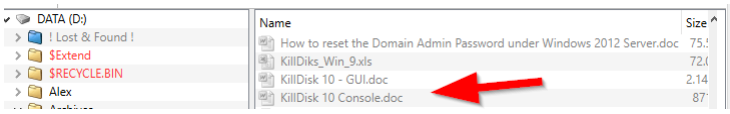


Figure 74: Deleted Files in the File Browser

Grey files indicate deleted files that have not been sanitized. These files are recoverable. Running `KillDisk`'s *Wipe* operation will ensure these files are unrecoverable and make these grey files disappear from the file browser.

Note: Found deleted files will appear in their original directory (before they were deleted). The **! Lost & Found !** folder a virtual directory created for found deleted files where the directory information is not discovered by the application.

Disk Viewer

`KillDisk`'s Disk Viewer allows users to view the contents of connected drives on a sector's level in a hexadecimal view. To launch it, select a disk to be inspected and click `Browse Disk` toolbar button.

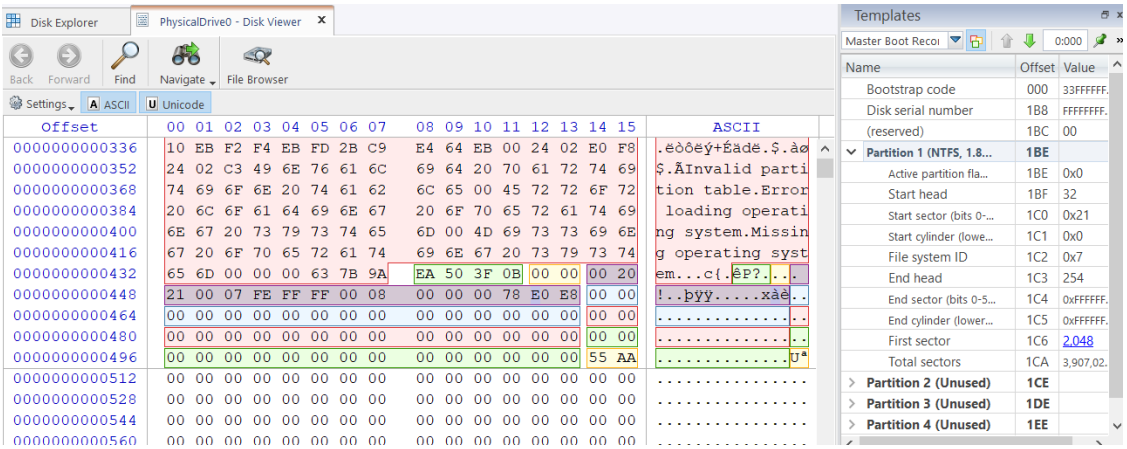


Figure 75: Disk Viewer with the MBR Template

To make it easier to navigate the Hex Editor view, `KillDisk` also offers a list of templates to help display the organization of the sectors on the disk by colored sections. The above uses the MBR template, below is a template for NTFS file system boot sector.

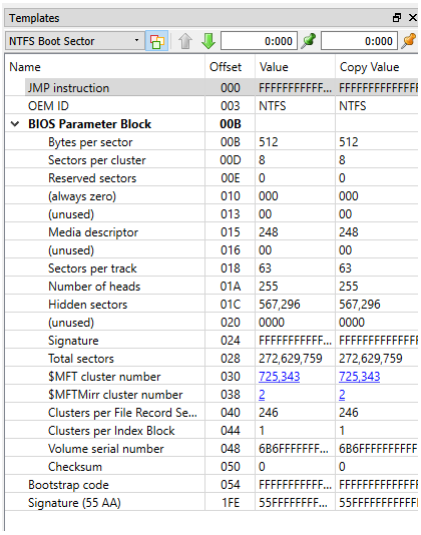


Figure 76: NTFS Boot Sector Template

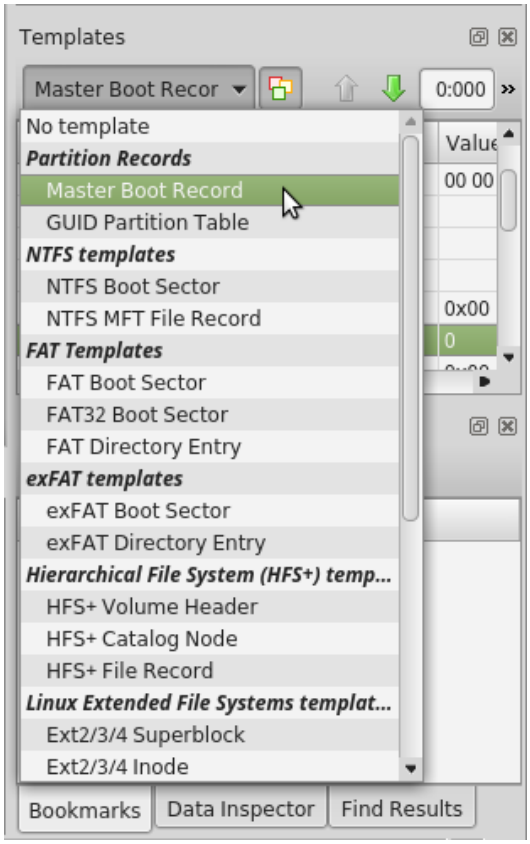


Figure 77: Disk Viewer Templates

The Disk Viewer also includes a `Find` feature, for locating specific data in the low-level disk view

Find what

Input the characters you are searching for in ANSI, Hex or Unicode

Search Direction

If you have an idea of where the data may be located, specify where to search

Not

Search for characters that do not correspond to the **Find what** parameter

Ignore case

Disables case-sensitivity in the search

Use

Select between `Regular Expressions` and `Wildcards`

Per block search

To speed up the search process, if you are familiar with the position of the data in the data block, you may specify a search with an offset or beginning of the object

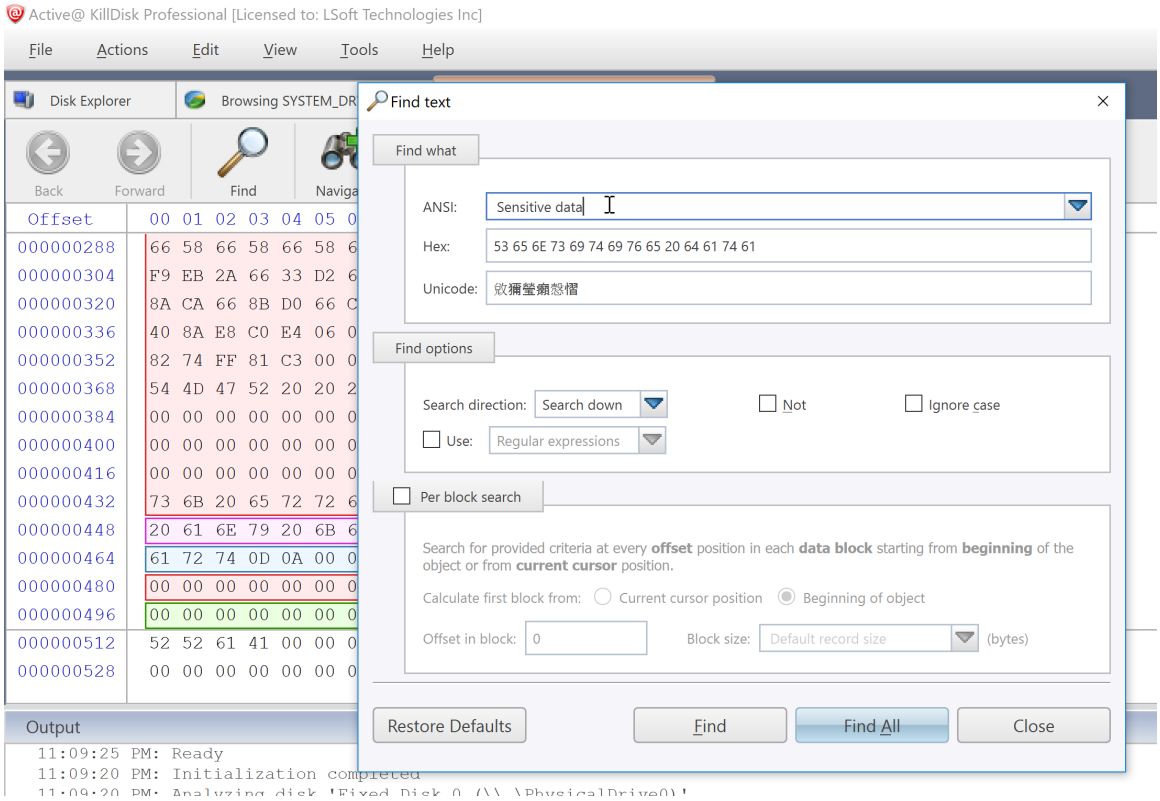


Figure 78: Finding Data

Disk Viewer's `Navigate` feature, located on toolbar allows:

Go to Offset

Jumps to the particular offset that needs to be entered manually in a decimal or hexadecimal form

Go to Sector

Jumps to the particular sector or cluster on the disk

Partition Table

Jumps to the sector where partition table is located, for example to the first sector on MBR disks

Partition Table

Jumps to the sector where partition table is located, for example to the first sector on MBR disks

Particular Partition

Lists all partitions and allows to jump to the boot sectors, to the beginning and to the end of any available partition.

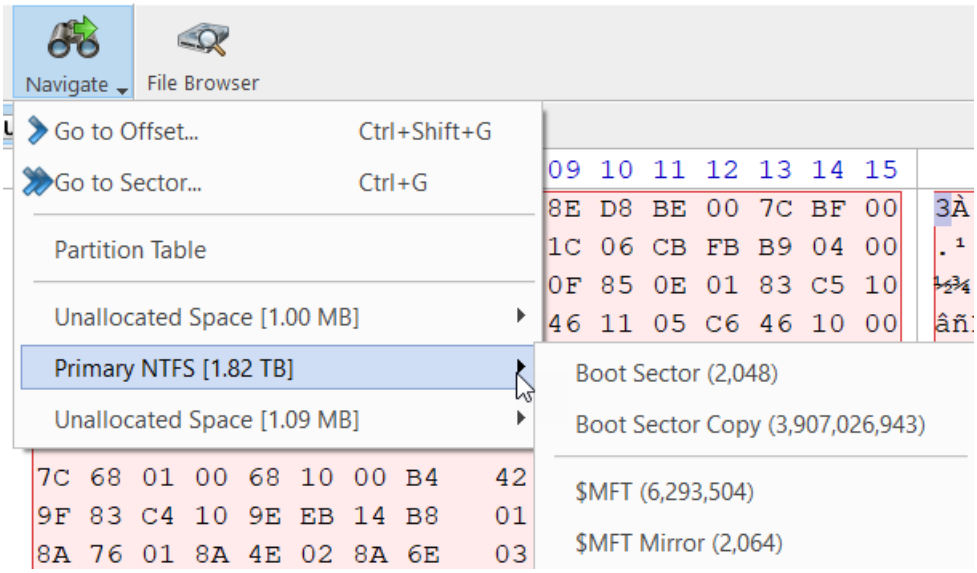


Figure 79: Disk Viewer Navigation Options

SMART Monitor

KillDisk supports displaying SMART information pertaining to the disks it sees. This is done simply by navigating to the file menu bar and selecting **Tools** > **SMART Monitor**. This will open the SMART Monitor window shown below.

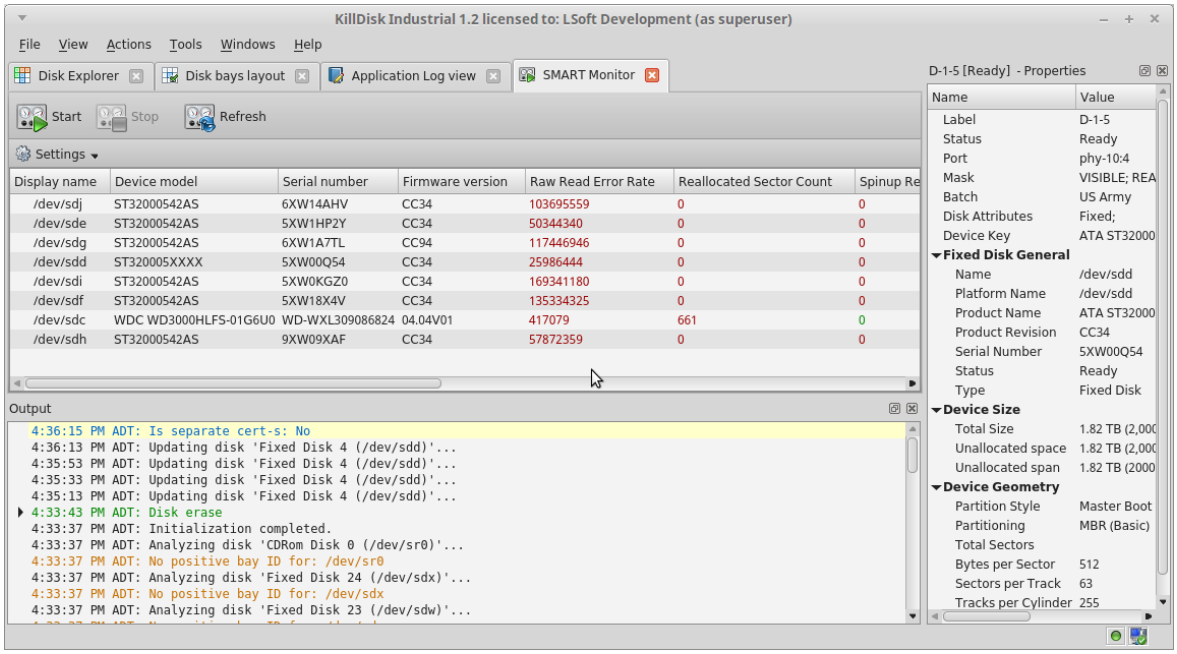


Figure 80: SMART Monitor

SMART Information

The SMART Monitor displays a list of all discovered disks and shows the SMART information next to them in table format. The following SMART information is shown as separate columns:

- Display Name
- Device Model

- Serial Number
- Firmware Version
- Read Error Rate
- Reallocated Sectors Count
- Spin-up Retries
- Command Timeout
- Reallocated Event Count
- Current Pending Sectors
- Reported Uncorrectable Errors
- Soft Read Error Rate
- Read Error Retry Rate

Configurable Settings

In the **Settings** drop-down menu on a toolbar, these are the parameters that can be configured:

Monitored disks

Here you have the option to either display **All Disks** seen by the system, or only the **Active** (processing) disks.

Refresh Rate

This specifies the interval in seconds between updates to the SMART information displayed when the SMART Monitor is running.

Running the SMART Monitor

The SMART monitor can either be refreshed manually or run to keep the information current. To run the SMART monitor, simply click the **Start** button in the action toolbar. To pause or stop auto-refreshing sequence click **Pause** or **Stop** buttons in view's toolbar respectively.

Note:

SMART Monitoring is a process that requires a lot of resources. It can slow down erase/wipe/examine process significantly. We advise you to avoid querying SMART information very often.

Erase History Log

Erase History is a feature that allows you to oversee all your operations from within KillDisk Industrial. Once any KillDisk Industrial operation completes, the results of this operation are added to the Erase History log stored in the local database, and are available to use with any of the features explained below.

To access the `Erase History` do one of:

1. In the file menu bar, navigate to **Tools** > **Erase History** or
2. Press **CTRL + L**

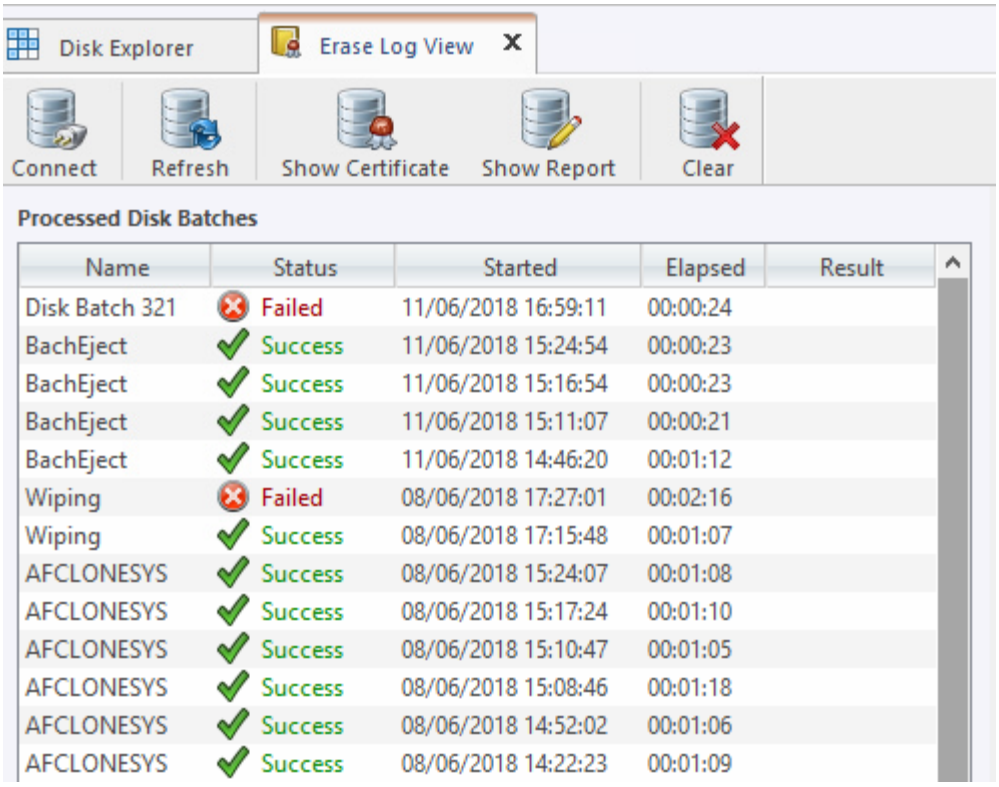


Figure 81: Erase History Log View

Action Toolbar Options

Connect

Allows you to connect to your external database to export erase logs. After providing credentials to log into the database, KillDisk Industrial will be able to export certificates and reports, as well as erase history to the external SQL database

Disconnect

Disconnects and stops exporting to the external SQL database, however Erase History still kept and accumulating in the local database

Refresh

Refreshes the erase history to reflect any recently completed operations

Show Certificate

Shows the corresponding PDF erase certificate for the selected erase operation

Show Report

Shows the corresponding erase report for the selected erase operation

Clear

Clears the erase history

Additional Options

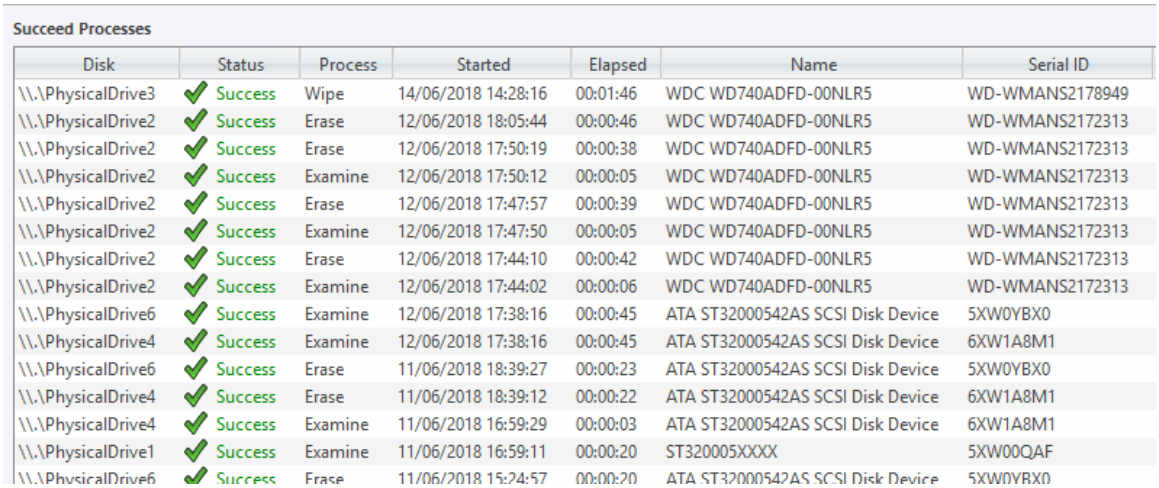
Show Batches View

Rather than showing history for each individual disk, batches are displayed together

Filter

Filter the operations displayed by success rate, batching, or display all

For the individual disk history, completed processes can be viewed and sorted by important attributes like Serial Number, size, date and more:



Succeed Processes

Disk	Status	Process	Started	Elapsed	Name	Serial ID
\\.\PhysicalDrive3	Success	Wipe	14/06/2018 14:28:16	00:01:46	WDC WD740ADFD-00NLR5	WD-WMANS2178949
\\.\PhysicalDrive2	Success	Erase	12/06/2018 18:05:44	00:00:46	WDC WD740ADFD-00NLR5	WD-WMANS2172313
\\.\PhysicalDrive2	Success	Erase	12/06/2018 17:50:19	00:00:38	WDC WD740ADFD-00NLR5	WD-WMANS2172313
\\.\PhysicalDrive2	Success	Examine	12/06/2018 17:50:12	00:00:05	WDC WD740ADFD-00NLR5	WD-WMANS2172313
\\.\PhysicalDrive2	Success	Erase	12/06/2018 17:47:57	00:00:39	WDC WD740ADFD-00NLR5	WD-WMANS2172313
\\.\PhysicalDrive2	Success	Examine	12/06/2018 17:47:50	00:00:05	WDC WD740ADFD-00NLR5	WD-WMANS2172313
\\.\PhysicalDrive2	Success	Erase	12/06/2018 17:44:10	00:00:42	WDC WD740ADFD-00NLR5	WD-WMANS2172313
\\.\PhysicalDrive2	Success	Examine	12/06/2018 17:44:02	00:00:06	WDC WD740ADFD-00NLR5	WD-WMANS2172313
\\.\PhysicalDrive6	Success	Examine	12/06/2018 17:38:16	00:00:45	ATA ST32000542AS SCSI Disk Device	5XW0YBX0
\\.\PhysicalDrive4	Success	Examine	12/06/2018 17:38:16	00:00:45	ATA ST32000542AS SCSI Disk Device	6XW1A8M1
\\.\PhysicalDrive6	Success	Erase	11/06/2018 18:39:27	00:00:23	ATA ST32000542AS SCSI Disk Device	5XW0YBX0
\\.\PhysicalDrive4	Success	Erase	11/06/2018 18:39:12	00:00:22	ATA ST32000542AS SCSI Disk Device	6XW1A8M1
\\.\PhysicalDrive4	Success	Examine	11/06/2018 16:59:29	00:00:03	ATA ST32000542AS SCSI Disk Device	6XW1A8M1
\\.\PhysicalDrive1	Success	Examine	11/06/2018 16:59:11	00:00:20	ST320005XXXX	5XW00QAF
\\.\PhysicalDrive6	Success	Erase	11/06/2018 15:24:57	00:00:20	ATA ST32000542AS SCSI Disk Device	5XW0YBX0

Export Log to SQL Database

KillDisk Industrial's `Export` feature allows to send out all current logs, certificates and reports from locally stored database over the network to the external SQL database. Both local Erase History and all future transactions can be exported after connection to database is established.

Connection to SQL Databases supported:

- Microsoft SQL Server
- ORACLE
- PostgreSQL
- MySQL

To connect to the external SQL database do one of:

1. Navigate to **File** > **Preferences** or press **F10**. Then click **Database Export** tab on the left
2. Alternatively, on the file menu bar, navigate to **Tools** > **Erase History** or press **CTRL + L**. Then click **Connect** toolbar button
3. `Database Export` dialog appears:

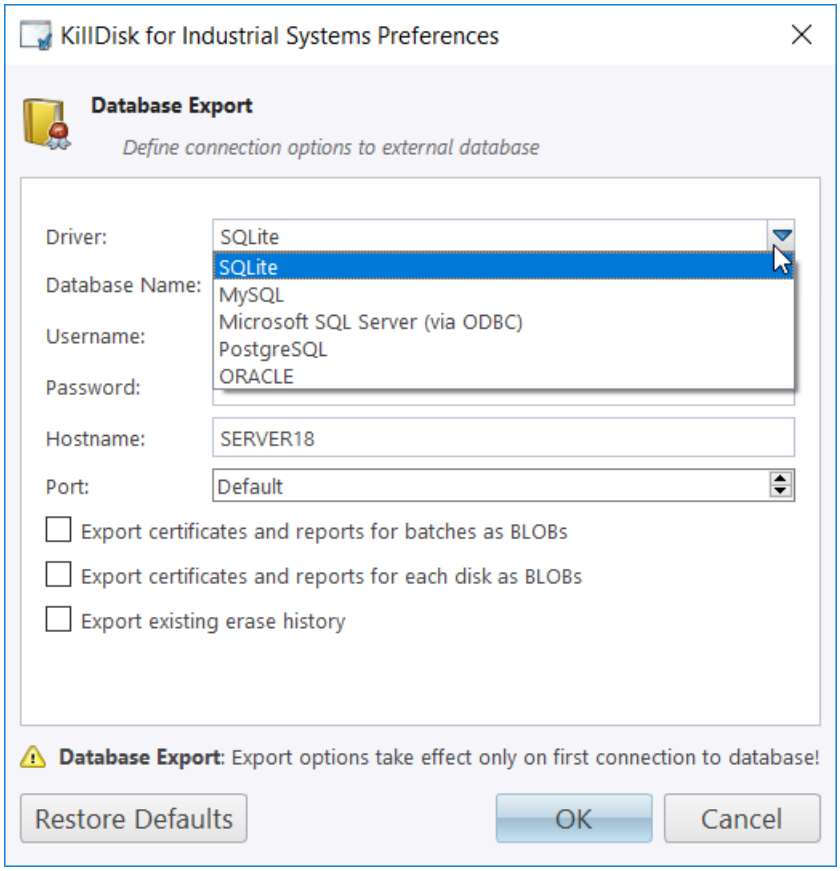


Figure 82: Database Export Dialog

4. Select Driver for the particular database you want to connect to from the list of databases
5. Type in the Database Name on the remote end
6. Type in the database Username for the connection
7. Type in the database password for the selected user
8. Type in the Hostname (which can be IP address or local Network Server Name)
9. Select a TCP/IP Port to use, if it is different from the defaut value for the particular database
10. Set check marks, if needed, for the additional export options:
    - Export certificates and reports for batches
    - Export certificates and reports for particular disks
    - Export existing erase history (can be done the only once per a new connection)
11. Click **OK** to test connection and store connection parameters in settings for future use

Once a connection to the external SQL database established, KillDisk Industrial starts exporting all information related to the current operations automatically.

Note:

For the database export to be successful you need to provide a database user with privileges enough for creation two tables (**DISKS** and **BATCHES**) and populating these tables with current operation's parameters.

Troubleshooting and System Recovery

In the event that you encounter technical difficulties with `KillDisk`, you may choose to either troubleshoot the system yourself with the files describe or, if you have active support and updates (you receive 1 year free with your purchase), contact our support team and attach your application log and hardware configuration file.

Common Troubleshooting Tips

Active@ KillDisk Troubleshooting:

Disk data will not erase

Ensure you are not erasing the system disk from the application. Use the boot disk to erase system disks

Data still found after a 'Wipe' operation

The Wipe operation will only sanitize data that has already been deleted in the OS. To sanitize all the data, including the operating system, use the 'Kill' operation

Erased the wrong disk

Stop the operation as soon as possible. Once data is sanitized by KillDisk, it will no longer be accessible. Use a tool like Active@ File Recovery to recover any data that has not been sanitized

Application Log

This log view monitors each action taken by the application and displays messages, notifications and other service information. Use the messages in this screen to observe and further understand the flow of the recovery process.

To open and activate Application log view do one of the following:

- From main menu choose **Tools** > **Application Log** or
- Use **F8** keyboard shortcut at any time

It is best to save the log file to a physical disk that is different from the disk that holds the deleted data. By doing this, you reduce the risk of writing over the data that you are trying to recover.

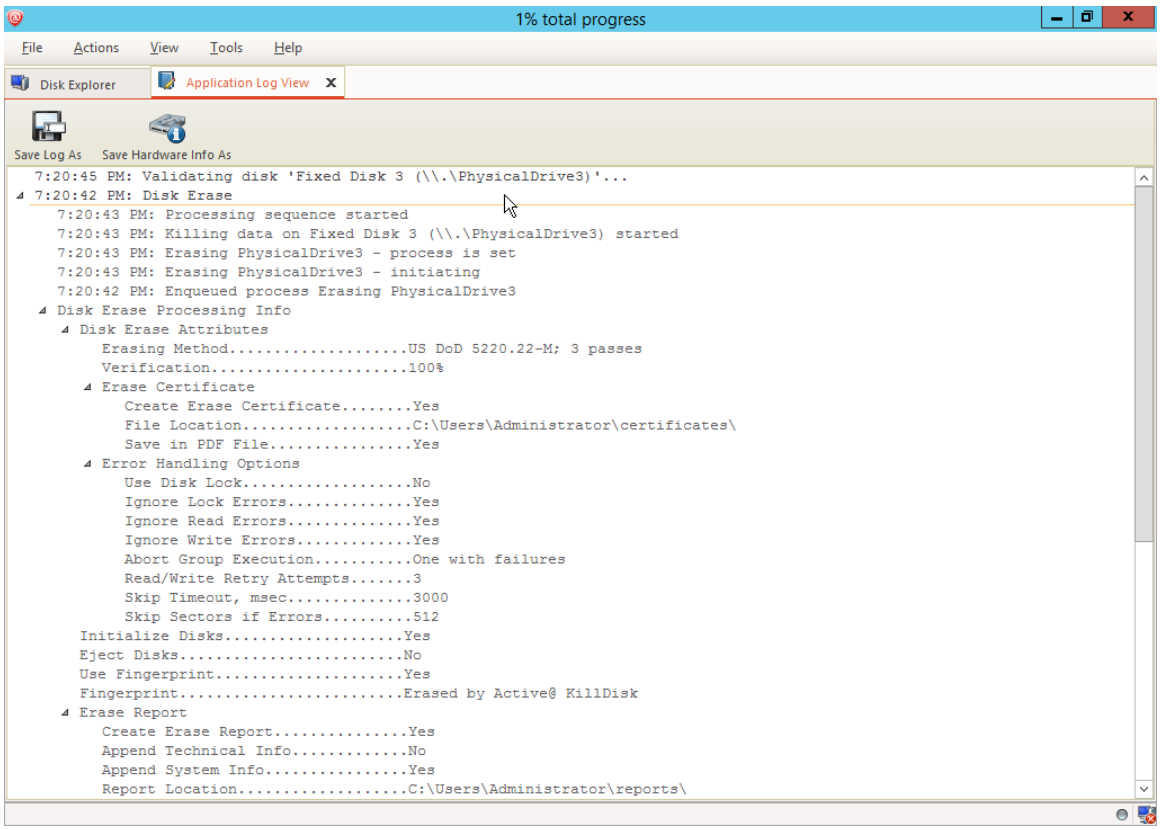


Figure 83: Viewing the application log

Log filter

Show or hide specific entry types in log view:

Show warning entries

Show non-critical warning entries

Show advanced entries

Show advanced entries related to application behavior and data analysis

Show console entries

Duplicate console entries into main log view

Show system entries

Show entries related to operating system activity and state

Font size

Change size of mono-space font used in log view for better experience

Write log on Disk

Writes log entries in dedicated file on disk, located in application directory. **Off** by default.

Expand and Collapse

Expand or collapse all log entries respectively

Clear

Clear log for current application sessions

Tip: We recommend that you attach a copy of the log file to all requests made to our technical support group. The entries in this file will help us resolve certain issues.

Hardware Diagnostic File

If you want to contact our technical support staff for help, a file that contains a summary of your local devices is helpful.

`KillDisk` allows you to create a summary listing file in XML format. This data format is “human-readable” and can help our technical support staff analyze your computer configuration or point out disk failures or abnormal behavior.

Create a hardware diagnostic file from the **File** menu by clicking the **Save Hardware Info as...** command.

Note: To save time when contacting our technical support staff, we highly recommend that you provide us with a hardware diagnostic file.

Appendix

Glossary

BIOS settings

Basic Input Output Subsystem. This programmable chip controls how information is passed to various devices in the computer system. A typical method to access the BIOS settings screen is to press F1, F2, F8, F10 or ESC during the boot sequence.

boot priority

BIOS settings allow you to run a boot sequence from a floppy drive, a hard drive, a CD/DVD-ROM drive or a USB device. You may configure the order that your computer searches these physical devices for the boot sequence. The first device in the order list has the first boot priority. For example, to boot from a CD/DVD-ROM drive instead of a hard drive, place the CD/DVDROM drive ahead of the hard drive in priority.

compressed cluster

When you set a file or folder property to compress data, the file or folder uses less disk space. While the size of the file is smaller, it must use a whole cluster in order to exist on the hard drive. As a result, compressed clusters contain "file slack space". This space may contain residual confidential data from the file that previously occupied this space. KillDisk can wipe out the residual data without touching the existing data.

cluster

A logical group of disk sectors, managed by the operating system, for storing files. Each cluster is assigned a unique number when it is used. The operating system keeps track of clusters in the hard disk's root records or MFT records. (See lost cluster).

file slack space

The smallest file (and even an empty folder) takes up an entire cluster. A 10- byte file will take up 2,048 bytes if that is the cluster size. File slack space is the unused portion of a cluster. This space may contain residual confidential data from the file that previously occupied this space. KillDisk can wipe out the residual data without touching the existing data.

free cluster

A cluster that is not occupied by a file. This space may contain residual confidential data from the file that previously occupied this space. KillDisk can wipe out the residual data.

deleted boot records

All disks start with a boot sector. In a damaged disk, if the location of the boot records is known, the partition table can be reconstructed. The boot record contains a file system identifier.

ISO

An International Organization for Standardization ISO-9660 file system is a standard CD-ROM file system that allows you to read the same CD-ROM whether you're on a PC, Mac, or other major computer platform. Disk images of ISO-9660 file systems (ISO images) are a common way to electronically transfer the contents of CD-ROMs. They often have the filename extension .ISO (though not necessarily), and are commonly referred to as "ISOs".

lost cluster

A cluster that has an assigned number in the file allocation table, even though it is not assigned to any file. You can free up disk space by reassigning lost clusters. In DOS and Windows, you can find lost clusters with the ScanDisk utility.

MFT records

Master File Table. A file that contains the records of every other file and directory in an NTFS-formatted hard disk drive. The operating system needs this information to access the files.

PXE

Preboot Execution Environment - In computing, the Preboot eXecution Environment specification describes a standardized client-server environment that boots a software assembly, retrieved from a network, on PXE-enabled clients. On the client side it requires only a PXE-capable network interface controller, and uses a small set of industry-standard network protocols such as DHCP and TFTP.

root records

File Allocation Table. A file that contains the records of every other file and directory in a FAT-formatted hard disk drive. The operating system needs this information to access the files. There are FAT32, FAT16 and FAT versions.

sector

The smallest unit that can be accessed on a disk. Tracks are concentric circles around the disk and the sectors are segments within each circle.

unallocated space

Space on a hard disk where no partition exists. A partition may have been deleted or damaged or a partition may not have been created.

unused space in MFT records

The performance of the computer system depends a lot on the performance of the MFT. When you delete files, the MFT entry for that file is not deleted, it is marked as deleted. This is called unused space in the MFT. If unused space is not removed from the MFT, the size of the table could grow to a point where it becomes fragmented, affecting the performance of the MFT and possibly the performance of the computer. This space may also contain residual confidential data (file names, file attributes, resident file data) from the files that previously occupied these spaces. KillDisk can wipe out the residual data without touching the existing data.

Windows system caching

Windows reserves a specified amount of volatile memory for file system operations. This is done in RAM because it is the quickest way to do these repetitive tasks.

Windows system records

The Windows registry keeps track of almost everything that happens in windows. This enhances performance of the computer when doing repetitive tasks. Over time, these records can take up a lot of space.

Erase Disk Concepts

Erasing Confidential Data

Modern methods of data encryption are deterring network attackers from extracting sensitive data from stored database files.

Attackers who want to retrieve confidential data are becoming more resourceful by looking into places where data might be stored temporarily. For example, the Windows **DELETE** command merely changes the files attributes and location so that the operating system will not look for the file. The situation with NTFS is similar.

One avenue of attack is the recovery of data from residual data on a discarded hard drive. When deleting confidential data from hard drives, removable disks or USB devices, it is important to extract all traces of the data so that recovery is not possible.

Most official guidelines regarding the disposal of confidential magnetic data do not take into account the depth of today's recording densities, nor the methods used by the operating system when removing data.

Removal of confidential personal information or company trade secrets in the past might have been performed using the **FORMAT** command or the **FDISK** command. Ordinarily, using these procedures gives users a sense of confidence that the data has been completely removed.

When using the **FORMAT** command, Windows displays a message like this:

```
Important: Formatting a disk removes all information from the disk.
```

The FORMAT utility actually creates new FAT and ROOT tables, leaving all previous data on the disk untouched. Moreover, an image of the replaced FAT and ROOT tables is stored, so that the **UNFORMAT** command can be used to restore them.

FDISK merely cleans the Partition Table (located in the drive's first sector) and does not touch anything else.

Moreover, most of hard disks contain hidden zones (disk areas that cannot be accessed and addressed on a logical access level). KillDisk is able to detect and reset these zones, cleaning up the information inside.

Advanced Data Recovery Systems

Advances in data recovery have been made such that in many cases data can be reclaimed from hard drives that have been wiped and disassembled.

Security agencies use advanced applications to find cybercrime-related evidence. There also are established industrial spy agencies adopting sophisticated channel coding techniques such as **Partial Response Maximum Likelihood (PRML)**, a technique used to reconstruct the data on magnetic disks.

Other methods include the use of magnetic force microscopy and recovery of data based on patterns in erase bands.

Although there are very sophisticated data recovery systems available at a high price, data can easily be restored with the help of an off-the-shelf data recovery utility like *Active@ File Recovery*, making your erased confidential data quite accessible.

Using our powerful and compact **Active@ KillDisk** utility, all data on your Hard Disk Drive/Solid State Disk or removable USB drive can be destroyed without the possibility of future recovery.

After using **Active@ KillDisk**, disposal, recycling, selling or donating your storage device can be done with peace of mind.

International Standards in Data Removal

Active@ KillDisk conforms to more than twenty international standards for clearing and sanitizing data (US DoD 5220.22-M, Gutmann and others). You can be sure that sensitive information is destroyed forever once you erase a disk with Active@ KillDisk.

Active@ KillDisk is a quality security application that destroys data permanently on any computer that can be started using a bootable CD/DVD-ROM or USB Flash Disk. Access to the drive's data is made on the physical level via the BIOS (Basic Input-Output Subsystem), bypassing the operating system’s logical drive structure organization. Regardless of the operating system, file systems, or type of machine, this utility can destroy all data on all storage devices. It does not matter which operating systems or file systems are located on the machine.

Wipe Disk Concepts

Wiping Confidential Data from Unoccupied Disk's Space

You may have confidential data on your hard drive in spaces where data may have been stored temporarily.

You may also have deleted files by using the Windows Recycle Bin and then emptying it. While you are still using your local hard drive, there may be confidential information available in these unoccupied spaces.

Wiping the logical drive's deleted data does not delete existing files and folders. It processes all unoccupied drive space so that recovery of previously deleted files becomes impossible.

Installed applications and existing data are not touched by this process. When you wipe unoccupied drive space, the process is run from the bootable CD/DVD operating system. As a result, the wipe or erase process uses an operating system that is outside the local hard drive and is not impeded by Windows system caching. This means that deleted Windows system records can be wiped clean.

KillDisk wipes unused data residue from file slack space, unused sectors, and unused space in MTF records or directory records.

Wiping drive space can take a long time, so do this when the system is not being otherwise utilized. For example, this can be done overnight.

Wipe Algorithms

The process of deleting files does not eliminate them from the hard drive. Unwanted information may still be left available for recovery on the computer. A majority of software that advertises itself as performing reliable deletions simply wipes out free clusters. Deleted information may be kept in additional areas of a drive. KillDisk therefore offers different wipe algorithms to ensure secure deletion: overwriting with zeros, overwriting with random values, overwriting with multiple passes using different patterns and much more. KillDisk supports more than 20 international data sanitizing standards, including US DoD 5220.22M and the most secure Gutmann's method overwriting with 35 passes.

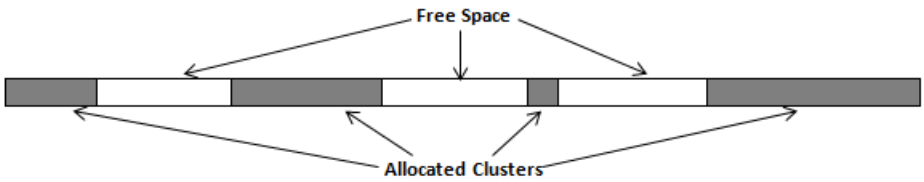


Figure 84: Disk free space and allocated clusters

Wiping File Slack Space

This relates to any regular files located on any file system. Free space to be wiped is found in the "tail" end of a file because disk space is usually allocated in 4 KB clusters. Most files have sizes that are not 4KB increments and thus have slack space at their end.

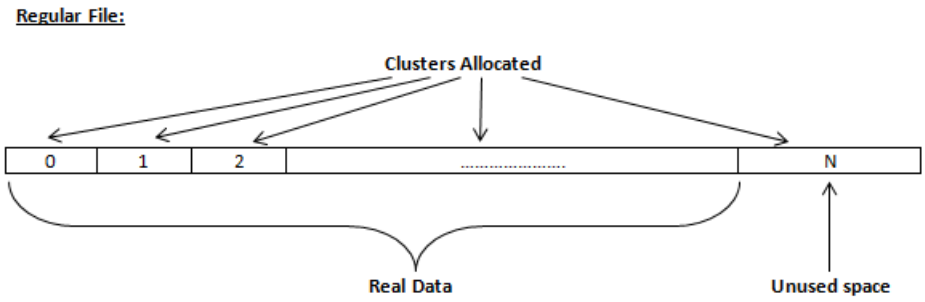


Figure 85: Disk free space and allocated clusters

Specifics of Wiping Microsoft NTFS File System

NTFS Compressed Files

Wiping free space inside a file: The algorithm NTFS uses to "compress" a file operates by separating the file into compressed blocks (usually 64KB long). After it is processed, each of these blocks has been allocated a certain amount of space on the volume. If the compressed information takes up less space than the source file, then the rest of the space is labeled as sparse space and no space on the volume is allocated to it. Because the compressed data often doesn't have a size exactly that of the cluster, the end of each of these blocks stays as unusable space of significant size. Our algorithm goes through each of these blocks in a compressed file and wipes the unusable space, erasing previously deleted information that was kept in those areas.

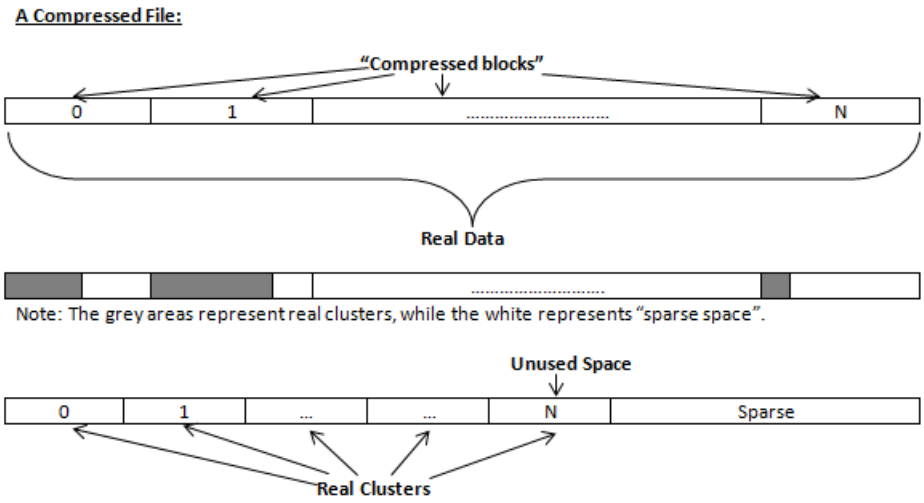


Figure 86: Compressed file structure

The MFT (Master File Table) Area

Wiping the system information:

The $MFT file contains records, describing every file on the volume. During the deletion of these files, the records of their deletion are left untouched - they are simply recorded as "deleted". Therefore file recovery software can use this information to recover anything from the name of the file and the structure of the deleted directories down to files smaller than 1KB that are able to be saved in the MFT directly. The algorithm used by KillDisk wipes all of the unused information out of the MFT records and wipes the unusable space, making a recovery process impossible.

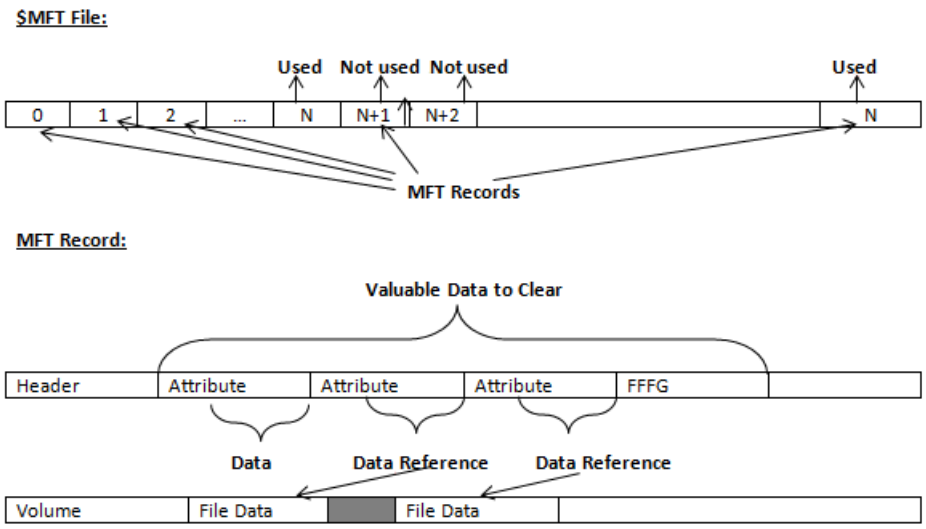


Figure 87: MFT structure

Specifics of Wiping Microsoft FAT File System

Wiping Directory Areas

Each directory on a FAT/FAT32 or an exFAT volume can be considered as a specific file, describing the contents of the directory. Inside this descriptor there are many 32-byte records, describing every file and other inner folders.

When you delete files this data is not being fully erased. It is just marked as deleted (hex symbol 0xE5). That's why data recovery software can detect and use these records to restore file names and full directory structures.

In some cases dependent on whether a space where item located has been overwritten yet or not, files and folders can be fully or partially recovered..

Active@ KillDisk makes data recovery impossible by using an algorithm that wipes out all unused information from directory descriptors. Active@ KillDisk not only removes unused information, but also **defragments** Directory Areas, thus speeding up directory access.

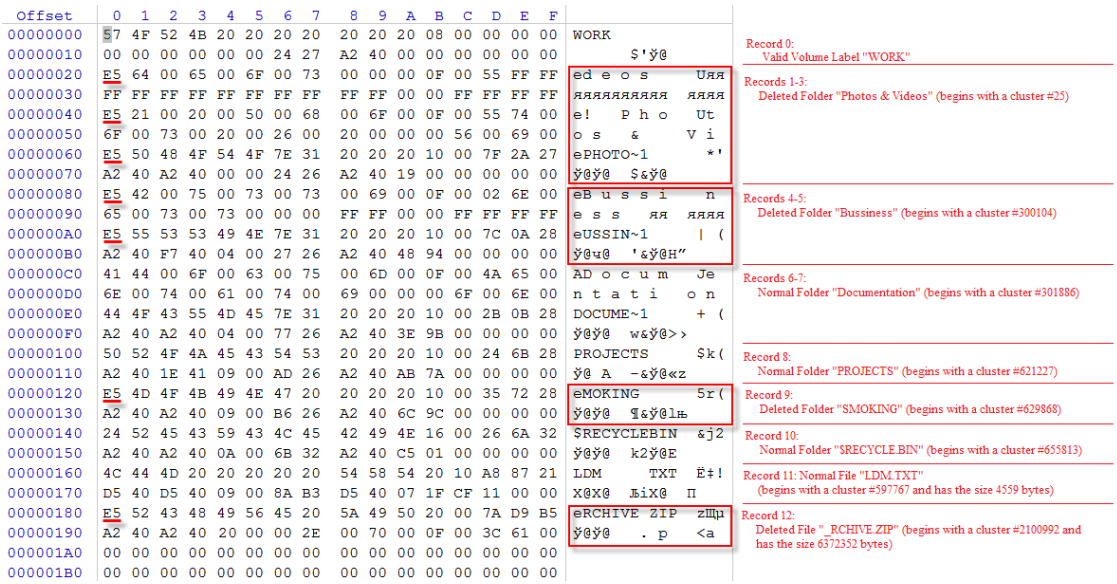


Figure 88: This is how Directory Area looks before Wiping, red rectangles display deleted records

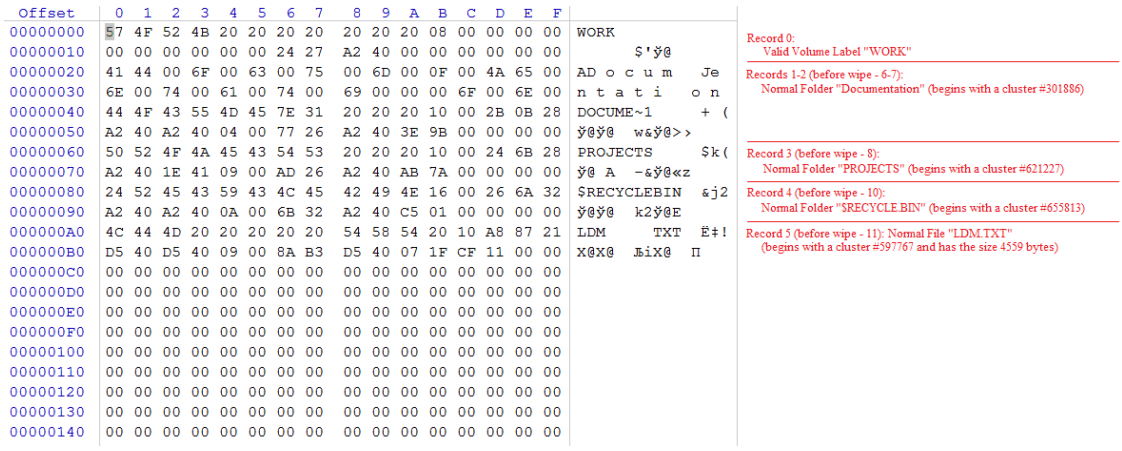


Figure 89: Directory Area after Wiping: all deleted records removed, root defragmented

Specifics of Wiping Apple HFS+ File System

HFS+ B-tree

A B-tree file is divided up into fixed-size nodes, each of which contains records consisting of a key and some data.

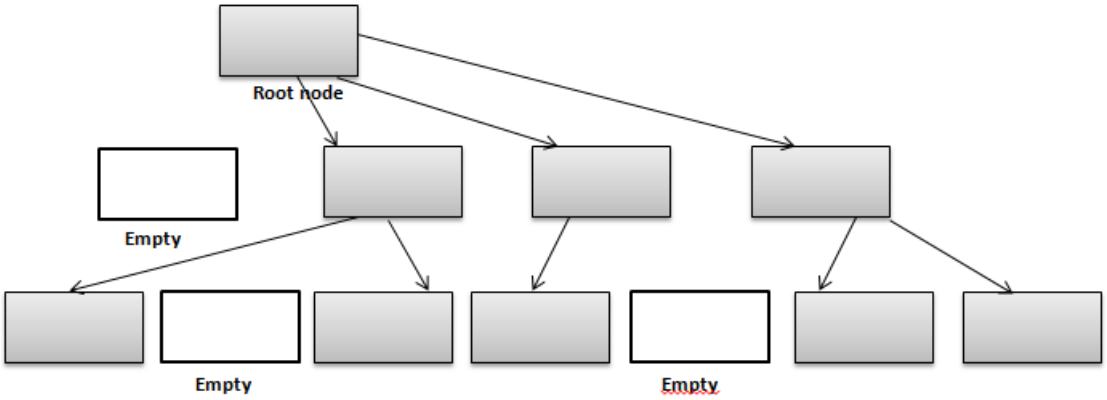


Figure 90: B-tree structure

In the event of the deletion of a file or folder, there is a possibility of recovering the metadata of the file, (such as its name and attributes), as well as the actual data that the file consists of. KillDisk's Wipe method clears out all of this free space in the system files.

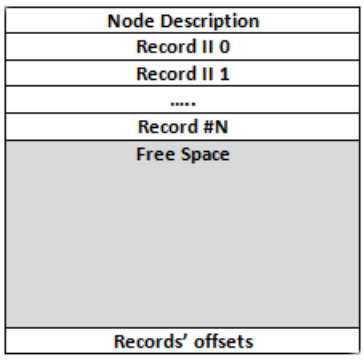


Figure 91: HFS+ system table

Specifics of Wiping Linux Ext2/Ext3/Ext4 File Systems

A Linux Ext file system (Ext2/Ext3/Ext4) volume has a global descriptors table. Descriptors table records are called group descriptors and describe each blocks group. Each blocks group has an equal number of data blocks.

A data block is the smallest allocation unit: size vary from 1024 bytes to 4096 bytes. Each group descriptor has a blocks allocation bitmap. Each bit of the bitmap shows whether the block is allocated (1) or available (0). KillDisk software enumerates all groups, and for each and every block within the group on the volume checks the related bitmap to define its availability. If the Block is available, KillDisk wipes it using the method supplied by the user.

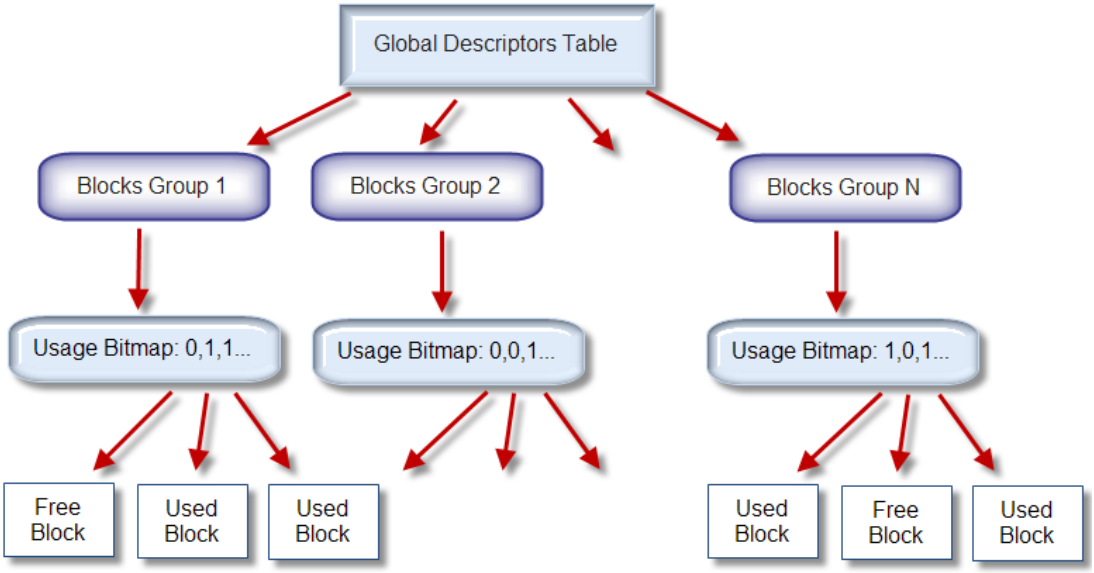


Figure 92: Ext2/Ext3/Ext4 descriptors table

Erase Methods / Sanitation Standards

One Pass Zeros or One Pass Random

When using One Pass Zeros or One Pass Random, the number of passes is fixed and cannot be changed. When the write head passes through a sector, it writes only zeros or a series of random characters.

US DoD 5220.22-M

The write head passes over each sector three times. The first time with zeros (0x00), second time with 0xFF and the third time with random characters. There is one final pass to verify random characters by reading.

Canadian CSEC ITSG-06

The write head passes over each sector, writing a Random character. On the next pass, writes the compliment of previously written character. Final pass is Random, proceeded by a verify.

Canadian OPS-II

The write head passes over each sector seven times (0x00, 0xFF, 0x00, 0xFF, 0x00, 0xFF, Random). There is one final pass to verify random characters by reading.

British HMG IS5 Baseline

Baseline method overwrites disk's surface with just zeros (0x00). There is one final pass to verify random characters by reading.

British HMG IS5 Enhanced

Enhanced method - the write head passes over each sector three times. The first time with zeros (0x00), second time with 0xFF and the third time with random characters. There is one final pass to verify random characters by reading.

Russian GOST p50739-95

The write head passes over each sector two times. (0x00, Random). There is one final pass to verify random characters by reading.

US Army AR380-19

The write head passes over each sector three times. The first time with 0xFF, second time with zeros (0x00) and the third time with random characters. There is one final pass to verify random characters by reading.

US Air Force 5020

The write head passes over each sector three times. The first time with random characters, second time with zeros (0x00) and the third time with 0xFF. There is one final pass to verify random characters by reading.

Navso P-5329-26 RL

RL method - the write head passes over each sector three times (0x01, 0x27FFFFFF, Random).

There is one final pass to verify random characters by reading.

NCSC-TG-025

The write head passes over each sector three times (0x00, 0xFF, Random). There is one final pass to verify random characters by reading.

NSA 130-2

The write head passes over each sector two times (Random, Random). There is one final pass to verify random characters by reading.

NIST 800-88

Supported three NIST 800-88 media sanitization standards:

1. The write head passes over each sector one time (0x00).

2. The write head passes over each sector one time (Random).

3. The write head passes over each sector three times (0x00, 0xFF, Random).

For details about this,the most secure data clearing standard, you can read the original article at the link below:*http://csrc.nist.gov/publications/nistpubs/800-88/NISTSP800-88_with-errata.pdf*

German VSITR

The write head passes over each sector seven times.

Bruce Schneier

The write head passes over each sector seven times (0xFF, 0x00, Random, Random, Random, Random, Random). There is one final pass to verify random characters by reading.

Peter Gutmann

The write head passes over each sector 35 times. For details about this, the most secure data clearing standard, you can read the original article at the link below:

http://www.cs.auckland.ac.nz/%7Epgut001/pubs/se%0Acure_del.html

Australian ISM-6.2.93

The write head passes over each sector once with random characters. There is one final pass to verify random characters by reading.

User Defined

User indicates the number of times the write head passes over each sector. Each overwriting pass is performed with a buffer containing random characters. Enables user to define any disk erase algorithm.

File Name Tags

Sequence number

Sequential number, used for group (batch) processing.

{Sequence #}

{Sequence 0#}

{Sequence 00#}

{Sequence 000#}

Date

Date file name tag uses current date in most cases in different formats:

{Date(YYYYMMDD)}

{Date(YYYY-MM-DD)}

{Date(YYMMDD)}

{Date(YYYY)}

{Date(YY)}

{Date(Month)}

{Date(MM)}

{Date(DD)}

Time name tags

{Time(HHmmss)}

{Time(HH-mm-ss)}

{Time(HH)}

{Time(mm)}

{Time(ss)}

Disk name tags

Values for these name tags retrieved from context device:

{Serial ID}
Disk serial number, retrieved from OS or from SMART attributes

{Platform ID}
Disk platform identification (may be vary due to OS format);

{Product ID}
Disk manufacturer id

{Model}
Disk model name (if available);

{Size}
Disk size in gigabytes

{Sectors}
Disk size in sectors

Processing attributes

Disk processing attributes based on execution conditions:

{BatchName}
Batch name, if part of a batch processing.

{BayName}
Label of disk bay (slot).

{Status}
Overall completion status for group processing or separate disk processing status.

Disk Hidden Zones (HPA/DCO)

Active@ KillDisk is able to detect and reset disk's hidden zones: HPA and DCO.

HPA - Host protected area

The **host protected area** (**HPA**) is an area of a hard drive or solid-state drive that is not normally visible to an operating system. It was first introduced in the ATA-4 standard CXV (T13) in 2001.

How it works

The IDE controller has registers that contain data that can be queried using ATA commands. The data returned gives information about the drive attached to the controller. There are three ATA commands involved in creating and using a host protected area. The commands are:

- IDENTIFY DEVICE
- SET MAX ADDRESS
- READ NATIVE MAX ADDRESS

Operating systems use the IDENTIFY DEVICE command to find out the addressable space of a hard drive. The IDENTIFY DEVICE command queries a particular register on the IDE controller to establish the size of a drive.

This register however can be changed using the SET MAX ADDRESS ATA command. If the value in the register is set to less than the actual hard drive size then effectively a host protected area is created. It is protected because the OS will work with only the value in the register that is returned by the IDENTIFY DEVICE command and thus will normally be unable to address the parts of the drive that lie within the HPA.

The HPA is useful only if other software or firmware (e.g. BIOS) is able to use it. Software and firmware that are able to use the HPA are referred to as 'HPA aware'. The ATA command that these entities use is called READ NATIVE MAX ADDRESS. This command accesses a register that contains the true size of the hard drive. To use the area, the controlling HPA-aware program changes the value of the register read by IDENTIFY DEVICE to that found in the register read by READ NATIVE MAX ADDRESS. When its operations are complete, the register read by IDENTIFY DEVICE is returned to its original fake value.

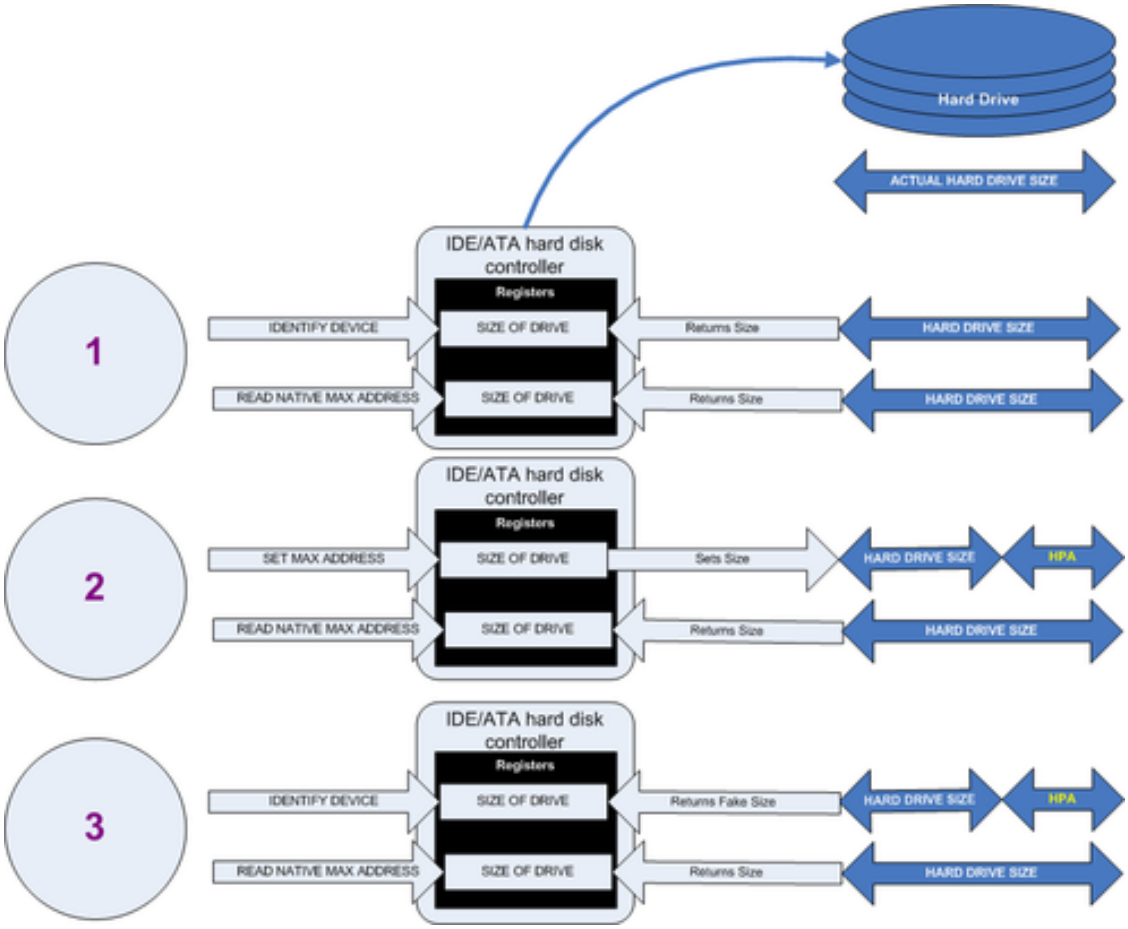


Figure 93: Creation of an HPA

The diagram shows how a host protected area (HPA) is created:

1. IDENTIFY DEVICE returns the true size of the hard drive. READ NATIVE MAX ADDRESS returns the true size of the hard drive.

2. SET MAX ADDRESS reduces the reported size of the hard drive. READ NATIVE MAX ADDRESS returns the true size of the hard drive. An HPA has been created.
3. IDENTIFY DEVICE returns the now fake size of the hard drive. READ NATIVE MAX ADDRESS returns the true size of the hard drive, the HPA is in existence.

Usage

- At the time HPA was first implemented on hard-disk firmware, some BIOS had difficulty booting with large hard disks. An initial HPA could then be set (by some jumpers on the hard disk) to limit the number of cylinder to 4095 or 4096 so that older BIOS would start. It was then the job of the bootloader to reset the HPA so that the operating system would see the full hard-disk storage space.
- HPA can be used by various booting and diagnostic utilities, normally in conjunction with the BIOS. An example of this implementation is the Phoenix FirstBIOS, which uses **Boot Engineering Extension Record** (**BEER**) and **Protected Area Run Time Interface Extension Services** (**PARTIES**). Another example is the Gujin installer which can install the bootloader in BEER, naming that pseudo-partition /dev/hda0 or /dev/sdb0; then only cold boots (from power-down) will succeed because warm boots (from Control-Alt-Delete) will not be able to read the HPA.
- Computer manufacturers may use the area to contain a preloaded OS for install and recovery purposes (instead of providing DVD or CD media).
- Dell notebooks hide Dell MediaDirect utility in HPA. IBM ThinkPad and LG notebooks hide system restore software in HPA.
- HPA is also used by various theft recovery and monitoring service vendors. For example, the laptop security firm Computrace use the HPA to load software that reports to their servers whenever the machine is booted on a network. HPA is useful to them because even when a stolen laptop has its hard drive formatted the HPA remains untouched.
- HPA can also be used to store data that is deemed illegal and is thus of interest to government and police
- Some vendor-specific external drive enclosures (Maxtor) are known to use HPA to limit the capacity of unknown replacement hard drives installed into the enclosure. When this occurs, the drive may appear to be limited in size (e.g. 128 GB), which can look like a BIOS or dynamic drive overlay (DDO) problem. In this case, one must use software utilities (see below) that use READ NATIVE MAX ADDRESS and SET MAX ADDRESS to change the drive's reported size back to its native size, and avoid using the external enclosure again with the affected drive.
- Some rootkits hide in the HPA to avoid being detected by anti-rootkit and antivirus software.
- Some NSA exploits use the HPA for application persistence.

DCO - Device configuration overlay

Device configuration overlay (**DCO**) is a hidden area on many of today's hard disk drives (HDDs). Usually when information is stored in either the DCO or host protected area (HPA), it is not accessible by the BIOS, OS, or the user. However, certain tools can be used to modify the HPA or DCO. The system uses the IDENTIFY_DEVICE command to determine the supported features of a given hard drive, but the DCO can report to this command that supported features are nonexistent or that the drive is smaller than it actually is. To determine the actual size and features of a disk, the DEVICE_CONFIGURATION_IDENTIFY command is used, and the output of this command can be compared to the output of IDENTIFY_DEVICE to see if a DCO is present on a given hard drive. Most major tools will remove the DCO in order to fully image a hard drive, using the DEVICE_CONFIGURATION_RESET command. This permanently alters the disk, unlike with the (HPA), which can be temporarily removed for a power cycle.

Usage

The Device Configuration Overlay (DCO), which was first introduced in the ATA-6 standard, "allows system vendors to purchase HDDs from different manufacturers with potentially different sizes, and then configure all HDDs to have the same number of sectors. An example of this would be using DCO to make an 80-gigabyte HDD appear as a 60-gigabyte HDD to both the (OS) and the BIOS.... Given the potential to place data in these hidden areas, this is an area of concern for computer forensics investigators. An additional issue for forensic investigators is imaging the HDD that has the HPA and/or DCO on it. While certain vendors claim that their tools are able to both properly detect and image the HPA, they are either silent on the handling of the DCO or indicate that this is beyond the capabilities of their tool.