

# Ransomware Detection Service

## Main Description:

This program detects all present and future ransomware in Windows file shares or local drives.

For early detection of ransomware you expect the ransomware to encrypt your sample files and you catch it in the act. This entraps the ransomware because it encrypts sample files that ordinarily would be left alone.

The screenshot shows the 'Ransomware Detection Service Settings' window. It includes a 'Service Interval' set to 60000 (1 Minute(s)), SMTP configuration fields (Host, Port, Username, Password, From, To), and checkboxes for 'SMTP Use SSL' and 'SMTP Use Default Credentials'. A 'Send Test Email' button is present. On the right, the 'File Server Status' is 'Running' with 'Start File Sharing' and 'Stop File Sharing' buttons. At the bottom, the 'Detection Service Status' is 'Stopped'. A table at the bottom lists detection rules with columns for ID, Enabled, Title, StartTime, EndTime, IntervalType, Interval, and days of the week. Callouts highlight the 'Email Options' (SMTP fields), 'Saving and Service Status' (Save/Apply/Stop/Start buttons), 'File Server File Sharing Status' (File Server Status and buttons), and 'Scheduling Options' (the table).

ID	Enabled	Title	StartTime	EndTime	IntervalType	Interval	Mon	Tue	Wed	Thu	Fri	Sat
1	<input type="checkbox"/>	test reg	16:22		Daily	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
*	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

This program solves the following issues:

- How do I monitor my windows file shares for ransomware with minimal performance impact? (Compare tab and a few example files in SourcePath)
- How do I detect a ransomware that does not create a ransom note in the file share or modify the file names in the share? (Compare tab)

- How do I automatically stop an infection from encrypting more files and only stop the user that was infected? (Compare tab - CommandProgram and the StopRansomwareInfectedUserPublic.ps1 script)
- What files and how many files are corrupted in my windows file shares? (Audit Files tab)
- What files are still good in my windows file shares? (Audit Files tab)
- What files have been recently changed or created since that last good backup? (During off hours only, Audit Files tab, or Compare tab for full binary comparison)
- How do I detect encrypted or corrupted zip files, Word documents, Excel files, or Powerpoint files? (During off hours only, Audit Files tab - ValidateZipFiles option)
- What files and how many were repeatedly created by the virus? (Find Ransom Files tab)
- How do I delete the ransom note files created by the virus? (Find Ransom Files tab and Find Filters tab)
- How do I replace the corrupted files and keep the newest good files? (Audit Files tab)
- How do I detect ransomware no matter what type of ransom files it creates? (Compare tab)
  - How do I quickly stop the Windows file server from sharing files during a virus outbreak? ("Stop File Sharing" button, or edit StopAllWindowsFileServersAfterRansomwareActivityDetected.cmd to suit your needs)
- How do I restore files when long file paths are involved? (Audit Files tab, or FastCopy)
- How do I find out what files have file permissions corrupted or files that are inaccessible? (Audit Files tab - ExportUnknownToCSV)
- What files were created or modified when compared to a previous backup? (Audit Files tab or Compare tab for full comparison)

This program helps to detect when/where ransomware has hit Windows file shares or local drives. This program doesn't prevent ransomware infection.

When staff members get ransomware, you need to respond quickly to get their computer shutdown as soon as possible. If you respond quickly enough, you can shut down the offending computer before other file shares become encrypted. Anti-virus programs currently do not detect encrypted files written by ransomware. Not knowing that a ransomware virus is on your network is a big problem. The sooner you get the offending computer shutdown and restore your backups of files shares the better.

File servers do not get the virus, the virus encrypts the files stored on the file server. This makes knowing the damage caused by a ransomware difficult. If you do not notice an encrypted file share, you can lose your opportunity to restore from backup or cause your users to use a much older backup than necessary. Anti-virus programs are always a few days behind in detecting new viruses.

Find Ransomware Files helps determine damage caused by a previous uncaught infection. I just added the ability to delete any ransomware created files for cleanup purposes after you restore your files from backup and determined which user caused the infection. To get a listing of files that were encrypted when file extensions were changed or to find files created by ransomware use the Find Ransomware Files tab.

Audit Files tab will traverse a directory, compare file signatures for expected file extensions, and create a verified files list, unverified files list (possible corrupted/encrypted files), unknown files list, and prohibited files list. This helps to determine the damage caused by a ransomware. The lists will aid the restore of encrypted/corrupted files. The FixUnverifiedFilesFromBackup option will fix corrupted files by replacing the bad files from the restored backup.

The worst case scenario is not noticing a ransomware infection, having to recover your file shares using an old backup, and keeping any new files saved in the file share since the infection. The Audit Files tab will help you know the damage done to the file share and help the recovery process. The only thing worse is not having a good backup at all, but the recovery process is not complicated in that scenario.

**Caveat:**

- Train or notify users to not delete the files/folders that are copied from the SourcePath. Deleted files will cause a false positive missing files error message or email.
- Find Ransomware Files tab and Audit Files tab will be slow for large directories with many files. Only run this during off hours. Run Compare (Detection Ransomware) during business hours if you use small example source files. Comparing a full backup vs your file share should be run off hours and make sure to turn off the command options.

**System Requirements:**

- At least .Net 4.0 is required.
- Windows Server 2008, 2012, 2012 R2, anything newer needs testing
- Windows 7, Windows 8, Windows 10, anything newer needs testing
- Both 32 bit and 64 bit operating systems are supported.

**Installation:**

1. Download the zip file and extract installer Files (setup.exe and RansomwareDetectionServiceInstaller.msi) into the same directory and run setup.exe as administrator <https://github.com/prestoncooper/RansomwareDetectionService/>
2. Run the installation setup.exe downloaded from step 1 (Preexisting username for the service will be requested before installing the Windows service (username must to be in "Username@DOMAIN", "DOMAIN\Username", "Username@COMPUTERNAME", "COMPUTERNAME\Username" format.)

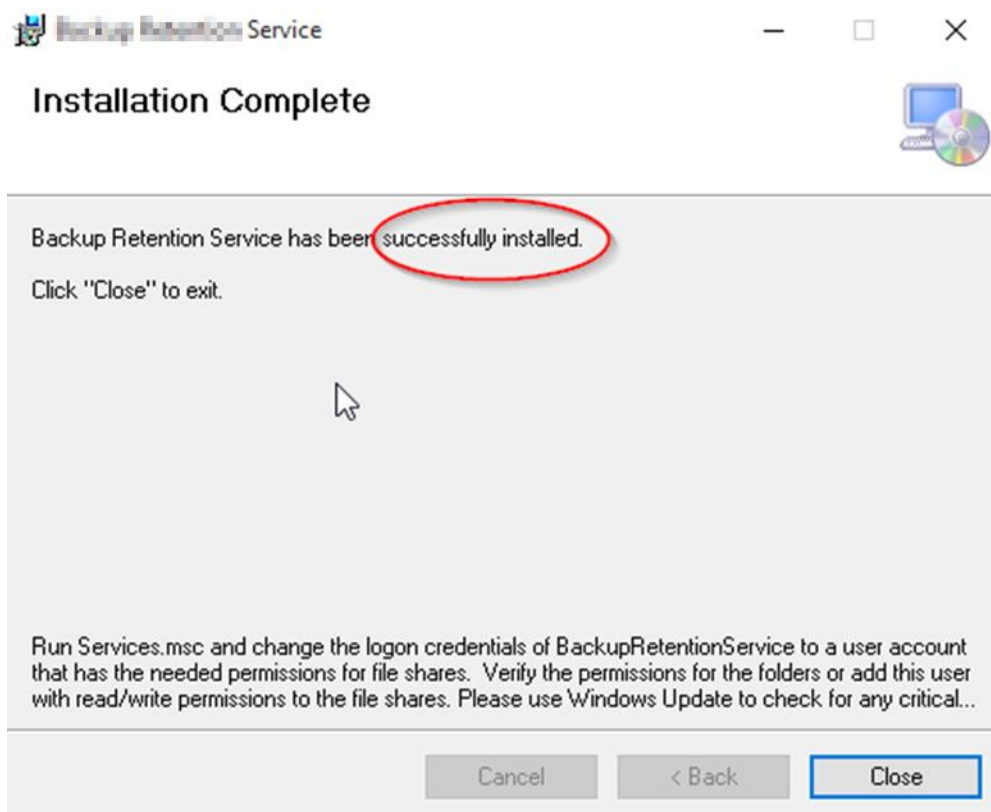
Set Service Login

Username:

Password:

Confirm password:

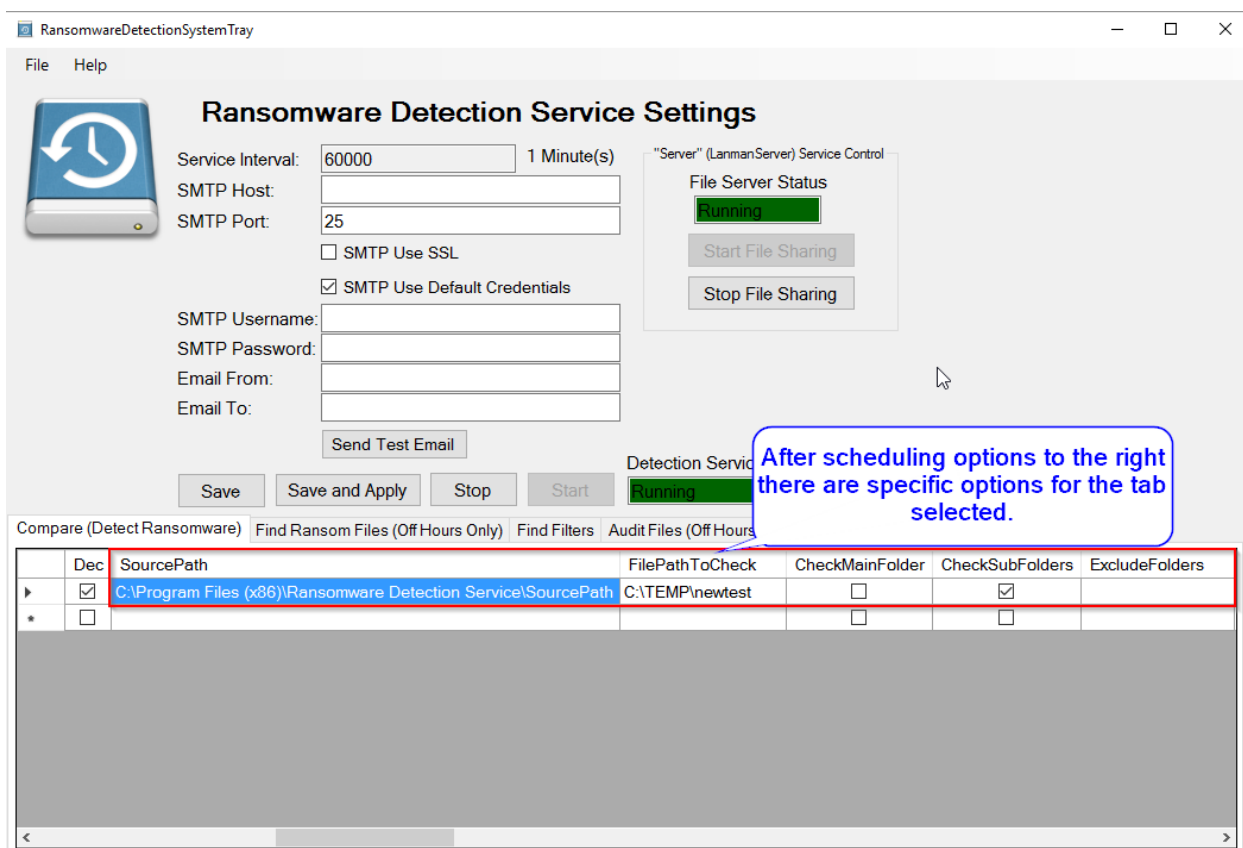
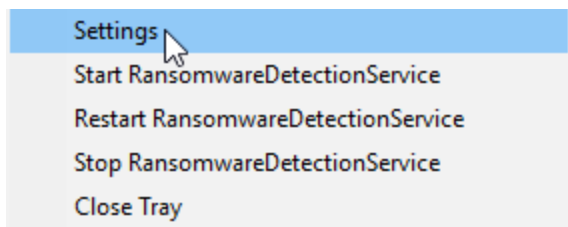
If you specified the username correctly and clicked on OK, then the install will show success. This existing domain account will need at least read access to the files shares you want to monitor. The copy options require read/write access to the file share.



After install launch the system tray application then right click on it. (You might have to click on the little arrow on the left of the system tray to show hidden system tray icons)



You will see the following options (click on settings to display the main form for changing settings):



### Installation and Use Notes:

- I created the ability to detect ransomware in file shares using the Compare tab.
- The Find files tab is for getting a list of ransomware created ransom note files after an infection and to help delete the files.
- The Audit files tab audits your file share and determine what files are not encrypted, files that are new, and encrypted/corrupted files. This tab validates file signatures and can test decompress zip files (.zip, .docx, .xlsx, .pptx, etc.)

- RansomwareDetectionService is a C# Windows service that will detect ransomware in a windows file share and optionally copy the files you want to verify to the SourcePath and the first layer of subfolders as well.
- Run services.msc and change the logon username and password for "RansomwareDetectionService" to a user that has read/write permissions to the file shares you are working with.
- Make sure to use UNC paths for file shares or a local folder for the Windows Server running the service.
- Default sample files are stored in "C:\Program Files (x86)\Ransomware Detection Service\SourcePath". Change the folder name and files names stored inside this folder immediately after the first time installing the program. It is preferable to delete the existing files and create your own sample files with different file names. Add any new or different files types that you want to monitor.

### Overall Features:

- SourcePath files and folders are checked against the FilePathToCheck and if files are changed or missing then an error is logged and an email sent if SendEmailOnError is checked.
- Each row in the configuration table can run on a different schedule and have different options.
- Long path names are supported.
- Configuration table rows are executed via a multi-threaded call. Therefore, multiple folders can be scheduled to be checked and even run at the same time.

### Scheduling Options:

- Enabled: Whether the schedule is enabled for the task
- Time Based or Interval Based Execution for each item in each configuration table.
- Day of the Week Selection via check box for Monday - Sunday
- Day of the Month Enter in day 1-31 desired and this will override Day of the Week
- Day of the Month Enter in -1 to -5 for NthDayOfTheWeek (where -1 is 1st day of the month and -5 is 5th day in the month) in conjunction with Day of the Week to select the desired WeekDay.
- Each configuration runs on a different thread so that they can run at the same time if needed and you don't see a file locking problem possible.
- StartDate: Date to task needs to start executing.
- EndDate: Date the task needs to stop executing.
- Interval Type:
  - Hourly: Enter start time in military time, end time in military time, select hourly interval type, and enter "interval" in minutes.
  - Daily: Set a start time in military format, select days and months you want to run and it will run at that time.
  - Monthly: Set Interval to 1-31 to run on a specific day of the month, specify -1 up to -5 and select a day to set the nth day of the month (e.g. -1 Mon would run on the 1st Monday of the month.)

## Example Hourly and Daily Schedules:

Compare (Detect Ransomware)				Find Ransomware Files (Off Hours Only)				Ransomware File Filters				Log											
	StartTime	EndTime	IntervalType	Interval	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Hourly	06:00	23:59	Hourly	30																			
	06:00	23:59	Hourly	23																			
	06:00	23:59	Hourly	27																			
	06:00	23:59	Hourly	33																			
	06:00	23:59	Hourly	37																			
	06:00	23:59	Hourly	43																			
	06:00	23:59	Hourly	45																			
Daily	05:05		Daily	0																			
	05:07		Daily	0																			
	05:10		Daily	0																			
	05:13		Daily	0																			
	05:16		Daily	0																			
	05:20		Daily	0																			
	05:25		Daily	0																			
	05:30		Daily	0																			

## Compare (Detect Ransomware in file share) Explanation and Overall Features:

I created the ability to detect ransomware in file shares using the Compare tab.

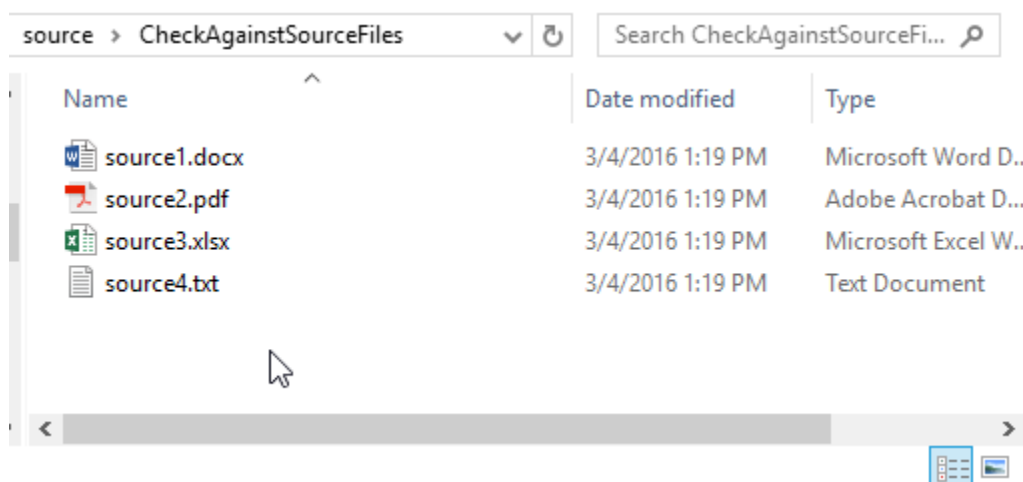
RansomwareDetectionService is a C# Windows service that will detect ransomware in a windows file share and optionally copy the files you want to verify to the FilePathToCheck and the first layer of subfolders as well.

The service will copy source files if missing into the FilePathToCheck and then on a schedule check to see if the source files have changed or went missing. First, create a folder in the SourcePath with a few small files with files of the type that you are concerned (XLS, XLSX, DOC, DOCX, PDF, JPG, PNG, TXT, etc.). Copy this directory to each folder that you want to monitor or use CopySourceFiles or CopySourceFilesSubFolders options in order to copy the SourcePath files (only needs to run once with these options). If these files change or get encrypted then you will receive an error in the error log and possibly an email if setup.

SourceFiles: Source Folder with a few example files that will copy and compare later. Make sure this path is not in a file share.

## Example Options (Entrapment):

Example Files for Comparison Later:



First level of immediate sub folders are compared but not the main folder, SourcePath folders and files are copied; If they go missing an error is logged/emailed/CommandProgram executed and the files are copied again. FilePathToCheck should be a windows file share, but SourcePath should not be a file share.

Compare (Detect Ransomware) Find Ransomware Files (Off Hours Only) Ransomware File Filters Log							
	SourcePath	FilePathToCheck	CheckMainFolder	CheckSubFolders	ExcludeFolders	CopySourceFiles	CopySourceFilesSubFolders
▶	C:\TEMP\source	C:\TEMP\filestocheck	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
*			<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>

The secondary purpose is to completely Audit a file share vs a full backup. This will compare files using binary differences and give you a list of changed files and files new since the backup that should be in the share. Set the backup path as the FilePathToCheck and the File Share to the SourcePath to do this. This process is slow and should only be run during off hours. The CSV files are saved in the ExportCSVPath. The new files will be in the Missing csv file because the backup won't have a copy of the new files. Review the missing files csv and verify that the files are good and not viruses or documents that deployed the virus. Viruses can wait a few days before encrypting files so running using a backup more than a week old is important. For further auditing see the Audit Files tab.

### Compare Options:

- SourcePath: Folder where files that will be used as the source for comparison (A file path that cannot be reached via a file share, and non-admin users do not have rights to modify are recommended.) I recommend creating a few simple files with extensions you care to monitor. These files will be copied to your FilePathToCheck Main folder for immediate sub folders and if these files are modified or the files are missing, then you can be notified of the problem.
- FilePathToCheck: This is the file share that you want to monitor for ransomware or monitor the files for changes
- CheckMainFolder: Check the main FilePathToCheck to see if it has the SourcePath files exist in FilePathToCheck directory and are not changed.



- CheckSubFolders: Check the immediate sub folders of FilePathToCheck repeatedly to see if it has the SourcePath files exist in each sub folder of the FilePathToCheck directory and are not changed.
- CopySourceFiles: Copies SourcePath files to FilePathToCheck if the files do not exist (This will make the "Files Missing" error only fire once.)
- CopySourceFilesSubFolders: Copies SourcePath files to each immediate sub folder repeatedly of FilePathToCheck if the files do not exist. (This will make the "Files Missing" error only fire once). I recommend that you only run this option once and then turn off on subsequent runs.
- SendEmailOnFailure: Sends summary email when files are changed or if files are missing each time the directory is compared.
- SendEmailOnSuccess: Sends summary email notifying you that the file path was checked.
- ExcludedFolders: Excludes list of folders separated by semicolon from the immediate sub folder check and immediate sub folder copy as well.
- ExportCSVPath: Path to where csv files will be saved.
- ExportFilesDifferentToCSV: Export files changed to csv file.
- ExportFilesMissingToCSV: Export files missing to csv file.
- ExecuteCommandOnDetectFileMissing: Executes CommandProgram if a file missing is detected.
- ExecuteCommandOnDetectFileDifferent: Executes CommandProgram if a file change is detected.
- ExecuteCommandOnDetectFolderMissing: Executes CommandProgram if folder missing is detected.
- ExecuteCommandOnUserScopeOnly: Only executes the CommandProgram if a username is determined from the file changed in a home directory or file is missing in a home directory. The main home directory with usernames as sub folders must be the FilePathToCheck and CheckSubFolders must be true.
- CommandWorkingDirectory: The directory where the script or program will be located.
- CommandProgram: The program or batch command script to run (I created a sample powershell script to disable the computer account from the username with ransomware activity. The script pulls the machine names from the associated user from Dell Kace. The script is called StopRansomwareInfectedComputerPublic.ps1. This script will only work on home share monitoring not a share with multiple users creating and modifying files.) I created another powershell script to disable an Active Directory user account when ransomware activity is detected. Example usage is below:
  - CommandWorkingDirectory: Path to where this script is saved usually "C:\Program Files (x86)\Ransomware Detection Service"
  - CommandProgram: powershell.exe
  - CommandArguments: -ExecutionPolicy UNRESTRICTED -File "C:\Program Files (x86)\Ransomware Detection Service\StopRansomwareInfectedUserPublic.ps1 " - username [Username]
- CommandArguments: Arguments for the program. These placeholders [Username] will replace with the username found, [FullFilePath] will replace with full file path of file changed, and [FullFolderPath] will replace parent folder full file path or FilePathToCheck.
- CommandTimeout: Timeout in minutes before the CommandProgram process will be killed.

## Find Ransomware Files (Search for Ransomware created files)

The "Find Ransomware Files" tab searches all the specified directories for the ransomware file filters that you specify in the "Ransomware File Filters" tab.


### Find Ransomware Files Options:

- FilePathToCheck: This is the file share that you want to monitor for ransomware or monitor the files for changes
- CheckSubFolders: Recursively check all the sub folders of FilePathToCheck.
- ExportCSVPath: The path where the csv result files will be saved.
- ExportFilesFoundToCSV: Export a list of ransomware related files found to a csv file.
- ExportFoldersFoundToCSV: Export list of folders found to a csv file.
- ExportFilesDeletedToCSV: Export list of files deleted to a csv file.
- ExportFileErrorToCSV: Export file access/permission error list to a csv file.
- SendEmailOnFailure: Sends summary email when files are changed or if files are missing each time the directory is compared.
- SendEmailOnSuccess: Sends summary email notifying you that the file path was checked.
- ExcludedFolders: Excludes list of folders separated by semicolon from FilePathToCheck. Any folder matching the exact name will be excluded.
- Ransomware File Filters (tab)
  - Enabled: Search for this FileFilter
  - Title: Name of ransomware to find or description of search
  - FileFilter: Enter in file filter search expected by windows (e.g. \*recover\*.txt, HELP\_RESTORE\_FILES.txt, or \*.ecc)
  - ExcludeFiles: Semicolon separated list of exact files names to exclude from results and delete. List false positive files found from a previous run of Find Files.
  - ObjectType: Search for File, Folder or Both.
  - DeleteFilesFound: Delete all files found by the file filter. (Only check mark this after you have verified the files you want to delete by a previous run and no false positives will be deleted. Uncheck this after it has run once. I recommend using a very specific file filter with this option.)
  - Comment: a comment regarding the file filter

## Find Ransomware Files (Off Hours Only) tab:

RansomwareDetectionSystemTray

File Help



### Ransomware Detection Service Settings

Service Interval:  1 Minute(s)

SMTP Host:

SMTP Port:

☐ SMTP Use SSL

☒ SMTP Use Default Credentials

SMTP Username:

SMTP Password:

Email From:

Email To:

"Server" (LanmanServer) Service Control

File Server Status

Running

Detection Service Status

Running

	FilePathToCheck	CheckSubFolders	ExcludeFolders	ExportCSVPath	ExportFilesFoundToCSV	ExportFoldersFoundToCSV
▶	c:\temp	<input checked="" type="checkbox"/>	test		<input type="checkbox"/>	<input type="checkbox"/>
*		<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>

## File Filters tab (More filters can be added at any time):

Compare (Detect Ransomware) Find Ransomware Files (Off Hours Only) Ransomware File Filters Log

	ID	Enabled	Title	FileFilter	ExcludeFiles	ObjectType	DeleteFilesFound	Comment
▶	1	<input checked="" type="checkbox"/>		*.0x0		File	<input type="checkbox"/>	
	2	<input checked="" type="checkbox"/>		*.1999		File	<input type="checkbox"/>	
	3	<input checked="" type="checkbox"/>		*.73i87A		File	<input type="checkbox"/>	
	4	<input checked="" type="checkbox"/>		*.7z.encrypted		File	<input type="checkbox"/>	
	5	<input checked="" type="checkbox"/>		*.aaa		File	<input type="checkbox"/>	
	6	<input checked="" type="checkbox"/>		*.abc		File	<input type="checkbox"/>	
	7	<input checked="" type="checkbox"/>		*.bleep		File	<input type="checkbox"/>	
	8	<input checked="" type="checkbox"/>		*.ccc		File	<input type="checkbox"/>	
	9	<input checked="" type="checkbox"/>		*.cerber		File	<input type="checkbox"/>	
	10	<input checked="" type="checkbox"/>		*.crinf		File	<input type="checkbox"/>	
	11	<input checked="" type="checkbox"/>		*.crjoker		File	<input type="checkbox"/>	
	12	<input checked="" type="checkbox"/>		*.crypt		File	<input type="checkbox"/>	
	13	<input checked="" type="checkbox"/>		*.crypto		File	<input type="checkbox"/>	

## Audit Files (Search for Ransomware Affected Files)

If a ransomware changes files in your windows files shares it is important to know the extent of the damage caused by the virus. The "Audit Files" tab will search specified directories and compare the file header/signature vs known file headers for the file extension. If a compared file does not match the header it is outputted into the UnverifiedFiles.csv file. If a file extension is not known then the file is outputted into the UnknownFiles.csv file. Files that match the known file header/signature will output into the VerifiedFiles.csv file. If a signature is flagged as prohibited then the file will be listed in the file ProhibitedFiles.csv file as well as the file VerifiedFiles.csv. Custom file signatures can be added later in the Audit Signatures tab. If the Audit Signatures table rows are deleted entirely then the stock signatures are used. Make sure and run the Audit prior to an infection to fix as many unknowns and unverified files as possible. Text files do not have a file signature and will be listed with the unknown files.

The FixUnverifiedFilesFromBackup option helps in the recovery process if you did not know about an infection and you have an old backup and recently saved files are still in the infected share. Make sure to run the Audit with FixUnverifiedFilesFromBackup unchecked first to get a list of the files first and fix as many unknowns as possible. Make backups and then give the FixUnverifiedFilesFromBackup option a try.

Compare (Detect Ransomware)		Find Ransom Files (Off Hours Only)		Find Filters		Audit Files (Off Hours Only)		Audit Signatures		Log	
	FilePathToCheck	CheckSubFolders	ExcludeFolders	ExportCSVPath	ExportUnVerifiedToCSV	ExportVerifiedToCSV	ExportUnknownToCSV	ExportProhibitedToCSV			
▶	C:\TEMP\filestoccheck	<input checked="" type="checkbox"/>		C:\TEMP\ExportCSV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
*		<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

### Audit Files Options:

- FilePathToCheck: This is the file share that you want to monitor for ransomware or monitor the files for changes
- CheckSubFolders: Recursively check all the sub folders of FilePathToCheck.
- ExcludeFolders: Excludes list of folders separated by semicolon from FilePathToCheck. Any folder matching the exact name will be excluded.
- ExportCSVPath: The path where the csv files will be saved (UnknownFiles.csv, UnVerifiedFiles.csv, and VerifiedFiles.csv)
- ValidateZipFiles: Any file starting with zip file header will be test extracted to confirm that the file is not corrupted or encrypted. (zip, docx, xlsx, pptx, xps, oxps, epub, etc are all tested)
- ExportUnVerifiedToCSV: Saves unverified (Possible ransomware affected files) to csv file
- ExportVerifiedToCSV: Saves file header verified list of files to csv file. (Prohibited files will also be in this list if the signature matches the file extension)
- ExportUnknownToCSV: Saves unknown (extension is unknown or error on reading the file) list of files to csv file.
- ExportProhibitedToCSV: If any signatures and extensions are flagged as prohibited then they will be added to the prohibited csv file.

- ProhibitedFilesIgnoreFileExtension: If a file signature is flagged as prohibited, then this option if checked will detect files even when file extension has been changed to hide the file.
- FixUnverifiedFilesFromBackup: Replace unverified files with files from restored backup. Make sure to run a full backup of FilePathToCheck folder before using this option. Run audit of FilePathToCheck folder with FixUnverifiedFilesFromBackup unchecked at least once and fix as many unknown files as possible to yield a better result. This makes the process of leaving good files alone and replacing corrupted/encrypted files with a backup file a lot easier.
- RestoredFilesPath: If FixUnverifiedFilesFromBackup is checked then this is the Path to restored backup of FilePathToCheck. These files must have the same folder structure as FilePathToCheck and will overwrite any unverified files.
- DetectDifferentFilesComparedWithBackup: Export files with different file sizes or different modified date or files missing when compared with restored backup path to a csv file.
- SendEmailOnFailure: Sends summary email of files that were possibly affected by ransomware.
- SendEmailOnSuccess: Sends summary email notifying you that the file path was audited.
- Audit Signatures tab (If no signatures are listed then the stock signatures are used)
  - Enabled: Whether signature check is enabled
  - ByteOffset: Number of bytes to ignore previous to the Hexadecimal Pattern.
  - FirstNumberOfBytesToRead: Number of bytes to read from the file to compare with the HexPattern. (0 will default to 100 or HexPattern.Length + ByteOffset whichever is greater)
  - HexPattern: The hexadecimal pattern to find within the first 100 bytes of a file.
  - SignaturesName: The file type title or signature name
  - FileExtensions: a semicolon separated list of file extensions to match with the signatures include the period with each file extension e.g. .doc;.docx;xls;xlsx
  - Prohibited: If prohibited then any file with the extension and signature will be added to the prohibited list. The file will also be listed in the verified list if signature hexadecimal pattern matches the file extension.
  - Comment: A comment for the signature.

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jzlib is based on zlib-1.1.3.

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