EaseFilter Filter Driver SDK Manual

Introduction

File system filter driver

A file system filter driver intercepts requests targeted at a file system or another file system filter driver. By intercepting the request before it reaches its intended target, the filter driver can extend or replace functionality provided by the original target of the request. It is developed primarily to allow the addition of new functionality beyond what is currently available.

File system monitor filter

File system monitor filter can monitor the file system activities on the fly. With file system monitor filter, you can monitor the file activities on file system level, capture file open/create/replace, read/write, query/set file attribute/size/time security information, rename/delete, directory browsing and file close request by which user and process name. You can develop the software for the following purposes:

- Continuous data protection (CDP).
- Auditing.
- Access log.
- Journaling.

File system control filter

File system control filter can control the file activities, which you can intercept the file system call, modify its content before or after the request goes down to the file system, allow/deny/cancel its execution based on the filter rule. You can fully control file open/create/replace, read/write, query/set file attribute/size/time security information, rename/delete, directory browsing these Io requests. With file system control filter, you can developer these kinds of software:

- Data protection.
- File Screening
- Access Control.
- File Security.

File system encryption filter

File system encryption filter provides a comprehensive solution for transparent file level encryption. It allows developers to create transparent, on-access, per-file encryption products which it can encrypt or decrypt file on-the-fly. Our encryption engine uses a strong cryptographic algorithm called Rijndael (256-bit key), it is a high security algorithm created by Joan Daemen and Vincent Rijmen (Belgium). Rijndael is the new Advanced Encryption Standard (AES) chosen by the National Institute of Standards and Technology (NIST).

Process filter driver

Process filter driver is a kernel-mode driver that tracks and controls the process and thread operations, it provides you an easy way to develop Windows application for the Windows process monitoring and protection. Prevent the untrusted executable binaries (malwares) from being launched, protect your data being damaged by the untrusted processes.

Registry filter driver

Registry filter driver is a kernel-mode driver that tracks and controls the registry access, it provides you an easy way to develop Windows application for registry monitoring and protection, it enables your application to prevent the Windows core registry keys and values from being damaged.

The rules to use of file system control filter

To use the file system control filter, you need to follow the following rules, or might cause the system deadlock.

1. *Avoid the re-entrance issue, don't generate any new I/O request which will cause the request comes to the control filter handler again.*
2. *Avoid using any file operations in buffered mode, open any file in the control filter handler with FILE_FLAG_NO_BUFFERING flag set.*
3. *Avoid asynchronous procedure calls.*
4. *Avoid any GUI (user interface) operations.*

Supported Platforms

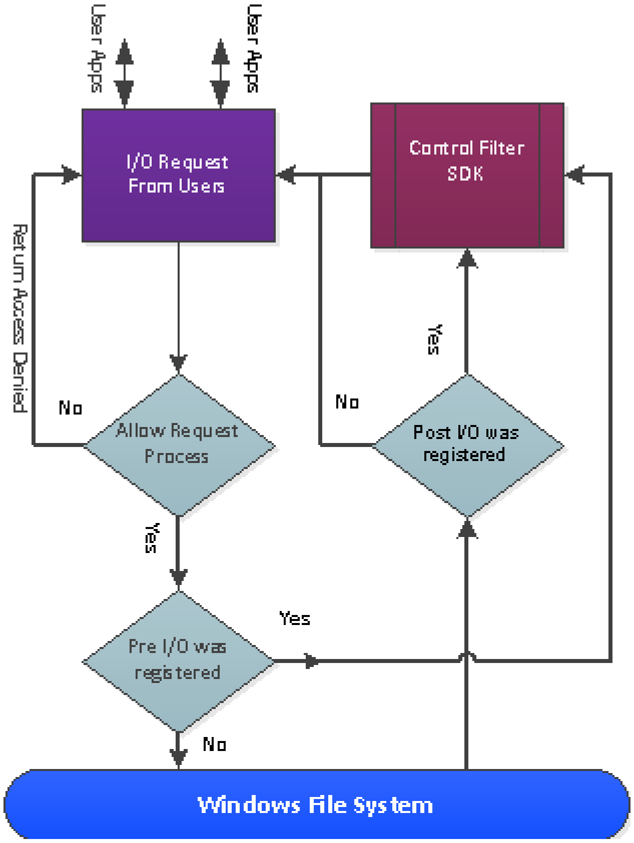
- Windows 2016/Windows 2019/Windows 2022
- Windows 10/11 (32bit, 64bit)
- Windows 8 (32bit, 64bit)
- Windows 2012 Server R2
- Windows 2008 Server R2 (32bit, 64bit)
- Windows 7 (32bit,64bit)

Overview and Basic Concepts

The EaseFilter file system filter driver

EaseFilter file system filter driver is a kernel component module which is sitting on the layer between the I/O manager and the file system. When a user application invokes a win32 API to a file, the filter driver can intercept this I/O, based on the policies was set with the filter rule, the

I/O information can be sent to the user, or be modified/blocked the access based on the setting as below figure.



Filter Rule

A filter rule is the policy to monitor or control the files by the filter driver. To manage the files by filter driver, you need to create at least one filter rule, you can have multiple filter rules with different policies to manage different files to meet your requirement.

A filter rule has only one unique include file mask, when a new filter rule was added to the filter driver, if a filter rule with the same include file filter mask exists, the new filter rule will replace the older one.

I/O registration

Pre IO and Post IO

A pre IO is the I/O operation which is not going down to the file system. A post IO is the I/O operation which was returned from the file system after it was processed.

To get the notification of an I/O for a monitor filter driver you need to register the specific post IO callback class. To control the file I/O, you can register the pre IO or post IO callback class for the control filter driver, you can modify the I/O data in your callback function.

Symbol Reference

Structures, Enums

Typedef enum FilterType

```
{
    FILE_SYSTEM_CONTROL                    = 1,
    FILE_SYSTEM_ENCRYPTION                 = 2,
    FILE_SYSTEM_MONITOR                    = 4,
    FILE_SYSTEM_REGISTRY                   = 8,
    FILE_SYSTEM_PROCESS                    = 16,
};
```

Comments

FILE_SYSTEM_CONTROL filter type is the file system filter driver which can control the file I/O request’s behaviour before it goes down to the file system or after it is completed by the file system.

FILE_SYSTEM_ENCRYPTION filter type is the file system filter driver which can encrypt and decrypt the files on-the-fly.

FILE_SYSTEM_MONITOR filter type is the file system filter driver which only intercept the file I/O notification after it was completed.

FILE_SYSTEM_REGISTRY filter type is the filter driver which can track and control the registry access.

FILE_SYSTEM_PROCESS filter type is the filter driver which can track and control the process and thread operations.

typedef enum IOCallbackClass

```
{
     PRE_CREATE                     = 0x00000001,
     POST_CREATE                    = 0x00000002,
     PRE_NEW_FILE_CREATED           = 0x0000000100000000,
     POST_NEW_FILE_CREATED          = 0x0000000200000000,
     PRE_FASTIO_READ               = 0x00000004,
     POST_FASTIO_READ              = 0x00000008,
     PRE_CACHE_READ                = 0x00000010,
     POST_CACHE_READ               = 0x00000020,
     PRE_NOCACHE_READ              = 0x00000040,
     POST_NOCACHE_READ             = 0x00000080,
     PRE_PAGING_IO_READ            = 0x00000100,
     POST_PAGING_IO_READ           = 0x00000200,
     PRE_FASTIO_WRITE              = 0x00000400,
     POST_FASTIO_WRITE             = 0x00000800,
     PRE_CACHE_WRITE               = 0x00001000,
     POST_CACHE_WRITE              = 0x00002000,
     PRE_NOCACHE_WRITE             = 0x00004000,
     POST_NOCACHE_WRITE            = 0x00008000,
     PRE_PAGING_IO_WRITE           = 0x00010000,
     POST_PAGING_IO_WRITE          = 0x00020000,
     PRE_QUERY_INFORMATION         = 0x00040000,
     POST_QUERY_INFORMATION        = 0x00080000,
     PRE_QUERY_FILE_SIZE           = 0x0000000400000000,
     POST_QUERY_FILE_SIZE          = 0x0000000800000000,
     PRE_QUERY_FILE_BASIC_INFO     = 0x0000001000000000,
     POST_QUERY_FILE_BASIC_INFO    = 0x0000002000000000,
     PRE_QUERY_FILE_STANDARD_INFO  = 0x0000004000000000,
     POST_QUERY_FILE_STANDARD_INFO = 0x0000008000000000,
     PRE_QUERY_FILE_NETWORK_INFO   = 0x0000010000000000,
     POST_QUERY_FILE_NETWORK_INFO  = 0x0000020000000000,
     PRE_QUERY_FILE_ID             = 0x0000040000000000,
     POST_QUERY_FILE_ID            = 0x0000080000000000,
     PRE_SET_INFORMATION           = 0x00100000,
     POST_SET_INFORMATION          = 0x00200000,
     PRE_SET_FILE_SIZE             = 0x0000400000000000,
     POST_SET_FILE_SIZE            = 0x0000800000000000,
     PRE_SET_FILE_BASIC_INFO       = 0x0001000000000000,
     POST_SET_FILE_BASIC_INFO      = 0x0002000000000000,
     PRE_SET_FILE_STANDARD_INFO    = 0x0004000000000000,
     POST_SET_FILE_STANDARD_INFO   = 0x0008000000000000,
     PRE_SET_FILE_NETWORK_INFO     = 0x0010000000000000,
     POST_SET_FILE_NETWORK_INFO    = 0x0020000000000000,
     PRE_RENAME_FILE               = 0x0040000000000000,
     POST_RENAME_FILE              = 0x0080000000000000,
     PRE_DELETE_FILE               = 0x0100000000000000,
     POST_DELETE_FILE              = 0x0200000000000000,
     PRE_DIRECTORY                 = 0x00400000,
     POST_DIRECTORY                = 0x00800000,
     PRE_QUERY_SECURITY            = 0x01000000,
     POST_QUERY_SECURITY           = 0x02000000,
     PRE_SET_SECURITY                    = 0x04000000,
     POST_SET_SECURITY                   = 0x08000000,
     PRE_CLEANUP                         = 0x10000000,
     POST_CLEANUP                        = 0x20000000,
     PRE_CLOSE                           = 0x40000000,
     POST_CLOSE                          = 0x80000000,

};
```

Members

PRE_CREATE

This is the IRP_MJ_CREATE request, the create I/O request before it goes down to the file system.

POST_CREATE

This is the IRP_MJ_CREATE request, the create I/O request after it is completed by file system.

PRE_NEW_FILE_CREATED

This is the IRP_MJ_CREATE request, if you want to filter the file going to be created operation only, you can register PRE_NEW_FILE_CREATED.

POST_NEW_FILE_CREATED

This is the IRP_MJ_CREATE request, if you want to filter the file being created operation only, you can register PRE_NEW_FILE_CREATED.

PRE_FASTIO_READ

This is the fast I/O pre read request if the data is in the cache.

POST_FASTIO_READ

This is the fast I/O post read request if the data is in the cache. If the data is already in the Cache Manager,it will return true, or it will return false and the I/O Manager will reissue a new IRP cache read request to the file system.

PRE_CACHE_READ

This is the IRP_MJ_READ cache read pre request, before the data was read from the cache manager.

POST_CACHE_READ

This is the IRP_MJ_READ cache read post request, after the data was read from the cache manager. If the data is not in the Cache Manager, it will trigger a paging I/O read request and load the data from the storage to the Cache Manager. Normally you will see the paging I/O read request follows the cache read request.

PRE_NOCACHE_READ

This is the IRP_MJ_READ no cache read pre request, read the data from the disk directly, bypass the cache manager.

POST_NOCACHE_READ

This is the IRP_MJ_READ no cache read post request, read the data from the disk directly, bypass the cache manager. You will see the noncache read request if you open a file with the flag FILE_NO_INTERMEDIATE_BUFFERING.

PRE_PAGING_IO_READ

This is the IRP_MJ_READ paging read pre request, read the data from the disk to the cache.

POST_PAGING_IO_READ

This is the IRP_MJ_READ paging read post request, read the data from the disk to the cache. It is initiated by the virtual memory system in order to satisfy the needs of the demand paging system.

PRE_FASTIO_WRITE

This is the fast I/O pre write request to the cache.

POST_FASTIO_WRITE

This is the fast I/O pre write request to the cache. The data was written to the cache if the request is satisfied immediately, or a IRP cache write will be issued.

PRE_CACHE_WRITE

This is the IRP_MJ_WRITE cache write pre request, write the data to the cache manager.

POST_CACHE_WRITE

This is the IRP_MJ_WRITE cache write post request, write the data to the cache manager. The paging I/O write request will be issued after the cache write.

PRE_NOCACHE_WRITE

This is the IRP_MJ_WRITE no cache write pre request, write the data to the disk directly, bypass the cache manager.

POST_NOCACHE_WRITE

This is the IRP_MJ_WRITE no cache write pre request, write the data to the disk directly, bypass the cache manager.You will see the noncache write request if you open a file with flag FILE_NO_INTERMEDIATE_BUFFERING.

PRE_PAGING_IO_WRITE

This is the IRP_MJ_WRITE paging write pre request, write the data from cache to the disk.

POST_PAGING_IO_WRITE

This is the IRP_MJ_WRITE paging write post request, after the data was written from the cache to the disk.

PRE_QUERY_INFORMATION

This is the IRP_MJ_QUERY_INFORMATION pre request to retrive the information for a given file before it goese down to the file system. The file information class tells the type of the information will be returned.

POST_QUERY_INFORMATION

This is the IRP_MJ_QUERY_INFORMATION post request to retrive the information for a given file after it came back from the file system. The file information class tells the type of the information will be returned.

PRE_QUERY_FILE_SIZE

This is the IRP_MJ_QUERY_INFORMATION pre request with information class FileEndOfFileInformation, if you only want to get the callback for the file size query, you can register this class.

POST_QUERY_FILE_SIZE

This is the IRP_MJ_QUERY_INFORMATION post request with information class FileEndOfFileInformation.

PRE_QUERY_FILE_BASIC_INFO

This is the IRP_MJ_QUERY_INFORMATION pre request with information class FileBasicInformation, if you only want to get the callback for the file basic information query, you can register this class.

POST_QUERY_FILE_BASIC_INFO

This is the IRP_MJ_QUERY_INFORMATION post request with information class FileBasicInformation.

PRE_QUERY_FILE_STANDARD_INFO

This is the IRP_MJ_QUERY_INFORMATION pre request with information class FileStandardInformation, if you only want to get the callback for the file standard information query, you can register this class.

POST_QUERY_FILE_STANDARD_INFO

This is the IRP_MJ_QUERY_INFORMATION post request with information class FileStandardInformation.

PRE_QUERY_FILE_NETWORK_INFO

This is the IRP_MJ_QUERY_INFORMATION pre request with information class FileNetworkOpenInformation, if you only want to get the callback for the file network information query, you can register this class.

POST_QUERY_FILE_NETWORK_INFO

This is the IRP_MJ_QUERY_INFORMATION post request with information class FileNetworkOpenInformation.

PRE_QUERY_FILE_ID

This is the IRP_MJ_QUERY_INFORMATION pre request with information class FileInternalInformation, if you only want to get the callback for the file Id information query, you can register this class.

POST_QUERY_FILE_ID

This is the IRP_MJ_QUERY_INFORMATION post request with information class FileInternalInformation.

PRE_SET_INFORMATION

This is the IRP_MJ_SET_INFORMATION pre request to set the information for a given file before it goese down to the file system. The file information class tells the type of the information will be set.

POST_SET_INFORMATION

This is the IRP_MJ_SET_INFORMATION post request to set the information for a given file after it came back from the file system. The file information class tells the type of the information will be set.

PRE_SET_FILE_SIZE

This is the IRP_MJ_SET_INFORMATION pre request to set the information with class FileEndOfFileInformation for a given file before it goese down to the file system. You can register this I/O class if you want to filter the file size change.

POST_SET_FILE_SIZE

This is the IRP_MJ_SET_INFORMATION post request to set the information with class FileEndOfFileInformation for a given file after the I/O completed and came back from the file system.

PRE_SET_FILE_BASIC_INFO

This is the IRP_MJ_SET_INFORMATION pre request to set the information with class FileBasicInformation for a given file before it goese down to the file system. You can register this I/O class if you want to filter the file basic information change.

POST_SET_FILE_BASIC_INFO

This is the IRP_MJ_SET_INFORMATION post request to set the information with class FileBasicInformation for a given file after the I/O completed and came back from the file system.

PRE_SET_FILE_STANDARD_INFO

This is the IRP_MJ_SET_INFORMATION pre request to set the information with class FileStandardInformation for a given file before it goese down to the file system. You can register this I/O class if you want to filter the file standard information change.

POST_SET_FILE_BASIC_INFO

This is the IRP_MJ_SET_INFORMATION post request to set the information with class FileStandardInformation for a given file after the I/O completed and came back from the file system.

PRE_SET_FILE_NETWORK_INFO

This is the IRP_MJ_SET_INFORMATION pre request to set the information with class FileNetworkOpenInformation for a given file before it goese down to the file system. You can register this I/O class if you want to filter the file network information change.

POST_SET_FILE_NETWORK_INFO

This is the IRP_MJ_SET_INFORMATION post request to set the information with class FileNetworkOpenInformation for a given file after the I/O completed and came back from the file system.

PRE_RENAME_FILE

This is the IRP_MJ_SET_INFORMATION pre request to set the information with class FileMoveOrRenameInformation for a given file before it goese down to the file system. You can register this I/O class if you want to filter the file move or rename operation.

POST_RENAME_FILE

This is the IRP_MJ_SET_INFORMATION post request to set the information with class FileMoveOrRenameInformation for a given file after the I/O completed and came back from the file system.

PRE_DELETE_FILE

This is the IRP_MJ_SET_INFORMATION pre request to set the information with class FileDispositionInformation for a given file before it goese down to the file system. You can register this I/O class if you want to filter the file delete operation.

POST_DELETE_FILE

This is the IRP_MJ_SET_INFORMATION post request to set the information with class FileDispositionInformation for a given file after the I/O completed and came back from the file system.

PRE_DIRECTORY

This the IRP_MJ_DIRECTORY_CONTROL pre request for the folder browsing I/O request before it goese down to the file system. It retrive various kinds of information about files in the given directory. The information class tells the type of information will be returned.

POST_DIRECTORY

This the IRP_MJ_DIRECTORY_CONTROL post request for the folder browsing I/O request after the data came back from the file system. It retrive various kinds of information about files in the given directory. The information class tells the type of information will be returned.

PRE_QUERY_SECURITY

This is the IRP_MJ_QUERY_SECURITY pre request to query the security information before it goes down to the file system. It will retrive the security descriptor for a given file. The security information tells the the type of the security descriptor.

POST_QUERY_SECURITY

This is the IRP_MJ_QUERY_SECURITY post request to query the security information after the data came back from the file system. It will retrive the security descriptor for a given file. The security information tells the the type of the security descriptor.

PRE_SET_SECURITY

This is the IRP_MJ_SET_SECURITY pre request to set the security information before it goes down to the file system. It will set the security state for a given file. The security information tells the the type of the security descriptor.

POST_SET_SECURITY

This is the IRP_MJ_SET_SECURITY post request to set the security information after the data was written to the file system. It will set the security state for a given file. The security information tells the the type of the security descriptor.

PRE_CLEANUP

This is the IRP_MJ_CLEANUP pre request before it goes down to the file system. It indicates that the handle reference count on a file object has reached zero. In other words, all handles to the file object have been closed. Often it is sent when a user-mode application has called the Microsoft Win32 CloseHandle function on the last outstanding handle to a file object.

POST_CLEANUP

This is the IRP_MJ_CLEANUP post request after the I/O completed and came back from the file system.

PRE_CLOSE

This is the IRP_MJ_CLOSE pre request before it goese down to the file system. It indicates that the reference count on a file object has reached zero, usually because a file system driver or other kernel-mode component has called ObDereferenceObject on the file object. This request normally follows a cleanup request. However, this does not necessarily mean that the close request will be received immediately after the cleanup request.

POST_CLOSE

This is the IRP_MJ_CLOSE post request after the I/O completed and came back from the file system.

Comments

Register the I/O request with the combination of the request type you want to monitor. For file system monitor filter, only post requests are affected.

typedef enum FilterCommand

```
{
FILTER_SEND_FILE_CHANGED_EVENT                      = 0X00010001,
FILTER_REQUEST_USER_PERMIT                          = 0X00010002,
FILTER_REQUEST_ENCRYPTION_KEY                       = 0X00010003,
FILTER_REQUEST_ENCRYPTION_IV_AND_KEY                = 0X00010004,
FILTER_REQUEST_ENCRYPTION_IV_AND_KEY_ACCESSFLAG=0X00010005,
FILTER_REQUEST_ENCRYPTION_IV_AND_KEY_TAGDATA =0X00010006,
FILTER_SEND_REG_CALLBACK_INFO                       = 0X00010007,
FILTER_SEND_PROCESS_CREATION_INFO                   = 0X00010008,
FILTER_SEND_PROCESS_TERMINATION_INFO                = 0X00010009,
FILTER_SEND_THREAD_CREATION_INFO                    = 0X0001000A,
FILTER_SEND_THREAD_TERMINATION_INFO                 = 0X0001000B,
FILTER_SEND_PROCESS_HANDLE_INFO                     = 0X0001000C,
FILTER_SEND_THREAD_HANDLE_INFO                      = 0X0001000D
FILTER_SEND_ATTACHED_VOLUME_INFO                    = 0x0001000e,
FILTER_SEND_DETACHED_VOLUME_INFO                    = 0x0001000f,
FILTER_SEND_DENIED_FILE_IO_EVENT                    = 0x00010010,
FILTER_SEND_DENIED_VOLUME_DISMOUNT_EVENT            = 0x00010011,
FILTER_SEND_DENIED_PROCESS_EVENT                    = 0x00010012,
FILTER_SEND_DENIED_REGISTRY_ACCESS_EVENT            = 0x00010013,
FILTER_SEND_DENIED_PROCESS_TERMINATED_EVENT         = 0x00010014,
FILTER_SEND_DENIED_USB_READ_EVENT                   = 0x00010015,
FILTER_SEND_DENIED_USB_WRITE_EVENT                  = 0x00010016,
FILTER_SEND_PRE_TERMINATE_PROCESS_INFO              = 0x00010017,
}
```

FILTER_SEND_FILE_CHANGED_EVENT

If the monitor filter driver register the event type with API ‘RegisterEventTypeToFilterRule’,the notification will be sent when the file was changed.

FILTER_REQUEST_USER_PERMIT

If the file has this control flag, the filter driver will request the permission to open this file.

FILTER_REQUEST_ENCRYPTION_KEY

For encryption filter driver, if this control flag was enable for this file, the filter driver will request the encryption key for this file.

FILTER_REQUEST_ENCRYPTION_IV_AND_KEY

For encryption filter driver, if this control flag was enable for this file, the filter driver will request the encryption key and IV for this file.

FILTER_REQUEST_ENCRYPTION_IV_AND_KEY_AND_ACCCESSFLAG

For encryption filter driver, if this control flag was enable for this file, the filter driver will request the encryption key, IV and access flag for this file.

FILTER_REQUEST_ENCRYPTION_IV_AND_KEY_AND_TAGDATA

For encryption filter driver, if this control flag was enable for this file, the filter driver will request the encryption key, IV and tag data for this file.

FILTER_SEND_REG_CALLBACK_INFO

For registry filter driver, if the registry callback class was registered, the registry access notification will be sent whent the registry was accessed.

FILTER_SEND_PROCESS_CREATION_INFO

For process filter driver, if the PROCESS_CREATION_NOTIFICATION was registered, the process infomation will be sent when the new process was created.

FILTER_SEND_PROCESS_TERMINATION_INFO

For process filter driver, if the PROCESS_TERMINATION_NOTIFICATION was registered, the process infomation will be sent when the process was terminated.

FILTER_SEND_THREAD_CREATION_INFO

For process filter driver, if the THREAD_CREATION_NOTIFICATION was registered, the process infomation will be sent when the new thread was created.

FILTER_SEND_THREAD_TERMINATION_INFO

For process filter driver, if the THREAD_TERMINATION_NOTIFICATION was registered, the process infomation will be sent when the thread was terminated.

FILTER_SEND_PROCESS_HANDLE_INFO

For process filter driver, if the PROCESS_HANDLE_OP_NOTIFICATION was registered, the process infomation will be sent when a handle for a process was created or duplicated.

FILTER_SEND_THREAD_HANDLE_INFO

For process filter driver, if the THREAD_ HANDLE_OP_NOTIFICATION was registered, the process infomation will be sent when a handle for a thread was created or duplicated.

FILTER_SEND_ATTACHED_VOLUME_INFO

Send the volume information if there a volume was attached to the filter driver if it was enabled in volume control flag.

FILTER_SEND_DETTACHED_VOLUME_INFO

Send the volume information if there a volume was dettached from the filter driver if it was enabled in volume control flag.

FILTER_SEND_FILE_IO_DENIED_EVENT

Send file I/O information if the I/O was blocked by the filter driver with access flag setting if the flag ENABLE_SEND_DENIED_EVENT was enabled in global boolean setting.

FILTER_SEND_FILE_IO_DENIED_EVENT

Send file I/O information if the I/O was blocked by the filter driver with access flag setting if the flag ENABLE_SEND_DENIED_EVENT was enabled in global boolean setting.

FILTER_SEND_DENIED_VOLUME_DISMOUNT_EVENT

Send volume information if the volume dismount operation was blocked by the filter driver with the flag

BLOCK_VOLUME_DISMOUNT enabled in the volume control flag if the ENABLE_SEND_DENIED_EVENT was enabled in global boolean setting.

FILTER_SEND_DENIED_PROCESS_EVENT

Send the new process information if new process creation was blocked by the filter driver with flag DENY_NEW_PROCESS_CREATION was enabled in the process control flag if the flag ENABLE_SEND_DENIED_EVENT was enabled in global boolean setting.

FILTER_SEND_DENIED_REGISTRY_ACCESS_EVENT

Send registry access information if the operation was blocked by the filter driver in registry control flag setting if the flag ENABLE_SEND_DENIED_EVENT was enabled in global boolean setting.

FILTER_SEND_DENIED_PROCESS_TERMINATION_EVENT

Send the process information if the protected process termination was blocked by the filter driver if the flag ENABLE_SEND_DENIED_EVENT was enabled in global boolean setting.

FILTER_SEND_DENIED_USB_READ_EVENT

Send file I/O information if the USB read was block by the filter driver with flag BLOCK_USB_READ enabled if the flag ENABLE_SEND_DENIED_EVENT was enabled in global boolean setting.

FILTER_SEND_DENIED_USB_WRITE_EVENT

Send file I/O information if the USB write was block by the filter driver with flag BLOCK_USB_WRITE enabled if the flag ENABLE_SEND_DENIED_EVENT was enabled in global boolean setting.

FILTER_SEND_PRE_TEMINIATE_PROCESS_INFO

Send the process information before it was going to be terminated if the flag PROCESS_PRE_TERMINATION_REQUEST was enabled in process control setting.

Comments

This is the command which was sent from the filter driver with the information associated to the specfic command in structure 'MESSAGE_SEND_DATA'.

```
typedef enum VolumeControlFlag
{
  GET_ATTACHED_VOLUME_INFORMATION                 = 0X00000001,
  VOLUME_ATTACHED_NOTIFICATION                    = 0X00000002,
  VOLUME_DETACHED_NOTIFICATION                    = 0X00000004,
  BLOCK_VOLUME_DISMOUNT                           = 0X00000008,
  BLOCK_USB_READ                                  = 0x00000010,
  BLOCK_USB_WRITE                                 = 0x00000020,

}
```

GET_ATTACHED_VOLUME_INFORMATION

If this flag is enabled, the filter driver will send all the attached volume information to the user mode service.

VOLUME_ATTACHED_NOTIFICATION

If this flag is enabled, you will get the notification when the filter driver attached to a volume.

VOLUME_DETACHED_NOTIFICATION

If this flag is enabled, you will get the notification when the filter driver detached from a volume.

BLOCK_VOLUME_DISMOUNT

If this flag is enabled, it will prevent the attached volumes from being formatted or dismounted.

BLOCK_USB_READ

If this flag is enabled, it will prevent USB volume from being read.

BLOCK_USB_WRITE

If this flag is enabled, it will prevent USB volume from being written.

Comments

This is the control flag for volume information with API "SetVolumeControlFlag", enable you to get the notification when the filter driver attached to a volume or detached a volume, or prevent the attached volumes from being formatted or dismounted.

typedef struct _VOLUME_INFO

```
{
	ULONG	VolumeNameLength;
	WCHAR	VolumeName[MAX_FILE_NAME_LENGTH];
	ULONG	VolumeDosNameLength;
	WCHAR	VolumeDosName[MAX_FILE_NAME_LENGTH];
	ULONG	VolumeFileSystemType;
	ULONG	DeviceCharacteristics;

} VOLUME_INFO, *PVOLUME_INFO;
```

Members

VolumeNameLength
This is the length of the volume name.

VolumeName
The volume name buffer.

VolumeDosNameLength
The length of the volume dos name.

VolumeDosName
The volume dos name buffer.

VolumeFileSystemType
The file system type of the attached volume.

DeviceCharacteristics
The volume attached device's characteristics.

Comments

This is the structure of the volume's information when the filter driver attached to a volume or detached a volume.

typedef enum ProcessControlFlag

```
{
  DENY_NEW_PROCESS_CREATION                          = 0X00000001,
  ENABLE_SEND_DENIED_PROCESS_EVENT                   = 0X00000002,
  PROCESS_PRE_TERMINATION_REQUEST                    = 0X00000004,
  PROCESS_CREATION_NOTIFICATION                      = 0X00000100,
  PROCESS_TERMINATION_NOTIFICATION                   = 0X00000200,
  PROCESS_HANDLE_OP_NOTIFICATION                     = 0X00000400,
  THREAD_CREATION_NOTIFICATION                       = 0X00000800,
  THREAD_TERMINATION_NOTIFICATION                    = 0X00001000,
  THREAD_HANDLE_OP_NOTIFICATION                      = 0X00002000,
}
```

DENY_NEW_PROCESS_CREATION

If this flag is enabled, it will block the new process creation when the process name matchs the process name filter mask. It is especially good to prevent the untrusted process from being launched.

ENABLE_SEND_DENIED_PROCESS_EVENT

If this flag is enabled, a notification will be sent when a new process creation was blocked by the filter driver.

PROCESS_PRE_TERMINATION_REQUEST

If this flag is enabled, a callback request will be sent before the process is going to be terminated ungratefully, you can block the termination in your callback function.

PROCESS_CREATION_NOTIFICATION

If this flag is enabled and was registered to the process filter rule, the process creation notification will be sent when the creating new process name matchs the process name filter mask.

PROCESS_TERMINATION_NOTIFICATION

If this flag is enabled and was registered to the process filter rule, the process termination notification will be sent when the terminating process name matchs the process name filter mask.

PROCESS_HANDLE_OP_NOTIFICATION

If this flag is enabled and was registered to the process filter rule, the process operation information notification will be sent when a handle for a process is being created or duplicated.

THREAD_CREATION_NOTIFICATION

If this flag is enabled and was registered to the process filter rule, the thread creation notification will be sent when the creating new thread's process name matchs the process name filter mask.

THREAD_TERMINATION_NOTIFICATION

If this flag is enabled and was registered to the process filter rule, the thread termination notification will be sent when the terminating thread's process name matchs the process name filter mask.

THREAD_HANDLE_OP_NOTIFICATION

If this flag is enabled and was registered to the process filter rule, the thread operation information notification will be sent when a handle for a thread is being created or duplicated.

Comments

This is the control flag for process filter rule, to prevent untrusted process from being launched or track the process operations.

typedef enum RegCallbackClass

```
{
  Reg_Pre_Delete_Key = 0x00000001,
  Reg_Pre_Set_Value_Key = 0x00000002,
  Reg_Pre_Delete_Value_Key = 0x00000004,
  Reg_Pre_SetInformation_Key = 0x00000008,
  Reg_Pre_Rename_Key = 0x00000010,
  Reg_Pre_Enumerate_Key = 0x00000020,
  Reg_Pre_Enumerate_Value_Key = 0x00000040,
  Reg_Pre_Query_Key = 0x00000080,
  Reg_Pre_Query_Value_Key = 0x00000100,
  Reg_Pre_Query_Multiple_Value_Key = 0x00000200,
  Reg_Pre_Create_Key = 0x00000400,
  Reg_Post_Create_Key = 0x00000800,
  Reg_Pre_Open_Key = 0x00001000,
  Reg_Post_Open_Key = 0x00002000,
  Reg_Pre_Key_Handle_Close = 0x00004000,
  //
  // .Net only
  //
  Reg_Post_Delete_Key = 0x00008000,
  Reg_Post_Set_Value_Key = 0x00010000,
  Reg_Post_Delete_Value_Key = 0x00020000,
  Reg_Post_SetInformation_Key = 0x00040000,
  Reg_Post_Rename_Key = 0x00080000,
  Reg_Post_Enumerate_Key = 0x00100000,
  Reg_Post_Enumerate_Value_Key = 0x00200000,
  Reg_Post_Query_Key = 0x00400000,
  Reg_Post_Query_Value_Key = 0x00800000,
  Reg_Post_Query_Multiple_Value_Key = 0x01000000,
  Reg_Post_Key_Handle_Close = 0x02000000,
  Reg_Pre_Create_KeyEx = 0x04000000,
  Reg_Post_Create_KeyEx = 0x08000000,
  Reg_Pre_Open_KeyEx = 0x10000000,
  Reg_Post_Open_KeyEx = 0x20000000,
   //
   // new to Windows Vista
   //
   Reg_Pre_Flush_Key = 0x40000000,
   Reg_Post_Flush_Key = 0x80000000,
   Reg_Pre_Load_Key = 0x100000000,
   Reg_Post_Load_Key = 0x200000000,
   Reg_Pre_UnLoad_Key = 0x400000000,
   Reg_Post_UnLoad_Key = 0x800000000,
   Reg_Pre_Query_Key_Security = 0x1000000000,
   Reg_Post_Query_Key_Security = 0x2000000000,
   Reg_Pre_Set_Key_Security = 0x4000000000,
   Reg_Post_Set_Key_Security = 0x8000000000,
   //
   // per-object context cleanup
   //
   Reg_Callback_Object_Context_Cleanup = 0x10000000000,
   //
   // new in Vista SP2
   //
   Reg_Pre_Restore_Key = 0x20000000000,
   Reg_Post_Restore_Key = 0x40000000000,
   Reg_Pre_Save_Key = 0x80000000000,
   Reg_Post_Save_Key = 0x100000000000,
   Reg_Pre_Replace_Key = 0x200000000000,
    Reg_Post_Replace_Key = 0x400000000000,
    //
    // new in Windows 10
    //
    Reg_Pre_Query_KeyName = 0x800000000000,
    Reg_Post_Query_KeyName = 0x1000000000000,
    MAX_REG_CALLBACK_CLASE = 0xffffffffffffff,
}
```

REG_PRE_DELETE_KEY

Specifies that a thread is attempting to delete a key. This value indicates a pre-notification call to RegistryCallback.

REG_PRE_SET_VALUE_KEY

Specifies that a thread is attempting to set a value entry for a key. This value indicates a pre-notification call to RegistryCallback.

REG_PRE_DELETE_VALUE_KEY

Specifies that a thread is attempting to delete a value entry for a key. This value indicates a pre-notification call to RegistryCallback.

REG_PRE_SETINFORMATION_KEY

Specifies that a thread is attempting to set the metadata for a key. This value indicates a pre-notification call to RegistryCallback.

REG_PRE_RENAME_KEY

Specifies that a thread is attempting to rename a key. This value indicates a pre-notification call to RegistryCallback.

REG_PRE_ENUMERATE_KEY

Specifies that a thread is attempting to enumerate a value entry for a key. This value indicates a pre-notification call to RegistryCallback.

REG_PRE_ENUMERATE_KEY

Specifies that a thread is attempting to enumerate a value entry for a key. This value indicates a pre-notification call to RegistryCallback.

REG_PRE_QUERY_KEY

Specifies that a thread is attempting to read the metadata for a key. This value indicates a pre-notification call to RegistryCallback.

REG_PRE_QUERY_VALUE_KEY

Specifies that a thread is attempting to read a value entry for a key. This value indicates a pre-notification call to RegistryCallback.

REG_PRE_QUERY_MULTIPLE_VALUE_KEY

Specifies that a thread is attempting to query multiple value entries for a key. This value indicates a pre-notification call to RegistryCallback.

REG_PRE_CREATE_KEY

Specifies that a thread is attempting to create a key. This value indicates a pre-notification call to RegistryCallback.

REG_POST_CREATE_KEY

Specifies that a thread has successfully created a key. This value indicates a post-notification call to RegistryCallback.

REG_PRE_OPEN_KEY

Specifies that a thread is attempting to open an existing key. This value indicates a pre-notification call to RegistryCallback.

REG_POST_OPEN_KEY

Specifies that a thread has successfully opened an existing key. This value indicates a post-notification call to RegistryCallback.

REG_PRE_KEY_HANDLE_CLOSE

Specifies that a thread is attempting to close a key handle. This value indicates a pre-notification call to RegistryCallback.

REG_POST_DELETE_KEY

Specifies that the system has attempted to delete the key. This value indicates a post-notification call to RegistryCallback.

REG_POST_SET_VALUE_KEY

Specifies that the system has attempted to set a value entry for a key. This value indicates a post-notification call to RegistryCallback.

REG_POST_DELETE_VALUE_KEY

Specifies that the system has attempted to delete a value entry for a key. This value indicates a post-notification call to RegistryCallback.

REG_POST_SETINFORMATION_KEY

Specifies that the system has attempted to set the key's metadata. This value indicates a post-notification call to RegistryCallback.

REG_POST_RENAME_KEY

Specifies that the system has attempted to rename the key. This value indicates a post-notification call to RegistryCallback.

REG_POST_ENUMERATE_KEY

Specifies that the system has attempted to enumerate the subkey of a key. This value indicates a post-notification call to RegistryCallback.

REG_POST_ENUMERATE_VALUE_KEY

Specifies that the system has attempted to enumerate the value entry of a key. This value indicates a post-notification call to RegistryCallback.

REG_POST_QUERY_KEY

Specifies that the system has attempted to query the metadata for a key. This value indicates a post-notification call to RegistryCallback.

REG_POST_QUERY_VALUE_KEY

Specifies that the system has attempted to query a value entry for the key. This value indicates a post-notification call to RegistryCallback.

REG_POST_QUERY_MULTIPLE_VALUE_KEY

Specifies that the system has attempted to query multiple value entries for the key. This value indicates a post-notification call to RegistryCallback.

REG_POST_KEY_HANDLE_CLOSE

Specifies that the system has attempted to close a key handle. This value indicates a post-notification call to RegistryCallback.

REG_PRE_CREATE_KEYEX

Specifies that a thread is attempting to create a key. This value indicates a pre-notification call to RegistryCallback.

REG_POST_CREATE_KEYEX

Specifies that the system has attempted to create a key. This value indicates a post-notification call to RegistryCallback.

REG_PRE_OPEN_KEYEX

Specifies that a thread is attempting to open an existing key. This value indicates a pre-notification call to RegistryCallback.

REG_POST_OPEN_KEYEX

Specifies that the system has attempted to open an existing key. This value indicates a post-notification call to RegistryCallback.

REG_PRE_FLUSH_KEY

Specifies that a thread is attempting to write a key to disk. This value indicates a pre-notification call to RegistryCallback.

REG_POST_FLUSH_KEY

Specifies that the system has attempted to write a key to disk. This value indicates a post-notification call to RegistryCallback.

REG_PRE_LOAD_KEY

Specifies that a thread is attempting to load a registry hive from a file. This value indicates a pre-notification call to RegistryCallback.

REG_POST_LOAD_KEY

Specifies that the system has attempted to load a registry hive from a file. This value indicates a post-notification call to RegistryCallback.

REG_PRE_UNLOAD_KEY

Specifies that a thread is attempting to unload a registry hive. This value indicates a pre-notification call to RegistryCallback.

REG_POST_UNLOAD_KEY

Specifies that the system has attempted to unload a registry hive. This value indicates a post-notification call to RegistryCallback.

REG_PRE_QUERY_KEY_SECURITY

Specifies that a thread is attempting to obtain a registry key's security information. This value indicates a pre-notification call to RegistryCallback.

REG_POST_QUERY_KEY_SECURITY

Specifies that a thread has attempted to obtain a registry key's security information. This value indicates a post-notification call to RegistryCallback.

REG_PRE_SET_KEY_SECURITY

Specifies that a thread is attempting to set a registry key's security information. This value indicates a pre-notification call to RegistryCallback.

REG_POST_SET_KEY_SECURITY

Specifies that a thread has attempted to set a registry key's security information. This value indicates a post-notification call to RegistryCallback.

REG_CALLBACK_OBJECT_CONTEXT_CLEANUP

Specifies that the driver has called CmUnRegisterCallback or the driver's RegistryCallback routine has just finished processing a RegNtPreKeyHandleClose class value.

REG_PRE_RESTORE_KEY

Specifies that a thread is attempting to restore a registry key's information. This value indicates a pre-notification call to RegistryCallback.

REG_POST_RESTORE_KEY

Specifies that a thread has attempted to restore a registry key's information. This value indicates a post-notification call to RegistryCallback.

REG_PRE_SAVE_KEY

Specifies that a thread is attempting to save a registry key's information. This value indicates a pre-notification call to RegistryCallback.

REG_POST_SAVE_KEY

Specifies that a thread has attempted to save a registry key's information. This value indicates a post-notification call to RegistryCallback.

REG_PRE_REPLACE_KEY

Specifies that a thread is attempting to replace a registry key's information. This value indicates a pre-notification call to RegistryCallback.

REG_POST_REPLACE_KEY

Specifies that a thread has attempted to replace a registry key's information. This value indicates a post-notification call to RegistryCallback.

REG_PRE_QUERY_KEYNAME

Specifies that a thread is attempting to obtain the full path of a registry key. Use this value on Windows 10 and later versions of the Windows operating system.

REG_POST_QUERY_KEYNAME

Specifies that a thread has attempted to obtain the full path of a registry key. Use this value on Windows 10 and later versions of the Windows operating system.

MAX_REG_CALLBACK_CLASS

Specifies the maximum value in this enumeration type.

Comments

This is registry callback class, to get the notification of the registry operations.

```
typedef enum RegControlFlag
{
  REG_ALLOW_OPEN_KEY                                      = 0X00000001,
  REG_ALLOW_CREATE_KEY                                    = 0X00000002,
  REG_ALLOW_QUERY_KEY                                     = 0X00000004,
  REG_ALLOW_RENAME_KEY                                    = 0X00000008
  REG_ALLOW_DELETE_KEY                                    = 0X00000010,
  REG_ALLOW_SET_VALUE_KEY_INFORMATION                     = 0X00000020,
  REG_ALLOW_SET_INFORMATION_KEY                           = 0X00000040,
  REG_ALLOW_ENUMERATE_KEY                                 = 0X00000080,
  REG_ALLOW_QUERY_VALUE_KEY                               = 0X00000100,
  REG_ALLOW_ENUMERATE_VALUE_KEY                           = 0X00000200,
  REG_ALLOW_QUERY_MULTIPLE_VALUE_KEY                      = 0X00000400,
  REG_ALLOW_DELETE_VALUE_KEY                              = 0X00000800,
  REG_ALLOW_QUERY_KEY_SECURITY                            = 0X00001000,
  REG_ALLOW_SET_KEY_SECURITY                              = 0X00002000,
  REG_ALLOW_RESTORE_KEY                                   = 0X00004000,
  REG_ALLOW_SAVE_KEY                                      = 0X00010000,
  REG_ALLOW_FLUSH_KEY                                     = 0X00020000,
  REG_ALLOW_LOAD_KEY                                      = 0X00040000,
  REG_ALLOW_UNLOAD_KEY                                    = 0X00080000,
  REG_ALLOW_KEY_CLOSE                                     = 0X00100000,
  REG_ALLOW_KEY_RENAME                                    = 0X00200000,
  REG_MAX_ACCESS_FLAG                                     = 0XFFFFFFFF,

}
```

REG_ALLOW_OPEN_KEY

If this flag is disabled, it will block the registry key open if the process name matchs the filter rule.

REG_ALLOW_CREATE_KEY

If this flag is disabled, it will block the registry key being created if the process name matchs the filter rule.

REG_ALLOW_QUERY_KEY

If this flag is disabled, it will block the registry key being queryed if the process name matchs the filter rule.

REG_ALLOW_RENAME_KEY

If this flag is disabled, it will block the registry key being renamed if the process name matchs the filter rule.

REG_ALLOW_DELETE_KEY

If this flag is disabled, it will block the registry key being deleted if the process name matchs the filter rule.

REG_ALLOW_SET_VALUE_KEY_INFORMATION

If this flag is disabled, it will block the setting the value of the registry key if the process name matchs the filter rule.

REG_ALLOW_SET_INFORMATION_KEY

If this flag is disabled, it will block the setting the registry key if the process name matchs the filter rule.

REG_ALLOW_ENUMERATE_KEY

If this flag is disabled, it will block the registry key being enumerated if the process name matchs the filter rule.

REG_ALLOW_QUERY_VALUE_KEY

If this flag is disabled, it will block the value of the registry key being queryed if the process name matchs the filter rule.

REG_ALLOW_ENUMERATE_VALUE_KEY

If this flag is disabled, it will block the value of the registry key being enumerated if the process name matchs the filter rule.

REG_ALLOW_QUERY_MULTIPLE_VALUE_KEY

If this flag is disabled, it will block the querying of multiple values of the registry key if the process name matchs the filter rule.

REG_ALLOW_DELETE_VALUE_KEY

If this flag is disabled, it will block the value of the registry key being deleted if the process name matchs the filter rule.

REG_ALLOW_QUERY_KEY_SECURITY

If this flag is disabled, it will block the registry key security being queryed if the process name matchs the filter rule.

REG_ALLOW_SET_KEY_SECURITY

If this flag is disabled, it will block the registry key security being setted if the process name matchs the filter rule.

REG_ALLOW_RESTORE_KEY

If this flag is disabled, it will block the registry key being restored if the process name matchs the filter rule.

REG_ALLOW_SAVE_KEY

If this flag is disabled, it will block the registry key being saved if the process name matchs the filter rule.

REG_ALLOW_FLUSH_KEY

If this flag is disabled, it will block the registry key security being flushed if the process name matchs the filter rule.

REG_ALLOW_LOAD_KEY

If this flag is disabled, it will block the registry key being loaded if the process name matchs the filter rule.

REG_ALLOW_UNLOAD_KEY

If this flag is disabled, it will block the registry key being unloaded if the process name matchs the filter rule.

REG_ALLOW_KEY_CLOSE

If this flag is disabled, it will block the registry key being closed if the process name matchs the filter rule.

REG_ALLOW_KEY_RENAME

If this flag is disabled, it will block the registry key being renamed if the process name matchs the filter rule.

REG_MAX_ACCESS_FLAG

Enable the maximum access right for the registry access.

Comments

This is the control flag for registry filter rule, to track or control the registry operations.

```
typedef enum FileEventType
{
	FILE_WAS_CREATED				= 0x00000020,
	FILE_WAS_WRITTEN				= 0x00000040,
	FILE_WAS_RENAMED				= 0x00000080,
	FILE_WAS_DELETED				= 0x00000100,
	FILE_SECURITY_CHANGED			= 0x00000200,
	FILE_INFO_CHANGED				= 0x00000400,
	FILE_WAS_READ				= 0x00000800,
};
```

Members

FILE_WAS_CREATED

The new file was created event.

FILE_WAS_WRITTEN

The file was written with data event.

FILE_WAS_RENAMED

The file was renamed event.

FILE_SECURITY_CHANGED

The file security was changed event.

FILE_INFO_CHANGED

The file information was changed event.

FILE_WAS_READ

The file data was read event.

Comments

This is the file change event, you can get the notification when the file was changed by registering the specific events.

typedef enum AccessFlag

```
{
  EXCLUDE_FILTER_RULE                           = 0X00000000,
  EXCLUDE_FILE_ACCESS                           = 0x00000001,
  REPARSE_FILE_OPEN                             = 0x00000002,
  HIDE_FILES_IN_DIRECTORY_BROWSING              = 0x00000004,
  FILE_ENCRYPTION_RULE                          = 0x00000008,
  ALLOW_OPEN_WTIH_ACCESS_SYSTEM_SECURITY        = 0x00000010,
  ALLOW_OPEN_WITH_READ_ACCESS                   = 0x00000020,
  ALLOW_OPEN_WITH_WRITE_ACCESS                  = 0x00000040,
  ALLOW_OPEN_WITH_CREATE_OR_OVERWRITE_ACCESS    = 0x00000080,
  ALLOW_OPEN_WITH_DELETE_ACCESS                 = 0x00000100,
  ALLOW_READ_ACCESS                             = 0x00000200,
  ALLOW_WRITE_ACCESS                            = 0x00000400,
  ALLOW_QUERY_INFORMATION_ACCESS                = 0x00000800,
  ALLOW_SET_INFORMATION                         = 0x00001000,
  ALLOW_FILE_RENAME                             = 0x00002000,
  ALLOW_FILE_DELETE                             = 0x00004000,
  ALLOW_FILE_SIZE_CHANGE                        = 0x00008000,
  ALLOW_QUERY_SECURITY_ACCESS                   = 0x00010000,
  ALLOW_SET_SECURITY_ACCESS                     = 0x00020000,
  ALLOW_DIRECTORY_LIST_ACCESS                   = 0x00040000,
  ALLOW_FILE_ACCESS_FROM_NETWORK                = 0x00080000,
  ALLOW_NEW_FILE_ENCRYPTION                     = 0x00100000,
  ALLOW_READ_ENCRYPTED_FILES                    = 0x00200000,
  ALLOW_ALL_SAVE_AS                             = 0x00400000,
  ALLOW_COPY_PROTECTED_FILES_OUT                = 0x00800000,
  ALLOW_FILE_MEMORY_MAPPED                      = 0x01000000,
  DISABLE_ENCRYPT_ON_READ                       = 0x02000000,
  ALLOW_COPY_PROTECTED_FILES_TO_USB             = 0x04000000,
  LEAST_ACCESS_FLAG                                        = 0xf0000000,
  ALLOW_MAX_RIGHT_ACCESS                                   = 0xfffffff0,

};
```

Members

EXCLUDE_FILTER_RULE

EXCLUDE_FILTER_RULE is the rule which bypass the files matched the FilterMask. It can`t combine to use with the other access flags. If a file matchs the exclude filter rule,the filter will bypass this file,you won`t get any Io request notification or control. If a file matches both the exclude filter rule and monitor rule, the exclude filter rule will be applied.

EXCLUDE_FILE_ACCESS

EXCLUDE_FILE_ACCESS is the flag indicates the filter will deny the access to the files which match the FilterMask.

REPARSE_FILE_OPEN

REPARSE_FILE_OPEN is the rule which reparses the file matched the FilterMask open to the other files which match the ReparseMask.

```
Example:

Reparse the file open in folder c:\test to another folder c:\reparseFol
der"


AddFileFilterRule(ALLOW_MAX_RIGHT_ACCESS|REPARSE_FILE_OPEN, L"c:\\test\
\*", 1);

AddReparseFileMaskToFilterRule(L"c:\\test\\*",L"c:\\reparseFolder\\*");
```

HIDE_FILES_IN_DIRECTORY_BROWSING

HIDE_FILES_IN_DIRECTORY_BROWSING is the flag let you hide the files in the managed folder when it matches the mask.

```
Example:

Hide the files in folder c:\test for process "explorer.exe"


AddFileFilterRule(ALLOW_MAX_RIGHT_ACCESS|HIDE_FILES_IN_DIRECTORY_BROWSI
NG, L"c:\\test\\*", FALSE, 1);

AddIncludeProcessNameToFilterRule(L"c:\\test\\*",L"explorer.exe");

AddHiddenFileMaskToFilterRule(L"c:\\test\\*",L"*.*");
```

ENCRYPTION_FILTER_RULE

ENCRYPTION_FILTER_RULE is the flag indicates the filter will encrypt the new created files which match the FilterMask.If the other flag were set, this flag is automatically enabled.

ALLOW_OPEN_WTIH_ACCESS_SYSTEM_SECURITY

ALLOW_OPEN_WTIH_ACCESS_SYSTEM_SECURITY is the flag indicates if you can open the file with the desired access with the ACCESS_SYSTEM_SECURITY set.

ALLOW_OPEN_WITH_READ_ACCESS

ALLOW_OPEN_WITH_READ_ACCESS is the flag indicates if you can open the file with read access.

ALLOW_OPEN_WITH_WRITE_ACCESS

ALLOW_OPEN_WITH_WRITE_ACCESS is the flag indicates if you can open the file with write access.

ALLOW_OPEN_WITH_CREATE_OR_OVERWRITE_ACCESS

ALLOW_OPEN_WITH_CREATE_OR_OVERWRITE_ACCESS is the flag indicates if you can open with create a new file or overwrite the exist file.

ALLOW_OPEN_WITH_DELETE_ACCESS

ALLOW_OPEN_WITH_DELETE_ACCESS is the flag indicates if you can open the file for deletion or rename access.

ALLOW_READ_ACCESS

ALLOW_READ_ACCESS is the flag indicates if you have the permission to read the file.

ALLOW_WRITE_ACCESS

ALLOW_WRITE_ACCESS is the flag indicates if you have the permission to write the file.

ALLOW_QUERY_INFORMATION_ACCESS

ALLOW_QUERY_INFORMATION_ACCESS is the flag indicates if you have the permission to query the file information.

ALLOW_SET_INFORMATION

ALLOW_SET_INFORMATION is the flag indicates if you have the permission to set the file information.

ALLOW_FILE_RENAME

ALLOW_FILE_RENAME is the flag indicates if you have the permission to rename the file. If the flag ALLOW_SET_INFORMATION is unset, the rename is blocked automatically.

ALLOW_FILE_DELETE

ALLOW_FILE_DELETE is the flag indicates if you have the permission to delete the file. If the flag ALLOW_SET_INFORMATION is unset, the deletion is blocked automatically.

ALLOW_FILE_SIZE_CHANGE

ALLOW_FILE_SIZE_CHANGE is the flag indicates if you have the permission to change the file size. If the flag ALLOW_SET_INFORMATION is unset, the file size chage is blocked automatically.

ALLOW_QUERY_SECURITY_ACCESS

ALLOW_QUERY_SECURITY_ACCESS is the flag indicates if you have the permission to query the file security.

ALLOW_SET_SECURITY_ACCESS

ALLOW_SET_SECURITY_ACCESS is the flag indicates if you have the permission to set the file security.

ALLOW_DIRECTORY_LIST_ACCESS

ALLOW_DIRECTORY_LIST_ACCESS is the flag indicates if you have the permission to browse the directory.

ALLOW_FILE_ACCESS_FROM_NETWORK

ALLOW_FILE_ACCESS_FROM_NETWORK is the flag indicates if you have the permission to access the files from the network server.

ALLOW_NEW_FILE_ENCRYPTION

ALLOW_NEW_FILE_ENCRYPTION is the flag indicates if you allow to encrypt the new created files by the filter driver.

ALLOW_READ_ENCRYPTED_FILES

ALLOW_READ_ENCRYPTED_FILES is the flag indicates if you allow to read encrypted files, if it is disabled, the encrypted data will return to the users.

ALLOW_ALL_SAVE_AS

ALLOW_ALL_SAVE_AS is the flag indicates if the process has the permission to create a new file.

ALLOW_COPY_PROTECTED_FILES_OUT

ALLOW_COPY_PROTECTED_FILES_OUT is the flag indicates if allow the protected files being copy out of the protected folder, if allow_all_save_as is true.

ALLOW_FILE_MEMORY_MAPPED

ALLOW_FILE_MEMORY_MAPPED indicates if the file can be opened with memory mapped, a file excution must be opened with memory mapped.

DISABLE_ENCRYPT_DATA_ON_READ

DISABLE_ENCRYPT_DATA_ON_READ is fale, and the encryption is enabled, it can encrypt the data when the application reads the file, it enables you to encrypt your files when you upload or copy out your files to other places.

LEAST_ACCESS_FLAG

LEAST_ACCESS_FLAG indicates the file has the least access right, it can't be set to 0, or it will be excluded by the filter driver.

ALLOW_COPY_PROTECTED_FILES_TO_USB

If this flag was disabled, the protected files can't be copied out to the USB drive.

ALLOW_MAX_RIGHT_ACCESS

ALLOW_MAX_RIGHT_ACCESS indicates if you have the maximum access right to the file.

Comments

A accessFlag is the control flag of a filter rule, you can control the file access by disabling the specific flags.

typedef enum AESFlags

```
{
  Flags_Enabled_Expire_Time                    = 0x00000010,
  Flags_Enabled_Check_ProcessName              = 0x00000020,
  Flags_Enabled_Check_UserName                 = 0x00000040,
  Flags_Enabled_Check_AccessFlags              = 0x00000080,
  Flags_Enabled_Check_User_Permit              = 0x00000100,
  Flags_AES_Key_Was_Embedded                   = 0x00000200,
  Flags_Enabled_Request_IV_And_Key             = 0x00000400,
  Flags_Enabled_Revoke_Access_Control          = 0x00000800,
  Flags_Enabled_Check_Computer_Id              = 0x00001000,
  Flags_Enabled_Check_User_Password            = 0x00002000,
};
```

Members

Flags_Enabled_Expire_Time

Flags_Enabled_Expire_Time is the flag which indicates that the filter driver will check if the encrypted file was expired before it can be opened.

Flags_Enabled_Check_ProcessName

Flags_Enabled_Check_ProcessName is the flag which indicates that the filter driver will check if the process has the permission to open the encrypted file.

Flags_Enabled_Check_UserName

Flags_Enabled_Check_UserName is the flag which indicates that the filter driver will check if the user has the permission to open the encrypted file.

Flags_Enabled_Check_AccessFlags

Flags_Enabled_Check_AccessFlags is the flag which indicates that the filter driver will check the access flags if the encrypted file can be opened.

Flags_Enabled_Check_User_Permit

Flags_Enabled_Check_User_Permit is the flag which indicates that the filter driver will require the user permission before the encrypted file can be opened.

Flags_AES_KEY_WAS_EMBEDDED

Flags_AES_KEY_WAS_EMBEDDED is the flag which indicates that the filter driver will user the embedded AES key to decrypt the file.

Flags_Enabled_Request_IV_And_Key

Flags_Enabled_Request_IV_And_Key is the flag which indicates that the filter driver will require encryption key and IV from user mode service to decrypt the file.

Flags_Enabled_Revoke_Access_Control

Flags_Enabled_Revoke_Access_Control is the flag which indicates that the filter driver will require the permission from the control server and get the encryption key and IV to decrypt the file.

Flags_Enabled_Check_Computer_Id

Flags_Enabled_Check_Computer_Id is the flag which indicates that the filter driver will check if the computer can access the encrypted files.

Flags_Enabled_Check_User_Password

Flags_Enabled_Check_User_Password is the flag which indicates that the filter driver will require the user password before the encrypted file can be opened.

Comments

A AESFlags is a flag inside the metadata of the encrypted file.

typedef struct _AES_DATA

```
{
	ULONG		VerificationKey;
	ULONG		AESFlags;
	ULONG		Version;
	UCHAR		IV[16];
	ULONG		EncryptionKeyLength;
	UCHAR		EncryptionKey[32];
	LONGLONG	FileSize;
	ULONG		CryptoType;
	ULONG		PaddingSize;
	ULONG		AESDataSize;
	LONGLONG	FileSizeOnDisk;
	ULONG		AccessFlags;
	ULONG		Reserve1;
	ULONG		Reserve2;
	ULONG		TagDataLength;
	WCHAR		TagData[1];

}
```

Members

EaseTagKey

The verification key of the AES data structure, the value is 0xccb76e80.

AESFlags

The Flags of the encrypted file’s meta data,indicates the filter driver what action needs to do for the encrypted file opens.

Version

The version indicates the encryption engine OpenSSL library if it is 16, or use Micrsoft CNG library if it is 32.

IV

The 16 bytes initialization vector, is an arbitrary number that can be used along with an encryption key for the file encryption.

EncryptionKeyLength

The length of the encryption key, it should be 16,24 or 32.

EncryptionKey

The encryption key for the file encryption.

FileSize

The file size was present to the user for the encrypted file, this is file size doesn’t include the padding size and the header size.

CryptoType

The crypto type for the encryption, default is 0 which is using AES CTR mode.

PaddingSize

The padding size of the last block if it needs the padding.

AESDataSize

The total size of this structure, this is the size which will be appended to the encrypted file, by default is 1024.

FileSizeOnDisk

This is the actual physical file size of the encrytped file, includes the pading size and the header size.

AccessFlags

The file access control flag if the bit *Flags_Enabled_Check_AccessFlags* in the AESFlags flag was enabled.

Reserve1

The reserve data for future use.

Reserve2

The reserve data for future use.

TagDataLength

The length of the custom data.

TagData

The custom tag data which was added by the user from the encryption API.

Comments

AES_DATA structure is the metadata of the encrypted file which was appended to the end of the file.

Typedef enum FilterStatus

```
{
     FILTER_MESSAGE_IS_DIRTY              = 0x00000001,
     FILTER_COMPLETE_PRE_OPERATION        = 0x00000002,
     FILTER_DATA_BUFFER_IS_UPDATED        = 0x00000004,
};
```

Members

FILTER_MESSAGE_IS_DIRTY

FILTER_MESSAGE_IS_DIRTY is the flag indicates the reply message was modified and needs to be processed in filter driver. Set this flag if you change the reply message.

FILTER_COMPLETE_PRE_OPERATION

FILTER_COMPLETE_PRE_OPERATION is the flag indicates the filter needs to complete this pre I/O request.Only set this flag with pre operation request when you don`t want the request goes down to the file system.

FILTER_DATA_BUFFER_IS_UPDATED

FILTER_DATA_BUFFER_IS_UPDATED is the flag indicates the data buffer of the reply message was updated.The filter will process this data buffer.

Comments

FitlerStatus is the status code which returns to the filter driver,it is for control filter driver.It instructs the filter drive what action needs to be done.

typedef struct _MESSAGE_SEND_DATA

```
{
    ULONG              VerificationNumber;
    ULONG              MessageId;
    ULONG              FilterRuleId;
    WCHAR              RemoteIP[INET_ADDR_STR_LEN];
    PVOID              FileObject;
    PVOID              FsContext;
    ULONG              MessageType;
    ULONG              ProcessId;
    ULONG              ThreadId;
    LONGLONG           Offset;
    ULONG              Length;
    LONGLONG           FileSize;
    LONGLONG           TransactionTime;
    LONGLONG           CreationTime;
    LONGLONG           LastAccessTime;
    LONGLONG           LastWriteTime;
    ULONG              FileAttributes;
    ULONG               DesiredAccess;
    ULONG               Disposition;
    ULONG               ShareAccess;
    ULONG               CreateOptions;
    ULONG               CreateStatus;
    ULONG               InfoClass;
    ULONG               Status;
    ULONG               ReturnLength;
    ULONG               FileNameLength;
    WCHAR               FileName[MAX_FILE_NAME_LENGTH];
    ULONG               SidLength;
    UCHAR               Sid[MAX_SID_LENGTH];
    ULONG               DataBufferLength;
    UCHAR               DataBuffer[MAX_MESSAGE_SIZE];

} MESSAGE_SEND_DATA, *PMESSAGE_SEND_DATA;
```

Members

VerificationNumber
The verification number to verify the data structure integerity.

MessageId
This is the sequential number of the transaction.

FilterRuleId
This is the filter rule Id of the file I/O was managed.

RemoteIP
The remote IP address if the file I/O was accessed from the smb network computer.

FileObject
The FileObject is the pointer to the file object,it is a unique number to every file open.

FsContext
The FsContext is the pointer to the file context,it is unique number to the same file.

MessageType
MessageType is the I/O request type for this transaction.

ProcessId

The ProcessId is the id of the process associated with the thread that originally requested the I/O operation.

ThreadId

The ThreadId is the id of thread which requested the I/O operation.

Offset

The Offset is the read or write offset.

Length

The Length is the length for read or write.

FileSize

The FileSize is the size of the file for this I/O request.

TransactionTime

The transaction time in UTC format of the request.

CreationTime

The creation time in UTC format of the file we are requesting.

LastAccessTime

The last access time in UTC format of the file we are requesting.

LastWriteTime

The last write time in UTC format of the file we are requesting.

FileAttributes

The file attributes of the file we are requesting.

DesiredAccess

The DesiredAccess is the request access to the file for the Create I/O request,which can be summarized as read,write,both or neither zero.For more information reference the Windows API CreateFile.

Disposition

The disposition is the action to take on a file that exist or does not exist. For more information reference the Windows API CreateFile.

SharedAccess

The SharedAccess is the requested sharing mode of the file which can be read,write,both,delete,all of these,or none. For more information reference the Windows API CreateFile.

CreateOptions

The CreateOptions specifies the options to be applied when creating or opening the file. For more information reference the Windows API CreateFile.

CreateStatus

The CreateStatus is the status after the Create I/O request completed.It could be the one of the following values:

```
FILE_SUPERSEDED = 0x00000000,
FILE_OPENED = 0x00000001,
FILE_CREATED = 0x00000002,
FILE_OVERWRITTEN = 0x00000003,
FILE_EXISTS = 0x00000004,
FILE_DOES_NOT_EXIST = 0x00000005,
```

InfoClass

The infoClss is the information class for query/set information I/O request, or directory browsing request. For query/set security request, it is the security information.For more information reference the windows Filter API FltQueryInformationFile, FltQueryDirectoryFile,FltQuerySecurityObject.

Status

The Status is the I/O status which returns from the file system,indicates if the I/O request succeeded.It is only meaningful to the post I/O requests.

ReturnLength

The return length of the I/O for read or write.

FileNameLength

The file name length in byte of the file we are requesting.

FileName

The file name we are requesting.

SidLength

The length of the security identifier buffer in byte.

Sid

The buffer of the security identifier data.

DataBufferLength

The data buffer length for read, write, security, information,directory I/O requests.

DataBuffer

The The data buffer length for read, write, security, information, directory I/O requests.

Comments

The MESSAGE_SEND_DATA structure is used to transfer the data from kernel to the user mode application. It includes all the information needed for the user.

```
typedef struct _PROCESS_INFO
{
        ULONG                   MessageId;
        PVOID                   Reserve1;
        PVOID                   Reserve2;
        ULONG                   MessageType;
        LONGLONG                TransactionTime;
        ULONG                   ProcessId;
        ULONG                   ThreadId;
        ULONG                   ParentProcessId;
        ULONG                   CreatingProcessId;
        ULONG                   CreatingThreadId;
        ULONG                   DesiredAccess;
        ULONG                   Operation;
        BOOL                    FileOpenNameAvailable;
        ULONG                   SidLength;
        UCHAR                   Sid[MAX_SID_LENGTH];
        ULONG                   FileNameLength;
        WCHAR                   FileName[MAX_FILE_NAME_LENGTH];
        ULONG                   CommandLineLength;
```

```
    WCHAR                  CommandLine[MAX_FILE_NAME_LENGTH];
    ULONG                  Status;
    ULONG                  VerificationNumber;

} PROCESS_INFO, *PPROCESS_INFO;
```

Members

MessageId
This is the sequential number of the transaction.

Reserve1
The reserve data field1.

Reserve2
The reserve data field2.

MessageType
MessageType is the process message type which is the filter command, reference filter command enumeration.

TransactionTime
The transaction time in UTC format of the request.

ProcessId
The ProcessId is the id of the current process associated with the thread that originally requested the process operation.

ThreadId
The thread Id of the current operation thread.

ParentProcessId
The process Id of the parent process for the new process. Note that the parent process is not necessarily the same process as the process that created the new process.

CreatingProcessId
The process Id of the process that created new process.

CreatingThreadId
The thread Id of the thread that created the new process.

DesiredAccess

An ACCESS_MASK value that specifies the access rights to grant for the handle.

Operation

The type of handle operation, this member might be one of the following values:OB_OPERATION_HANDLE_CREATE, OB_OPERATION_HANDLE_DUPLICATE.

FileOperNameAvailable

A boolean value that specifies whether the ImageFilename member contains the exact file name that is used to open the process executable file.

SidLength

The length of the security identifier buffer in byte.

Sid

The buffer of the security identifier data.

ImageFileNameLength

The image file name length in byte of the file name that is used to open the process executable file.

ImageFileName

The file name that is used to open the process executable file.

CommandLineLength

The length in byte of the command line.

CommandLine

The process executable file and command line.

Status

The Status is the I/O status which returns from the file system,indicates if the I/O request succeeded.

VerificationNumber

The verification number to verify the data structure integerity.

Comments

Replace MESSAGE_SEND_DATA structure with this one when process filter driver sends the process operation callback notification, is used to transfer the data from kernel to the user mode application.

```
typedef struct _MESSAGE_REPLY_DATA
{
	ULONG		MessageId;
	ULONG		MessageType;
	ULONG		ReturnStatus;
	ULONG		FilterStatus;
	union
	{
	Struct{
			ULONG	DataBufferLength;
			UCHAR	DataBuffer[MAX_MESSAGE_SIZE];
		}Data;

	Struct{
			ULONG	AESDataLength;
			UCHAR	IV[16];
			ULONG	EncryptionKeyLength;
			UCHAR	EncryptionKey[1];
		}AESData;

	Struct{
			ULONG	UserNameLength;
			UCHAR	UserName[1];
		}UserInfo;

	Struct{
			ULONG	FileNameLength;
			UCHAR	FileName[1];
		}FileInfo;

	}ReplyData

} MESSAGE_REPLY_DATA, *PMESSAGE_REPLY_DATA;
```

Members

MessageId

This is the sequential number of the transaction.

MessageType

MessageType is the I/O request type for this transaction. Reference MessageType enum type.

ReturnStatus

The ReturnStatus is the I/O status which returns to filter driver, and filter will return this status to the user application for the request.

FilterStatus

The FitlerStatus is the status code which returns to the filter driver,it instructs the filter what process needs to be done. For more information reference the FilterStatus enum.

DataBufferLength

The data buffer length which returns to the filter driver.

DataBuffer

The data buffer which returns to the filter driver.

AESDataLength

The total length of the AESData.

IV

The 16 bytes initialization vector returns to filter driver.

EncryptionKeyLength

The length of the encryption key.

EncrytionKey

The encrytion key returns to the filter driver.

UserNameLength

The length of the user name.

UserName

The user name buffer.

FileNameLength

The length of the file name.

FileName

The file name buffer.

Comments

MESSAGE_REPLY_DATA is only for control filter, when it needs to change the data or status of the I/O request. To update the reply data buffer, you must understand the format of the buffer, incorrect data could cause your system unfunctional, even crash.

Types

typedef BOOL (__stdcall *Proto_Message_Callback)(

```
   IN     PMESSAGE_SEND_DATA  pSendMessage,
   IN OUT PMESSAGE_REPLY_DATA pReplyMessage)
```

Comments

This is the proto type of the message callback function. The function will be called when the registed I/O requests match the filter rule. The second parameter “pReplyMessage” is always NULL for the file system monitor filter.

typedef VOID (__stdcall *Proto_Disconnect_Callback)()

Comments

This is the proto type of disconnect function.The function will be called when the connection to the filter is disconnected.

Exported API

BOOL

InstallDriver()

Return Value

Return true if it succeeds, else return false.

Comments

Install the EaseFilter driver to the system.To install the driver you need the administrator permission.

BOOL

UnInstallDriver()

Return Value

Return true if it succeeds, else return false.

Comments

UnInstall the EaseFilter driver from the system. To UnInstall the driver you need the administrator permission.

BOOL

SetRegistrationKey(

```
IN   WCHAR* RegisterKey)
```

Parameters

RegisterKey

Your register key.

Return Value

Return true if it succeeds, else return false.

Comments

You have to set the registration key before you can start the filter.

BOOL

RegisterMessageCallback(

```
     ULONG ThreadCount,
     Proto_Message_Callback MessageCallback,
     Proto_Disconnect_Callback DisconnectCallback )
```

Parameters

ThreadCount

The number of threads used for connection to the filter.

MessageCallback
The message callback function for the registered I/O requests.

DisconnectCallback
The disconnect callback function when the connection is disconnected.

Return Value
Return true if it succeeds, else return false.

Comments

RegisterMessageCallback is the first API you need to call, it is the API start the filter and create the connection to the filter.

VOID

Disconnect()

Comments

Disconnect is the API when you want to stop filter and filter connection.

BOOL

GetLastErrorMessage(*WCHAR* Buffer, PULONG BufferLength****)***

Parameters

Buffer
This the pointer of the buffer to receive the last error message.

BufferLength
The length of the buffer.

Return Value
Return true if it succeeds,else return false if the buffer length is not big enough to contain the message,and the BufferLength is set with the right size needed.

Comments

This API is called right after if the other API is failed. It will return the error message.

BOOL

ResetConfigData();

Return Value

Return true if it succeeds, else return false.

Comments

ResetConfigData is the API reset all the configuration of the filter, it will clear up all the setting includes the filter rules.

BOOL

SetFilterType(ULONG FilterType)

Parameters

FilterType

The type of the filter you want to set. There are FILE_SYSTEM_MONITOR filter and FILE_SYSTEM_CONTROL filter.

Return Value

Return true if it succeeds, else return false.

Comments

The default filter type is file system monitor filter.

BOOL

SetConnectionTimeout(ULONG TimeOutInSeconds)

Parameters

TimeOutInSeconds

The value of the filter wait time out.

Return Value

Return true if it succeeds, else return false.

Comments

This is the maixmum time for the filter driver wait for the response from user mode, the user mode application should return as fast as possible, or it will block the system requests.Set it bigger if your application needs to process with more time.

BOOL

SetVolumeControlFlag(ULONG VolumeControlFlag)

Parameters

VolumeControlFlag
The value of the volume control flag.

Return Value
Return true if it succeeds, else return false.

Comments

This is the API to register the notification when the filter driver attached the volume or detached the volume. You also can prevent the attached volumes from being formatted or dismounted.

BOOL

AddFileFilterRule(

```
     IN   ULONG   AccessFlag,
     IN   WCHAR* FilterMask,
     IN   BOOLEAN IsResident,
     IN   ULONG    FilterRuleId
)
```

Parameters

AccessFlag
The AccessFlag of this filter rule.

FilterMask

The FilterMask set the target folder or files.The mask is dos format,it can include wild character '*'or '?'. For example:

C:\test\*txt
The filter only monitor the files end with 'txt' in the folder c:\test.

IsResident

The flag indicates if the filter rule will be saved to the registry.

FilterRuleId

The Id of this filter rule, when you get the I/O callback or the notification, the filter rule Id in the data strucure "MessageSend" can tell you which filter rule was applied to this I/O.

Return Value

Return true if it succeeds, else return false.

Comments

AddFileFilterRule is the API to setup the filter rule,You can set up multiple filte rules, the FilterMask must be different, if the FilterMask is the same, it will overwrite the previous one.

BOOL

RegisterFileChangeEventToFilterRule(

```
	IN   WCHAR* FilterMask,
	IN   ULONG  EventType
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule.

EventType

The event types were registered to the filter rule, to monitor the file events.

Comments

If you want to monitor the file events for the filter rule, this is the API to register the event types.

BOOL

RegisterMonitorIOToFilterRule(

```
      IN   WCHAR* FilterMask,
      IN   ULONG  RegisterIO
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule.

RegisterIO

The IOs were registered to the filter rule,only post-IOs can be registered, it was used to monitor the file IOs, when it was triggered, filter driver will send the notification to the user.

Comments

If you want to get the notification of the file IOs for the filter rule, this is the API to register the IOs which you are interested.

BOOL

RegisterControlIOToFilterRule(

```
      IN   WCHAR* FilterMask,
      IN   ULONG  RegisterIO
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule.

RegisterIO

The IOs were registered to the filter rule, were used to control the file IOs, when it was triggered, filter driver will send the notification to the user, block and wait for the response, it can control the IOs data and status based on the return result.

Comments

If you want to control the file requests, this is the API to register the IOs which you are interested.

BOOL

AddRegisterIOFilterToFilterRule(

```
      IN   WCHAR* FilterMask,
      IN   ULONG  FilterByDesiredAccess,
      IN   ULONG  FilterByDisposition,
      IN   ULONG  FilterByCreateOptions
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule.

FilterByDesiredAccess

Filter the register IO option with file opens DesiredAccess.

FilterByDisposition

Filter the register IO option with file opens Disposition.

FilterByCreateOptions

Filter the register IO option with file opens CreateOptions.

Comments

Filter the callback IOs by the file open options if the callback IOs were registered.

BOOL

AddEncryptionKeyToFilterRule(

```
      IN   WCHAR* FilterMask,
      IN   ULONG  EncryptionKeyLength,
      IN   UCHAR* EncryptionKey
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule.

EncryptionKeyLength

The length of the encryption key.

EncryptionKey

The encryption key for the filter rule.

Return Value

Return true if it succeeds, else return false.

Comments

If the encryption was enabled in the access flag in the API AddFileFilterRule, this is the API to add the encryption key for the filter rule, every file will use an unique iv.

```
BOOL

AddEncryptionKeyAndIVToFilterRule(
      IN   WCHAR* FilterMask,
      IN   ULONG  EncryptionKeyLength,
      IN   UCHAR* EncryptionKey,
      IN   ULONG  IVLength,
      IN   UCHAR* IV
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule.

EncryptionKeyLength

The length of the encryption key.

EncryptionKey

The encryption key for the filter rule.

IVLength

The length of the encryption iv.

IV

The encryption iv for the filter rule.

Return Value

Return true if it succeeds, else return false.

Comments

If the encryption was enabled in the access flag in the API AddFileFilterRule, this is the API to add the encryption key and iv for the filter rule, all files in this filter rule will use the same key and iv.

BOOL

AddReparseFileMaskToFilterRule(

```
    IN   WCHAR* FilterMask,
    IN   WCHAR* ReparseFilterMask
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

ReparseFilterMask

The reparse folder mask, it can include the wild character, but it must match the wild character in FilterMask.

For example:
FilterMask = c:\test\*txt
ReparseFilterMask = d:\reparse\*doc

If you open file c:\test\MyTest.txt, it will reparse to the file d:\reparse\MyTest.doc.

Return Value

Return true if it succeeds, else return false.

Comments

If the REPARSE_FILE_OPEN was enabled in the access flag in the API AddFileFilterRule , this is the API to add the reparse filter mask for the filter rule.

BOOL

AddHiddenFileMaskToFilterRule(

```
      IN   WCHAR* FilterMask,
      IN   WCHAR* HiddenFileFilterMask
)
```

Parameters

FilterMask
The FilterMask which was set in API AddFileFilterRule .

HiddenFileFilterMask
The hidden file filter mask for the files to be hidden.

For example:
FilterMask = c:\hideFilesTest\\*
HiddenFileFilterMask = *.doc

If you open folder c:\hideFilesTest, all the files with extension .doc won't show up in the folder.

Return Value
Return true if it succeeds, else return false.

Comments

If the HIDE_FILES_IN_DIRECTORY_BROWSING was enabled in the access flag in the API AddFileFilterRule , this is the API to add the hidden filter mask for the filter rule.

BOOL

AddExcludeFileMaskToFilterRule(

```
      IN   WCHAR* FilterMask,
      IN   WCHAR* ExcludeFileFilterMask
)
```

Parameters

FilterMask
The FilterMask which was set in API AddFileFilterRule .

ExcludeFileFilterMask
The file filter mask to be excluded.

```
For example:
FilterMask = *.txt
ExcludeFileFilterMask = c:\windows\*

The filter driver target file is all the files with
extension .txt except the files in folder c:\windows
and its subfolders.
```

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the exclude file filter mask for the filter rule which was set in AddFileFilterRule .

BOOL

AddIncludeProcessIdToFilterRule(

```
      IN   WCHAR* FilterMask,
      IN   ULONG IncludeProcessId
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

IncludeProcessId

The process Id to be included by filter driver.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the include process Id for the filter rule which was set in AddFileFilterRule ,only the files opened by the processes in the included process Ids and process names will be monitored by the filter driver.

BOOL

AddExcludeProcessIdToFilterRule(

```
        IN    WCHAR* FilterMask,
        IN    ULONG ExcludeProcessId
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

ExcludeProcessId

The process Id to be excluded by filter driver.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the exclude process Id for the filter rule which was set in AddFileFilterRule , all the files were opened by the processes in the excluded process Ids and process names won't be monitored by the filter driver.

BOOL

AddIncludeProcessNameToFilterRule(

```
        IN    WCHAR* FilterMask,
        IN    WCHAR* IncludeProcessName
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

IncludeProcessName

The process name to be included by filter driver.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the include process name for the filter rule which was set in AddFileFilterRule , only the files opened by the processes in the included process Ids and process names will be monitored by the filter driver.

BOOL

AddExcludeProcessNameToFilterRule(

```
	IN	WCHAR* FilterMask,
	IN	WCHAR* ExcludeProcessName
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

ExcludeProcessName

The process name to be excluded by filter driver.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the exclude process name for the filter rule which was set in AddFileFilterRule , all the files were opened by the processes in the excluded process Ids and process names won’t be monitored by the filter driver.

BOOL

AddIncludeUserNameToFilterRule(

```
	IN	WCHAR* FilterMask,
	IN	WCHAR* IncludeUserName
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

IncludeUserName

The user name to be included by filter driver.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the include user name for the filter rule which was set in AddFileFilterRule ,only the files were opened by the useres in the included user names will be monitored by the filter driver.

BOOL

AddExcludeUserNameToFilterRule(

```
     IN   WCHAR* FilterMask,
     IN   WCHAR* ExcludeUserName
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

ExcludeUserName

The process name to be excluded by filter driver.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the exclude user name for the filter rule which was set in AddFileFilterRule , all the files were opened by the users in the excluded user names won't be monitored by the filter driver.

BOOL

AddSha256ProcessAcessRightsToFilterRule(

```
     IN   WCHAR* FilterMask,
     IN   UCHAR* ImageSHA256,
     IN   ULONG  HashLength,
     IN   ULONG  AccessFlag
```

)

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

ImageSHA256

The sha256 hash of the executable binary.

HashLength

The length of the sha256.

AccessFlag

The access rights for the process.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the access flags to the specific process with the same sha256,when the process accesses the files, it needs to check permission from access flags firt to allow or deny the file access.

BOOL

AddSignedProcessAcessRightsToFilterRule(

```
     IN   WCHAR* FilterMask,
     IN   WCHAR* CertificateName,
     IN   ULONG  LengthOfCertificate,
     IN   ULONG  AccessFlag
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

CertificateName

The subject name of the certificate of the signed process.

LengthOfCertificate

The length of the certificate.

AccessFlag

The access rights for the process.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the access flags to the signed process with the specific subject name of the certificate, when the signed process accesses the files, it needs to check permission from access flags firt to allow or deny the file access.

BOOL

AddProcessRightsToFilterRule(

```
      IN    WCHAR* FilterMask,
      IN    WCHAR* ProcessName,
      IN    ULONG  AccessFlag
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

ProcessName

The process name to be set access rights.

AccessFlag

The access rights for the process.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the access flags to the specific process,when the process accesses the files, it needs to check permission from access flags firt to allow or deny the file access.

BOOL

RemoveProcessRightsFromFilterRule(

```
      IN   WCHAR* FilterMask,
      IN   WCHAR* ProcessName
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

ProcessName

The process name to be set access rights.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to remove the process access rights setting from the filter rule.

BOOL

AddProcessIdRightsToFilterRule(

```
      IN   WCHAR* FilterMask,
      IN   ULONG  ProcessId,
      IN   ULONG  AccessFlag
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

ProcessId

The process Id to be set access rights.

AccessFlag

The access rights for the process.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the access flags to the specific process with the process Id, when the process accesses the files, it needs to check permission from access flags firt to allow or deny the file access.

BOOL

AddUserRightsToFilterRule(

```
    IN   WCHAR* FilterMask,
    IN   WCHAR* UserName,
    IN   ULONG  AccessFlag
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

UserName

The user name to be set access rights.

AccessFlag

The access rights for the user.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the access flags to the specific user,when the user accesses the files, it needs to check permission from access flags firt to allow or deny the file access.

BOOL

AddBooleanConfigToFilterRule(

```
      IN   WCHAR* FilterMask,
      IN   ULONG  BooleanConfig
)
```

Parameters

FilterMask

The FilterMask which was set in API AddFileFilterRule .

Booleanconfig

The boolean config setting.

Return Value

Return true if it succeeds, else return false.

Comments

This is the API to add the boolean config setting for the filter rule which was set in AddFileFilterRule , please reference the BooleanConfig enumeration.

BOOL

RemoveFilterRule*(WCHAR* FilterMask);*

Parameters

FilterMask

The FilterMask associated to the filter rule.

Return Value

Return true if it succeeds, else return false.

Comments

You can remove the filter rule which was set by AddFileFilterRule API.

BOOL

AddIncludedProcessId*(ULONG ProcessId)*

Parameters

ProcessId

The process Id you want to be included by filter.

Return Value

Return true if it succeeds, else return false.

Comments

This API let the filter dirver only intercept the I/O for the included processes,discard all other I/O from other processes, you can add multiple process Id.

BOOL

RemoveExcludeProcessId*(ULONG ProcessId)*

Parameters

ProcessId

The process Id you want to remove which set by AddIncludedProcessId API.

Return Value

Return true if it succeeds, else return false.

Comments

This API removes the included process Id from filter.

BOOL

AddExcludedProcessId*(ULONG ProcessId)*

Parameters

ProcessId

The process Id you want to be excluded by filter.

Return Value

Return true if it succeeds, else return false.

Comments

This API let you can bypass the filter for specific processes, you can add multiple process Id.

BOOL

RemoveExcludeProcessId*(ULONG ProcessId)*

Parameters

ProcessId
The process Id you want to remove which set by AddExcludedProcessId API.

Return Value
Return true if it succeeds, else return false.

Comments

This API removes the excluded process Id from filter.

BOOL

AddRegistryFilterRule(

```
	IN	ULONG	ProcessNameLength
	IN	WCHAR*	ProcessName,
	IN	ULONG	ProcessId,
	IN	ULONG	UserNameLength,
	IN	WCHAR*	UserNameFilterMask,
	IN	ULONG	KeyNameLength,
	IN	WCHAR*	KeyNameFilterMask,
	IN	ULONG	AccessFlag,
	IN	ULONGLONG RegCallbackClass,
	IN	BOOL	IsExcludeFilter,
	IN	ULONG	FilterRuleId
)
```

Parameters

ProcessNameLength
The length of the process name string in bytes.

ProcessName
The process name to be filtered, use '*' to include all processes.

ProcessId

If the process Id is not 0, then filter with the process Id instead of the process name.

UserNameLength

The length of the user name string in bytes.

UserNameFilterMask

The user name to be filtered, use '*' to include all users.

KeyNameLength

The length of the process name string in bytes.

KeyNameFilterMask

The register key name to be filtered, use '*' to include all the keys.

AccessFlag

The access control flag for the registry filter rule.

RegCallbackClass

Register the callback class for the registry filter rule.

IsExcludeFilter

The flag indicates if the filter rule exclude filter rule, if it is true, the filter driver will skip all the registry operation for this filter rule.

FilterRuleId

The Id of this filter rule.

Comments

This is the API to add the registry filter rule, filter by process name.

BOOL

AddRegistryFlterRuleByName(

```
        IN    ULONG      ProcessNameLength
        IN    WCHAR*     ProcessName,
        IN    ULONG      AccessFlag,
        IN    ULONGLONG  RegCallbackClass,
        IN    BOOL       IsExcludeFilter
```

)

Parameters

ProcessNameLength

The length of the process name string in bytes.

ProcessName

The process name to be filtered, use '*' to include all processes.

AccessFlag

The access control flag for the registry filter rule.

RegCallbackClass

Register the callback class for the registry filter rule.

IsExcludeFilter

The flag indicates if the filter rule exclude filter rule, if it is true, the filter driver will skip all the registry operation for this filter rule.

Comments

This is the API to add the registry filter rule, filter by process name.

BOOL

AddRegistryFilterRuleByProcessId(

```
    IN   ULONG     ProcessId
    IN   ULONG     AccessFlag,
    IN   ULONGLONG RegCallbackClass,
    IN   BOOL      IsExcludeFilter
)
```

Parameters

ProcessId

The process Id of the process which will be managed by registry filter driver.

AccessFlag

The access control flag for the registry filter rule.

RegCallbackClass

Register the callback class for the registry filter rule.

IsExcludeFilter

The flag indicates if the filter rule exclude filter rule, if it is true, the filter driver will skip all the registry operation for this filter rule.

Comments

This is the API to add the registry filter rule, filter by process Id.

BOOL

RemoveRegistryFilterRuleByProcessId(

```
    IN   ULONG     ProcessId
)
```

Parameters

ProcessId

The process Id of the process which will be managed by registry filter driver.

Comments

This is the API to remove the registry filter rule, filter by process Id.

BOOL

RemoveRegistryFilterRuleByName(

```
    IN   ULONG     ProcessNameLength
    IN   WCHAR*    ProcessName
)
```

Parameters

ProcessNameLength

The length of the process name string in bytes.

ProcessName

The process name to be filtered.

Comments

This is the API to remove the registry filter rule, filter by process name.

BOOL

RemoveRegistryFilterRuleByRegKeyName(

```
      IN    ULONG      RegKeyNameLength
      IN    WCHAR*     RegKeyName
)
```

Parameters

RegNameLength
The length of the registry key name string in bytes.

RegKeyName
The registry key name to be filtered.

Comments

This is the API to remove the registry filter rule, filter by registry key name.

BOOL

AddProceeFilterRule(

```
      IN    ULONG      ProcessNameMaskLength,
      IN    WCHAR*     ProcessNameMask,
      IN    ULONG      ControlFlag,
      IN    ULONG      FilterRuleId
)
```

Parameters

ProcessNameLength
The length of the process name mask string in bytes.

ProcessName
The process name mask to be filtered.

ControlFlag

The control flag for the process, reference the ProcessControlFlag enumeration.

FilterRuleId
The Id of this process filter rule.

Comments

This is the API to add the process filter rule, to prevent the process from being launched, or register the callback notification of the process operation.

```
BOOL

RemoveProceeFilterEntry(
	IN	ULONG		ProcessNameMaskLength,
	IN	WCHAR*		ProcessNameMask
)
```

Parameters

ProcessNameLength
The length of the process name mask string in bytes.

ProcessName
The process name mask to be filtered.

Comments

This is the API to remove the process filter rule.

```
BOOL

AddFileControlToProcessByName(
	IN	ULONG		ProcessNameMaskLength,
	IN	WCHAR*		ProcessNameMask,
	IN	ULONG		FileNameNameMaskLength,
	IN	WCHAR*		FileNameMask,
	IN	ULONG		AccessFlag
)
```

Parameters

ProcessNameLength
The length of the process name mask string in bytes.

ProcessName
The process name mask to be filtered.

FileNameMaskLength
The length of the file name mask string in bytes.

FileNameMask
The file name mask to be filtered.

AccessFlag
The file access flag which control the process file access rights.

MonitorIO
Register the callback notification of the monitor IO.

ControlIO
Register the callback notification of the control IO.

Comments

This is the API to add the file access rights of the specific files to the specific processes.

BOOL

AddFilterCallbackIOToProcessByName(

```
    IN   ULONG     ProcessNameMaskLength,
    IN   WCHAR*    ProcessNameMask,
    IN   ULONG     FileNameNameMaskLength,
    IN   WCHAR*    FileNameMask,
    IN   ULONG     MonitorIO,
    IN   ULONG     ControlIO,
    IN   ULONG     FilterByDesiredAccess,
    IN   ULONG     FilterByDisposition,
    IN   ULONG     FilterByCreateOptions

)
```

Parameters

ProcessNameLength
The length of the process name mask string in bytes.

ProcessName

The process name mask to be filtered.

FileNameMaskLength

The length of the file name mask string in bytes.

FileNameMask

The file name mask to be filtered.

MonitorIO

Register the callback notification of the monitor IO.

ControlIO

Register the callback notification of the control IO.

FilterByDesiredAccess

Filter the register IO option with file opens DesiredAccess.

FilterByDisposition

Filter the register IO option with file opens Disposition.

FilterByCreateOptions

Filter the register IO option with file opens CreateOptions.

Comments

Register the callback IOs for the process, filter the callback IOs by the file open options if they are not zero.

BOOL

RemoveFileControlFromProcessByName(

```
    IN    ULONG      ProcessNameMaskLength,
    IN    WCHAR*     ProcessNameMask,
    IN    ULONG      FileNameNameMaskLength,
    IN    WCHAR*     FileNameMask
)
```

Parameters

ProcessNameLength

The length of the process name mask string in bytes.

ProcessName

The process name mask to be filtered.

FileNameMaskLength

The length of the file name mask string in bytes.

FileNameMask

The file name mask to be filtered.

Comments

This is the API to remove the file access rights of the specific files to the specific processes if it was set.

BOOL

AddFileControlToProcessById(

```
      IN   ULONG     ProcessId,
      IN   ULONG     FileNameNameMaskLength,
      IN   WCHAR*    FileNameMask,
      IN   ULONG     AccessFlag
)
```

Parameters

ProcessId

The process Id of the process which will be added file access rights.

ProcessName

The process name mask to be filtered.

FileNameMaskLength

The length of the file name mask string in bytes.

FileNameMask

The file name mask to be filtered.

AccessFlag

The file access flag which control the process file access rights.

Comments

This is the API to add the file access rights of the specific files to the specific process.

BOOL

RemoveFileControlFromProcessById(

```
      IN    ULONG      ProcessId,
      IN    ULONG      FileNameNameMaskLength,
      IN    WCHAR*     FileNameMask
)
```

Parameters

ProcessId

The process Id of the process which will bed removed file access rights.

FileNameMaskLength

The length of the file name mask string in bytes.

FileNameMask

The file name mask to be filtered.

Comments

This is the API to remove the file access rights of the specific files to the specific process if it was set.

BOOL

AddProtectedProcessId*(ULONG ProcessId)*

Parameters

ProcessId

The process Id you want to be protected by filter.

Return Value

Return true if it succeeds, else return false.

Comments

This API can prevent the process being terminated, you can add multiple process Id, this API is supported in OS vista or later versions.

BOOL

RemoveProtectedProcessId*(ULONG ProcessId)*

Parameters

ProcessId

The process Id you want to remove which set by *Add**Protect**edProcessId* API.

Return Value

Return true if it succeeds, else return false.

Comments

This API removes the protected procss Id.

BOOL

RegisterIoRequest*(ULONG RequestRegistration)*

Parameters

RequestRegistration

The RequestRegistration is the bit combination of the request type.

Return Value

Return true if it succeeds, else return false.

Comments

Register the I/O requests which you want to monitor. For File_SYSTEM_MONITOR filter, only post I/O requests registration are affected, since it only can get notification after the request was completed by file system.

For FILE_SYSTEM_CONTROL filter you can register both pre and post reqeusts. If you want to deny, cancel or return with your own data instead of going down to the file system, you need to register the pre request.

For some post I/O requests, you can’t cancel or deny it, for example Create, Set information,Set security, Write requests.

BOOL

GetFileHandleInFilter*(WCHAR* FileName, ULONG DesiredAccess, Handle* FileHandle);*

Parameters

FileName
The full path of the file which you want to open.

DesiredAccess
The requested access to the file or device, which can be summarized as read, write, both or neither zero).

FileHandle
The pointer to the file handle which will receive the file handle after the file was opened.

Return Value
Return true if it succeeds, else return false.

Comments

Use this API to open the file,it will bypass the filter, avoid reentrant issue.It also will bypass the security check.Close the handle with CloseHandle win32 API.

BOOL

AESEncryptFile(

```
    IN   WCHAR* FileName,
    IN   ULONG  KeyLength,
    IN   UCHAR* Key,
    IN   ULONG  IVLength,
    IN   UCHAR* IV,
    IN   BOOL   AddAESData )
```

Parameters

FileName
The file name to be encrypted.

KeyLength
The encryption key length,it has to be 16(128bits),24(192bits) or 32(256bits).

Key

The encryption key,it is an unsigned char array with KeyLength size.

IVLength

The initial vector length,if it is 0, the sysem will allocate an unique IV for the file.

IV

The initial vector,when IVLenght is 0, it sets to NULL.

AddAESData

If it is true,it will add the AESData structure to the encrypted file,then the encryption filter driver can recognize this encrypted file.

Return Value

Return true if it succeeds, else return false.

Comments

AESEncryptFile is the API to encrypt file file with AES encryption cryptographic algorithm.

BOOL

AESEncryptFileWithTag(

```
IN   WCHAR* FileName,
IN   ULONG  KeyLength,
IN   UCHAR* Key,
IN   ULONG  IVLength,
IN   UCHAR* IV,
IN   ULONG  TagDataLength,
IN   UCHAR* TagData )
```

Parameters

FileName

The file name to be encrypted.

KeyLength

The encryption key length,it has to be 16(128bits),24(192bits) or 32(256bits).

Key

The encryption key,it is an unsigned char array with KeyLength size.

IVLength

The initial vector length,if it is 0, the sysem will allocate an unique IV for the file.

IV

The initial vector,when IVLenght is 0, it sets to NULL.

TagDataLength

The the length of the tag data.

TagData

The custom tag data which was added to the AESData structure in the encrypted file header, the user can get this custom data when the filter request the encyrption iv and key.

Return Value

Return true if it succeeds, else return false.

Comments

AESEncryptFile is the API to encrypt file file with AES encryption cryptographic algorithm.

BOOL

AESEncryptFileToFile(

```
IN   WCHAR* SourceFileName,
IN   WCHAR* DestFileName,
IN   ULONG  KeyLength,
IN   UCHAR* Key,
IN   ULONG  IVLength,
IN   UCHAR* IV,
IN   BOOL   AddAESData )
```

Parameters

SourceFileName

The source file name to be encrypted.

DestFileName

    The target file name was encrypted.

KeyLength

    The encryption key length,it has to be 16(128bits),24(192bits) or 32(256bits).

Key

    The encryption key,it is an unsigned char array with KeyLength size.

IVLength

    The initial vector length,if it is 0, the sysem will allocate an unique IV for the file.

IV

    The initial vector,when IVLenght is 0, it sets to NULL.

AddAESData

    If it is true,it will add the AESData structure to the encrypted file,then the encryption filter driver can recognize this encrypted file.

Return Value

    Return true if it succeeds, else return false.

Comments

AESEncryptFileToFile is the API to encrypt file file with AES encryption cryptographic algorithm.

BOOL

AESEncryptFileToFileWithTag(

```
    IN   WCHAR* SourceFileName,
    IN   WCHAR* DestFileName,
    IN   ULONG  KeyLength,
    IN   UCHAR* Key,
    IN   ULONG  IVLength,
    IN   UCHAR* IV,
    IN   ULONG  TagDataLength,
    IN   UCHAR* TagData )
```

Parameters

SourceFileName

The source file name to be encrypted.

DestFileName

The target file name was encrypted.

KeyLength

The encryption key length,it has to be 16(128bits),24(192bits) or 32(256bits).

Key

The encryption key,it is an unsigned char array with KeyLength size.

IVLength

The initial vector length,if it is 0, the sysem will allocate an unique IV for the file.

IV

The initial vector,when IVLenght is 0, it sets to NULL.

TagDataLength

The the length of the tag data.

TagData

The custom tag data which was added to the AESData structure in the encrypted file header, the user can get this custom data when the filter request the encyrption iv and key.

Return Value

Return true if it succeeds, else return false.

Comments

AESEncryptFileToFile is the API to encrypt file file with AES encryption cryptographic algorithm.

BOOL

AESDecryptFile(

```
    IN   WCHAR* FileName,
    IN   ULONG  KeyLength,
    IN   UCHAR* Key,
    IN   ULONG  IVLength,
    IN   UCHAR* IV )
```

Parameters

FileName

The file name to be decrypted.

KeyLength

The encryption key length,it has to be 16(128bits),24(192bits) or 32(256bits).

Key

The encryption key,it is an unsigned char array with KeyLength size.

IVLength

The initial vector length,if the encrypted file already has IVTag,it will use the IV tag instead of the pass in IV, if the encrypted file doesn’t set the IV tag,then the IVLength can’t be 0, and IV can’t be NULL.

IV

The initial vector,when the encrypted file doesn’t set IV tag, the IV can’t be NULL, or it can be NULL.

Return Value

Return true if it succeeds, else return false.

Comments

AESDecryptFile is the API to decrypt file file with AES encryption cryptographic algorithm.

BOOL

AESDecryptFileToFile(

```
IN   WCHAR* SourceFileName,
IN   WCHAR* DestFileName,
IN   ULONG  KeyLength,
IN   UCHAR* Key,
IN   ULONG  IVLength,
IN   UCHAR* IV )
```

Parameters

SourceFileName

The encrypted file name.

DestFileName

The target file name was decrypted.

KeyLength

The encryption key length,it has to be 16(128bits),24(192bits) or 32(256bits).

Key

The encryption key,it is an unsigned char array with KeyLength size.

IVLength

The initial vector length,if the encrypted file already has IVTag,it will use the IV tag instead of the pass in IV, if the encrypted file doesn't set the IV tag,then the IVLength can't be 0, and IV can't be NULL.

IV

The initial vector,when the encrypted file doesn't set IV tag, the IV can't be NULL, or it can be NULL.

Return Value

Return true if it succeeds, else return false.

Comments

AESDecryptFileToFile is the API to decrypt file file with AES encryption cryptographic algorithm.

BOOL

GetAESHeader(

```
IN   WCHAR*  FileName,
IN   PULONG  HeaderSize,
IN   UCHAR*  Header )
```

Parameters

FileName

The file name was encrypted.

HeaderSize

The pointer of the header buffer size.

Header

The header buffer to store the header data.

Return Value

Return true if it succeeds, else return false.

Comments

GetAESHeader is the API to get encrypted file header, return true if it exists, or it will return false.

BOOL

GetAESTagData(

```
    IN   WCHAR*   FileName,
    IN   PULONG   TagDataSize,
    IN   UCHAR*   TagData )
```

Parameters

FileName

The file name was encrypted.

TagDataSize

The pointer of the Tag Data size.

TagData

The custom tag data which was added to the header of the encrypted file.

Return Value

Return true if it succeeds, else return false.

Comments

GetTagData is the API to get the custom tag data from the encrypted file header, return true if it exists, or it will return false.

How to use EaseFilter SDK

The components

The EaseFilter file system filter SDK includes two components (EaseFlt.sys and FilterAPI.dll), The EaseFlt.sys and FilterAPI.dll are different for 32bit and 64bit windows system. EaseFlt.sys is the file system filter driver which implements all the functionalities in the file system level. FilterAPI.dll is a wrapper DLL which exports the API to the user mode applications.

To check the binary is 32 bit or 64 bit you can right click file and go to the property, then go to the "Details" tag and check the "file description" section.

Set up the filter

Install the filter driver with *InstallDriver()* method if the driver has not been installed yet. After filter driver was installed, the filter was loaded, if not you can load the filter with command "Fltmc load EaseFlt" in dos prompt. To remove the filter driver from the system, call *UninstallDriver()* method.

Start the filter

1. Enable the filter with API *SetRegistrationKey()*. You can request the trial license key with the link: http://www.easefilter.com/Order.htm or email us info@easefilter.com
2. Start the filter driver by registering the callback function with API RegisterMessageCallback:

   RegisterMessageCallback(FilterConnectionThreadsCount, MessageCallback, DisconnectCallback);

3. Setup global configuration setting for the filter driver:

   //To enable the monitor/control/encryption/process/registry filter driver by setting the filter type with proper license key.

   SetFilterType(FILE_SYSTEM_MONITOR|FILE_SYSTEM_CONTROL);

   //Set up the connection timeout in seconds, this is the maximum time for the filter driver waiting for the response of the callback function.

   SetConnectionTimeout(30);

   //Set up the global Boolean config setting to enable some features: ENABLE_SEND_DENIED_EVENT|ENABLE_SEND_DATA_BUFFER

SetBooleanConfig(booleanConfig);

//Add or remove protected process Id to the filter driver to prevent it from being terminated ungratefully:

AddProtectedProcessId (processId);
RemoveProtectedProcessId (processId);

//Set up the volume control flag to block the USB read write:
BLOCK_USB_READ|BLOCK_USB_WRITE

SetvolumeControlFlag(volumeControlFlag);

4. Setup the file filter rule for the filter driver:

//Setup the filter rule to **monitor** the file I/O in c:\\test folder
AddFileFilterRule(AccessFlags,L"C:\\test\\*", FALSE, FilterRuleId);

//Register the file change events to get the notification for below events:
FILE_WAS_CREATED|FILE_WAS_WRITTEN|FILE_WAS_RENAMED|FILE_WAS_DELETED|FILE_SECURITY_CHANGED|FILE_INFO_CHANGED
RegisterFileChangedEventsToFilterRule(L"C:\\test\\*", FileChangedEvents);

//Register the POST IO to get the notification when the IO was processed by the file system.
RegisterMonitorIOToFilterRule(L"c:\\test\\*",
POST_NEW_FILE_CREATED|POST_FILE_RENAMED|POST_FILE_DELETED);

//Setup the filter rule to **control** the file I/O in c:\\protected folder
configure the access control flag to protect the folder, not allow the file being renamed or deleted.
AccessFlags= ALLOW_MAX_RIGHT_ACCESS & (~ALLOW_FILE_RENAME) & (~ALLOW_FILE_DELETE)
AddFileFilterRule(AccessFlags,L"C:\\protected\\*", FALSE, FilterRuleId);

//Register the PRE IO to get the callback before the IO was processed by the file system, you can allow or deny the file I/O in the callback function.

```
RegisterControlIOToFilterRule(L”c:\\protected\\*”, PRE_CREATE);

//Add or remove the access rights for a specific process to the files in the
protected folder. i.e., Set full access rights for process “wordpad.exe”
AddProecessRightsToFilterRule(L”c:\\protected\\*”, L”wordpad.exe”,
ALLOW_MAX_RIGHT_ACCESS);

//Hide your sensitive files from the protected folder by enabling the hide file
access flag. i.e., hide the files with extension .prt in folder c:\\protected.
AccessFlags= ALLOW_MAX_RIGHT_ACCESS | ENABLE_HIDE_FILES_DIRECTORY_BROWSING
AddFileFilterRule(AccessFlags,L”C:\\protected\\*”, FALSE, FilterRuleId);
AddHiddenFileMaskToFilterRule(L”c:\\protected\\*”, L”*.prt”);

// Setup the filter rule for AUTO FILE ENCRYPTION in c:\\protected folder
AccessFlags= ALLOW_MAX_RIGHT_ACCESS | ENABLE_FILE_ENCRYPTION_RULE
AddFileFilterRule(AccessFlags,L”C:\\encrypt\\*”, FALSE, FilterRuleId);

//Configure the processes to read the raw encrypted data for backup software or
other software needs to send raw encrypted files.
AccessFlags= ALLOW_MAX_RIGHT_ACCESS & (~ALLOW_READ_ENCRYPTED_FILES)
AddProecessRightsToFilterRule(L”c:\\encrypt\\*”, L”explorer.exe”, AccessFlags);

//Setup the registry filter rule to monitor or protect the registry access
You can block the registry access, for example you block the registry key change,
you also can get the notification for the registry access.
AddRegistryFilterRule(2,L"*",0,2,L"*",0,NULL,REG_MAX_ACCESS_FLAG,regC
allbackClass,FALSE, FilterRuleId);

//Setup the process filter rule to monitor or protect the process operation
You can block the new process launching, you can get the notification when the
process was created or terminated.
AddProcessFilterRule((ULONG)wcslen(ProcessFilterMask)*sizeof(WCH
AR),ProcessFilterMask,ControlFlag);
```

We provide C++ example and C# example to demonstrate how to use the EaseFilter File System Monitor and Control Filter.

C++ Example

Copy the correct version (32bit or 64bit) EaseFlt.sys, FilterAPI.DLL,FilterAPI.h and FilterAPI.lib to your folder. FilterAPI.h file includes all the functions and structures used for connecting to the filter driver. WinDataStructures.h file is part of the structures of windows API which is used in the example, for more structures please reference Microsoft MSDN website.

For monitor filter, you can get the notification with file I/O messages which include process Id, Thread Id, file name, user name, file system I/O type, etc.

For Control filter, the filter will block and wait for the response if that I/O was registered, so it is better handling this request as soon as possible, or it will block the system call.

C# Example

Copy the correct version (32bit or 64bit) EaseFlt.sys, FilterAPI.DLL to your binary folder, then add the reference “FilterControl” project to your project.

```
FilterControl filterControl = new FilterControl();

if (!filterControl.StartFilter(filterType, serviceThreads, connectionTimeOut,
licenseKey, ref lastError))
{
    Console.WriteLine("Start Filter Service failed with error:" + lastError);
    return;
}

//create a file monitor filter rule, every filter
//rule must have the unique watch path.
FileFilter fileMonitorFilter = new FileFilter(watchPath);

//Filter the file change event to monitor all file change events.
fileMonitorFilter.FileChangeEventFilter =
(FilterAPI.FileChangedEvents)FilterAPI.NotifyAllFileEvents;

//register the file change callback events.
fileMonitorFilter.NotifyFileWasChanged += NotifyFileChanged;

//Filter the monitor file IO events
fileMonitorFilter.MonitorFileIOEventFilter =
(ulong)(MonitorFileIOEvents.OnFileOpen | MonitorFileIOEvents.OnFileRead);

//fileMonitorFilter.OnFileOpen += OnFileOpen;
//fileMonitorFilter.OnFileRead += OnFileRead;

filterControl.AddFilter(fileMonitorFilter);
```

```
if (!filterControl.SendConfigSettingsToFilter(ref lastError))
{
   Console.WriteLine("SendConfigSettingsToFilter failed." + lastError);
   return;
}
```

For more programming reference, go to :

https://www.easefilter.com/programming.htm