The GpgOL Technical Manual

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Werner Koch (wk@gnupg.org)

This is *The GpgOL Technical Manual* for GpgOL (version 1.2.1, August 2014).

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40699 Erkrath, Germany

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1 Introduction

To debug GpgOL you should set the Registry entry `HKCU\Software\Gnu\GpgOL:enableDebug` to the string value `1`:

```
[HKEY_CURRENT_USER\Software\GNU\GpgOL]
"enableDebug"="1"
```

This allows easy setting of a debug file by using the extended options menu and enables a few extra menu items.

2 Description of the UI Server Protocol

All cryptographic operations are done by a server and the server is responsible for all dialogs. If a a server is not available, GpgOL does not work.

This protocol used between GpgOL and the User Interface Server (UI server) is specified in the 'GPGME Reference Manual', under the heading 'The GnuPG UI Server Protocol'.

3 MAPI Properties used by GpgOL

GpgOL uses a some custom MAPI properties in the named properties range. Thus their actual numbers are determined at runtime and only the names should be used. The GUID assigned to these properties is `31805ab8-3e92-11dc-879c-00061b031004`.

`GpgOL Msg Class`
: This is a STRING8 property used as a override for PR_MESSAGE_CLASS. GpgOL uses this internally for creating messages.

`GpgOL Old Msg Class`
: This is a STRING8 property which saves the original PR_MESSAGE_CLASS before GpgOL changes it.

`GpgOL Attach Type`
: This is a property of type LONG and used to further describe the attachments created by GpgOL. These values are used:

  ATTACHTYPE_MOSS = 1
  : The attachment contains the original MOSS message. That is either an S/MIME or a PGP/MIME message in its original RFC-2822 format (but only with the relevant MIME parts of the main header).

  ATTACHTYPE_FROMMOSS = 2
  : The attachment has been created from the original MOSS attachment. It will automagically be recreated as needed. If the attachment has been created from an encrypted message, it is saved re-encrypted under a non-permanent session key. This session key is valid as long as the current Outlook porcess exists.

  ATTACHTYPE_MOSSTEMPL = 3
  : The attachment has been created in the course of sending a message.

  ATTACHTYPE_PGPBODY = 4
  : The attachment contains the original PGP message body of PGP inline encrypted messages. We need to save this away because it may happen that in the course of displaying the plaintext Outlook overwrites the actual body due to internal syncronization.

`GpgOL Sig Status`
: This is a property of type STRING8 and used to cache the result of the last signature verification. It is used with the actual message and consists of a single character, a space and a human readable string (utf-8 encoded). The first character is used as a machine processable flag indicating the status. These values are defined:

  `#` The message is not of interest to us. GpgOL may flag any message with this signature status to avoid extra processing for messages already known not to need any processing by GpgOL.

  `@` The message has been created and signed or encrypted by GpgOL.

`?` The signature status has not been checked. This is for example used if the public key to be used for the verification could not be found.

`!` The signature verified okay and is deemed to be fully valid.

`~` The signature was not fully verified. This often means that the full result information of the signature verification needs to be considered to decide the actual validity. Used for example if the signing key has expired

`-` The signature is bad. Either this means the message has been tampered with or an intermediate message relay has accidently changed the message (e.g. due to recoding).

`GpgOL Protect IV`
This binary property is used to store the initialization vector of an re-encrypted attachment. The existence of this property indicates that the attachment has been encrypted under the non-permanent session key.

`GpgOL Charset`
This is a property of type STRING8 and used to describe the character set of an attachment or of the body. If this propery is missing the default of UTF-8 is assumed.

`GpgOL Last Decrypted`
This binary property is used on the message to save a session marker to tell GpgOL whether the message as already been decrypted. If this property does not exists or the session marker does not macth the one of the current session, GpgOL needs to decrypt it again.

`GpgOL MIME Info`
This property is of type STRING8 and used to store the MIME structure of the orginal message. The content are lines of colon delimited fields. The specification has not yet been finished.

`GpgOL Draft Info`
This is a property of type STRING8 used to preserve crypto settings in a draft message. For details see the function `mapi_set_gpgol_draft_info`.

4 How GpgOL uses the Registry

This is a list of registry entries GpgOL knows about.

`HKLM\Software\GNU\GnuPG:Install Directory`
: This is used by GnuPG to describe the directory where GnupG has been installed. GpgOL requires this to get the location of the localedir which is used to show translated strings ('`gpgol.mo`'). It is further used to check whether GnuPG has been installed at all.

`HKCU\Software\GNU\GnuPG:UI Server`
: If the UI server could not be connected, GpgOL tries to start the one given in this entry. It is assumed that the UI server is stored in the `Install Directory` (as described above). This Registry entry gives the actual command name relative to this directory. If the key does not exist, is is first searched below `HKLM` and then it defaults to `kleopatra.exe`.

`HKCU\Software\GNU\GpgOL:enableDebug`
: Setting this key to the string `1` enables a few extra features in the UI, useful only for debugging. Setting it to values larger than 1 make the log file output more verbose; these are actually bit flags according to the following table (which may change with any release):

  `2 (0x0002) (ioworker)`
  : Tell what the Assuan I/O scheduler is doing.

  `4 (0x0004) (ioworker-extra)`
  : Even more verbose Assuan I/O scheduler reporting.

  `8 (0x0008) (filter)`
  : Tell what the filter I/O system is doing.

  `16 (0x0010) (filter-extra)`
  : Tell how the filter I/O locks the resources.

  `32 (0x0020) (memory)`
  : Tell about resource allocation.

  `64 (0x0040) (commands)`
  : Tell about command events.

  `128 (0x0080) (mime-parser)`
  : Tell what the MIME parser is doing

  `256 (0x0100) (mime-data)`
  : Print data lines while parsing MIME.

  `512 (0x0200) (oom)`
  : Outlook Object Model reporting.

  `1024 (0x0400) (oom-extra)`
  : Verbose OOM allocation and advising reporting.

You may use the regular C-syntax for entering the value. As an alternative you may use the names of the flags, separated by space or comma.

`HKCU\Software\GNU\GpgOL:logFile`
: If the value is not empty, GpgOL takes this as a log file and appends debug information to this file. The file may get very large.

`HKCU\Software\GNU\GpgOL:compatFlags`
: This is a string consisting of `0` and `1` to enable certain compatibility flags. Not generally useful; use the source for a description.

`HKCU\Software\GNU\GpgOL:enableSmime`
`HKCU\Software\GNU\GpgOL:defaultProtocol`
`HKCU\Software\GNU\GpgOL:encryptDefault`
`HKCU\Software\GNU\GpgOL:signDefault`
`HKCU\Software\GNU\GpgOL:previewDecrypt`
`HKCU\Software\GNU\GpgOL:storePasswdTime`
`HKCU\Software\GNU\GpgOL:encodingFormat`
`HKCU\Software\GNU\GpgOL:defaultKey`
`HKCU\Software\GNU\GpgOL:enableDefaultKey`
`HKCU\Software\GNU\GpgOL:preferHtml`
: These registry keys store the values from the configuration dialog.

`HKCU\Software\GNU\GpgOL:svnRevision`
: Obsolete since 1.1.3.

`HKCU\Software\GNU\GpgOL:gitCommit`
: When leaving GpgOL's options dialog, the GIT commit id of the current version will be stored in this entry. This is used to display a note after software upgrades.

5 What MAPI Storage or Transport providers can do to help GpgOL

GpgOL uses some tricks to make decryption of OpenPGP message better fit into the Outlook framework. This is due to a lack of proper Plugin API for Outllok and because some features of Outlook — meant as a security measure — hinder a better implementation. That is not to say that Outlook will be less secure when used with GpgOL — to the opposite: Due to encryption and digital signature reading and sending mail with GpgOL support can be much more secure than using Outlook as is.

There are some points where custom MAPI storage or transport providers can help GpgOL to gain better performance and to make it more secure.

5.1 MAPI Message Class Renaming

To implement S/MIME processing using its own engine, GpgOL needs to inhibit Outlook from doing the S/MIME before the message is passed to the ECE hooks. As usual this is done by changing the message class (PR_MESSAGE_CLASS). For new message this happens right away at the OnDelivery hook; for already existing messages GpgOL tries to detect the case at several other places (which is less reliable but in general works).

The renaming is very straightforward:

- If the message class is just `IPM.Note` extra tests are done to figure out a suitable message class. This yields one of these new message classes:

  ```
  IPM.Note.GpgOL.OpaqueSigned
  IPM.Note.GpgOL.OpaqueEncrypted
  IPM.Note.GpgOL.ClearSigned
  IPM.Note.GpgOL.PGPMessage
  ```
- If the message class is either `IPM.Note.SMIME` or that one followed by a dot and a subclass, the `SMIME` string is replaced by `GpgOL`.
- If the message class is `IPM.Note.Secure.CexSig` or `IPM.Note.Secure.CexEnc` the class is changed depending on other information to one of:

  ```
  IPM.Note.GpgOL.OpaqueSigned
  IPM.Note.GpgOL.OpaqueEncrypted
  IPM.Note.GpgOL.MultipartSigned
  IPM.Note.GpgOL
  IPM.Note.GpgOL.ClearSigned
  IPM.Note.GpgOL.PGPMessage
  ```

To revert these message class changes one need to replace any message class prefix of `IPM.Note.GpgOL` by `IPM.Note.SMIME`. There are two caveats however:

- GpgOL copies or flags the original MOSS attachment as created by Outlook to a new attachment with the attach type set to ATTACHTYPE_MOSS. If such an attachment exists it should be converted back to the original attachment (or used to convert the message back to RFC-822). It might however not exist and in this case there should be only one attachment at all as created by Outlook, so no further changes are required.
- Inline PGP encrypted mails (`IPM.Note.GpgOL.PGPMessage`) might have a wrong PR_BODY. This condition can be detected by the existance of an attachment named '`gpgolPGP.dat`', flagged as hidden and with the attach type

ATTACHTYPE_PGPBODY (See above under MAPI Properties). If such an attachment exists, it should be copied to PR_BODY and may then be deleted.

Note that reverting original CryptoEx message classes (`CexSig` etc.) back is not possible. They are identical to GpgOL messages.

5.2 MAPI Attachment Processing

GpgOL creates a couple of attachments for the purpose of storing a parsed mail and to allow Outlook to display attachments in the usual way without sending them as plaintext to the storage. The attachments are only stored on the local disk while being opened from the attachment's context menu for viewing. Almost all these attachments are ephemeral and may be deleted when not displayed. GpgOL re-creates them by parsing the original message if neeeded. In fact they are always re-created after Outlook as been started again. This is because the attachments holding the plaintext are symmetrical encrypted with an ephemeral session key, only valid as long as Outlook runs.

FIXME: Needs more documentation.

5.3 MAPI PR_BODY Processing

GpgOL does not use the PR_BODY property. This is because internal Outlook syncronisation may change that property after the plaintext of a message has been displayed. In general this is not a problem because the messages processed by GpgOL do not use that property (the orginal S/MIME and PGP/MIME message is stored in attachments). However, there is one exception: Inline PGP message (in contrast to the modern PGP/MIME messages) are conveyed in the PR_BODY. To avoid changing that orginal mail, GpgOL copies such a body to a new attachment named '`gpgolPGP.dat`', flags it as hidden and sets the attach type to ATTACHTYPE_PGPBODY (See above under MAPI Properties). That attachment may never be deleted!

Due to internal OL syncronisation, plaintext data may end up in PR_BODY, GpgOL tries hard to delete PR_BODY so that it nevers shows up in the MAPI storage. However this is hard and here a storage provider can help by deleting PR_BODY under one of these conditions:

- If the message class is either `IPM.Note.GpgOL.MultipartEncrypted` or `IPM.Note.GpgOL.OpaqueEncrypted` and in addition the message has a property `GpgOL Last Decrypted` (with any value), delete the properties `PR_BODY` and `PR_BODY_HTML`.
- If the message class is `IPM.Note.GpgOL.PGPMessage` and an attachment of ATTACHTYPE_PGPBODY with a filename '`gpgolPGP.dat`' exists, delete the properties `PR_BODY` and `PR_BODY_HTML`.

Instead of deleting it should be sufficient to make sure that such PR_BODYs are not updated and don't make it to the disk or a strage server.

Implementing such a feature would really help with end-to-end encryption where the security policy requires that the plaintext of an encrypted message will never be stored on a disk or leave the local machine.

5.4 Filtering GpgOL internal properties

To avoid attacks by importing TNEF data with certain GpgOL internal properties, a MAPI provider may want to filter them out when receiving a message from an external location. It is not yet clear whether this is really needed.

FIXME.

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