Automated use of GnuPG through GPGME

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OpenPGP-Conf Cologne – 9.9.16
Outline

- What is the Problem?
- Advantages
- Concepts and Usage
- Disadvantages
- Language Bindings
- Questions
What is the Problem?

- GnuPG is a tool not a library
- Changes to machine interface break things
- Example:
  
  pub:f:2048:17:F2AD85AC1E42B367:1199118275:1546232400::f:::scESC:
  pub:f:2048:17:F2AD85AC1E42B367:1199118275:1546232400::f:::scESC:::::::

- Usage of outdated versions
- Wrong usage / status handling
GnuPG Made Easy

- Make the tool into a library
- Stable API / ABI
- Reference parser implementation
- Works with all GnuPG Versions
- You can update it and you can update GnuPG
Dependencies

Linked

Libgpg-error

Libassuan

Runtime

gpg (1/2)
g13
gpgconf
gpgsm

GPGME
Advantages

- No need for DETAILS
- Decent Documentation
- Version Abstraction
- Data Abstraction
- Platform Abstraction
- Protocol Abstraction (CMS / OpenPGP)
- Convenience functions
- Lots of Tests that can serve as examples
- Maintained by the GnuPG Project
Data abstraction

- gpgme_data_t
  - File
  - Memory
    - Callbacks
      - Anything
Concepts and Usage

- Operations controlled by a Context
- Context binds the resources
- Workflow
  - Create Context for your Protocol
  - Set up data for input / output
  - Set options on a Context
  - Run an Operation (Async or Sync)
  - Handle the result
Engine Abstraction

- Think of an Engine as a distinct tool
  - OpenPGP
  - CMS
  - GpgConf
  - Assuan (can be used for dirmngr or scdaemon)
  - G13 (VFS Container)
  - Spawn (Platform independent process control)
Example - core use

```c

gpgme_error_t err;
gpgme_ctx_t ctx;
gpgme_key_t key;
gpgme_keylist_result_t result;

gpgme_check_version (NULL);

gpgme_new (&ctx);
gpgme_set_protocol (ctx,
                GPGME_PROTOCOL_OpenPGP);

gpgme_op_keylist_start (ctx, "foo@bar.baz", 0);
while (! (err = gpgme_op_keylist_next (ctx, &key)))
{
    ...
}
```
Example – context modification

- Look for keys on Keyserver:
  ```c
  gpgme_set_keylist_mode(ctx,
      GPGME_KEYLIST_MODE_EXTERN);
  ```

- Look for keys with "locate-keys" (if supported)
  ```c
  gpgme_set_keylist_mode(ctx,
      GPGME_KEYLIST_MODE_EXTERN |
      GPGME_KEYLIST_MODE_LOCAL);
  ```
Disadvantages

- Low Level API
- Not complete
- Edit Key / Smartcard Edit still tricky
  - 98 Status codes,.. (few are relevant)
- Can make it harder to debug problems
- It's written in C
Language Bindings

- New in GpgME 1.7.0
- Can provide high level functions
- Make it actually easy for their language
  - Python
  - Common Lisp
  - C++
  - Qt
GpgMEpp

- Formerly part of KDE
- Uses C++ patterns for resource management
- Object Oriented
- A bit more high level. E.g. Edit-Interactors
- Manually written / maintained
- Bad documentation
Context *ctx = Context::CreateForProtocol(OpenPGP);

EditInteractor *ei = new
    GpgSetExpiryTimeEditInteractor(std::string("2016-09-08T15:35:37+0200")
Data data;
const Error err = ctx->edit(key, std::unique_ptr<EditInteractor> (ei), data);
delete ctx;
QGpgME

- Formerly part of KDE
- Uses itself GpgMEpp
- Convenient API
- Everything is a Job (Async)
- Handles Qt Data Types
- Manually written / maintained
ChangeOwnerTrustJob *job = openpgp()->changeOwnerTrustJob();
connect(job, &ChangeOwnerTrustJob::result, this, [this](Error e)
{
    /* Do something */
});
job->start(key, Key::Ultimate);
• Based on PyME (SWIG)

Example:

```python
# Init
support.init_gpgme(constants.PROTOCOL_OpenPGP)
c = core.Context()
# Set options
c.set_armor(True)

# Setup Data
text = core.Data(test_text1)
sig = core.Data(test_sig1)

# Verify
c.op_verify(sig, text, None)
result = c.op_verify_result()
```
Example:

```
with tempfile.TemporaryFile() as source, \
    tempfile.TemporaryFile() as signed, \
    core.Context() as c:
    source.write(b"Hello world\n")
    source.seek(0, os.SEEK_SET)
    c.op_sign(source, signed, constants.SIG_MODE_NORMAL)
```
Use & Contribute

- Use it, report use cases that are missing
- It's LGPL
- Contribute to it :-)  
- More language bindings (C#, Java, etc.)
Questions?

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