# An introduction to Cryptography, OpenPGP and

# the Free Software implementation : GnuPG.

""I have even had 13 days in prison for not revealing our PGP pass phrases, but it was a very small price to pay for protecting our clients."" a NGO in the Balkans.

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# Agenda

- Cryptography
- Misconception around cryptography
- Symmetric cryptography
- Asymmetric cryptography
- Hybrid cryptosystem
- PGP/OpenPGP History
- GnuPG initial setup
- GnuPG signing key
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- Q&A and key signing ?

# Cryptography

- Cryptography provides these functions :

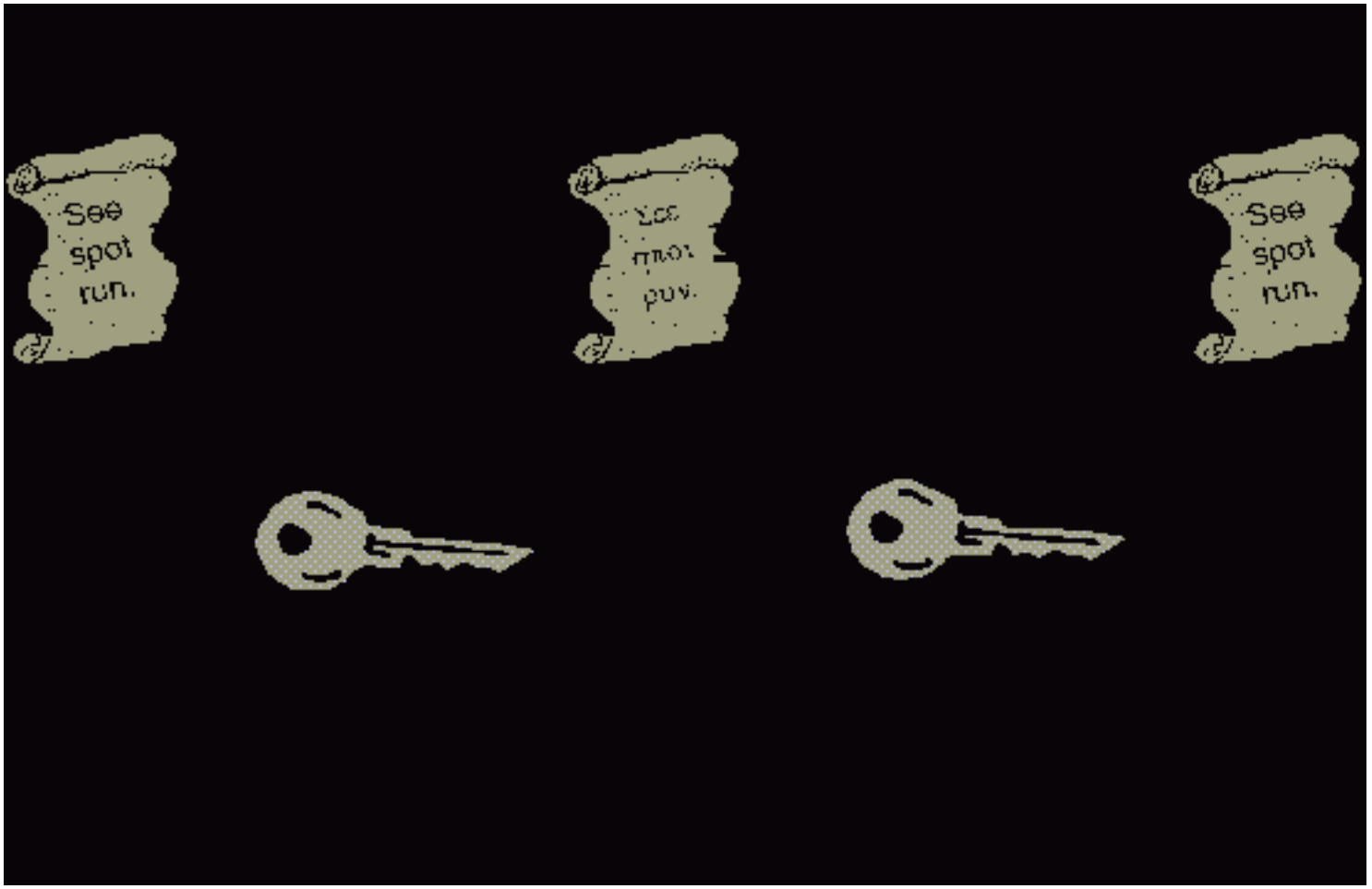
- Confidentiality (or privacy)
  - characteristic of a communication which prevents eaves-dropping
- Authentication
  - process of identifying the user accessing the system, server, or data
  - from shared secret to digital signature
- Message Integrity
  - characteristic of a communication which ensures the data received is the same as the data transmitted
  - digital signatures assure both that the signer actually originated the message and also that the transmitted message has not been altered

- Non-repudiation
  - difficult/impossible to deny a correct message

# Misconception about cryptography

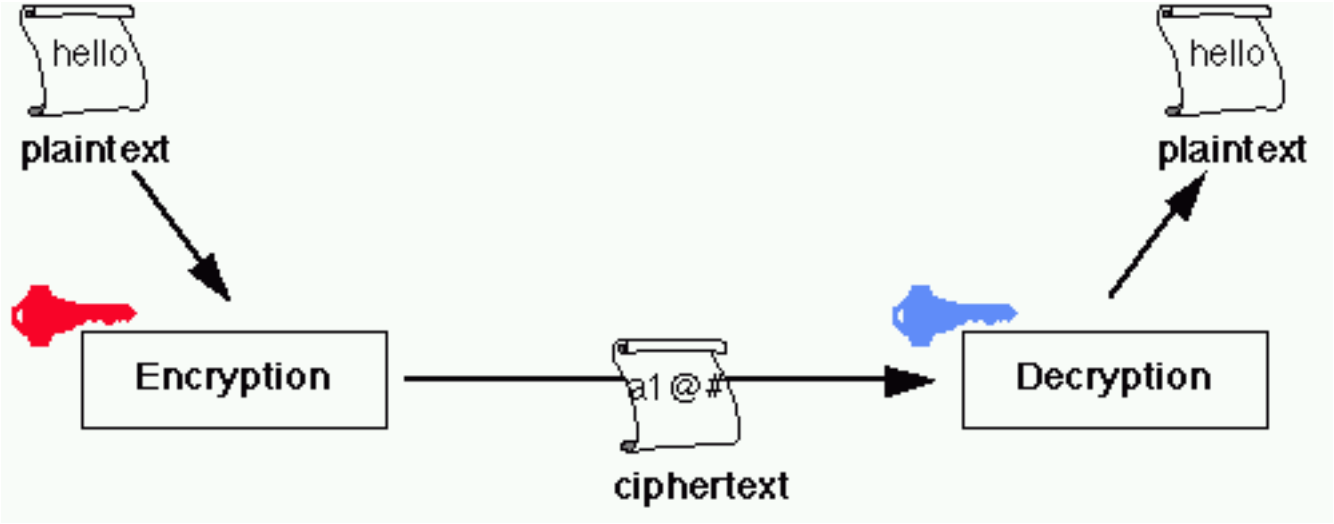
- Security is a process not a product
- Obscurity is not security
- "Snake oil"
  - http://www.interhack.net/people/cmcurtin/snake-oil-faq.html
- We can’t use it
  - http://rechten.kub.nl/koops/cryptolaw/cls2.htm#be
  - Free usage in Benelux but a licence is required for exporting
  - Criminality law : decryption order
- Cryptography is a complex matter

# Symmetric cryptography (Private-key cryptography)



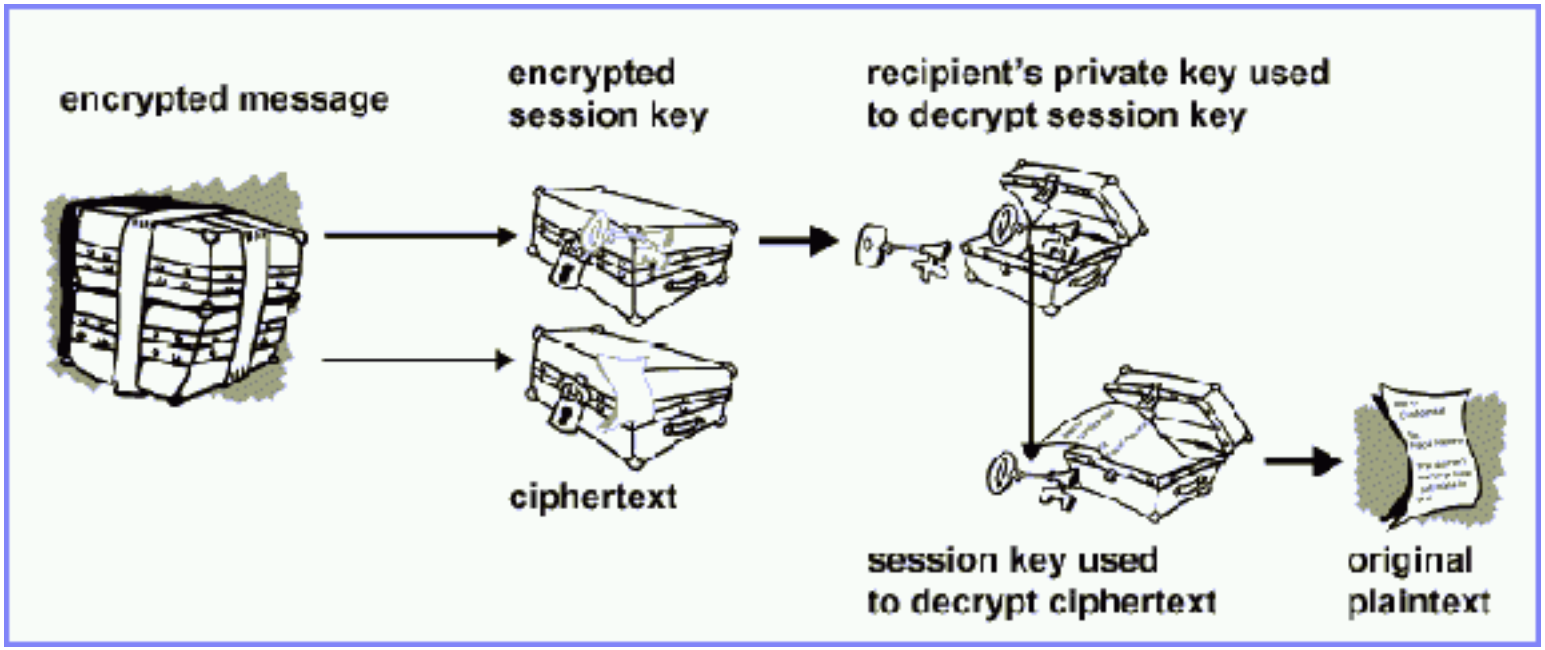

- Security is in the key
- Issue

# Asymmetric cryptography (Public-key cryptography)




- Concept by Whitfield Diffie and Martin Hellman (1976 IEEE)
  - A public-key cipher uses a pair of keys
  - The two keys are for the same persons (one public, one private)
- Security is also in the keys like symmetric cryptography
- Issue
  - Slow
  - Key size (>1024 bits)

# Hybrid cryptosystem




- Combined usage of symmetric cryptography and asymmetric cryptography
- A hybrid cryptosystem is no stronger than the weakest cipher (Asymmetric)
- -> OpenPGP, SSL/TLS are hybrid cryptosystems
- In OpenPGP, session key is variable for each messages

# PGP/OpenPGP History

- Phil Zimmermann in 1991 introduced the first version of PGP
  - -> Legal issue
  - -> Usable tools
- PGP Inc in 1996 -> NAI
  - -> John Callas (and others) -> OpenPGP / RFC
- GnuPG (Werner Koch)
  - full OpenPGP implementation
  - released under GNU GPL and part of the GNU project
  - backward compatibility with old proprietary PGP NAI

# GnuPG initial setup

- Install GnuPG (http://www.gnupg.org/)
- Generating a new keypair
  - gpg --gen-key
- Generating revocation certificate for all cases
  - gpg -output revokeX.asc --gen-revoke myname
- Make a copy of the .gnupg directory and all the revocation and put that in a secure place
- Export your public key to keyserver (pgp.mit.edu) and website
  - gpg --armor --export myname  (if not armored, binary format)
- and now, there is nothing secure ;-)

# GnuPG signing key

- Importing the key
  - gpg --import friend.gpg
- Check the fingerprint with your friend (PHYSICALLY !! with identity card)
  - gpg --fingerprint yourfriend
- If it’s ok, sign the key
  - gpg --sign-key yourfriend
- Send the signed key to him and to the keyserver
  - gpg --armor --export yourfriend

- Too complex ? : http://aplit.org/damien/gpgsig/

# GnuPG encrypt/decrypt

- Sending a crypted document to your friend
  - gpg --ouput document.gpg --encrypt --recipient yourfriend document
- Your friend (with private key) will do that to decrypt
  - gpg -output document -decrypt document.gpg

# GnuPG signature

- Sending a signature of the document to your friend
  - gpg --output document.sig --sign doc
- Sending a detached signature of the document to your friend
  - gpg --output document.sig --detach-sig document
- Sending a clearsign of a ascii file
  - gpg --clearsign document.txt
- GnuPG web-of-trust
  - (unknown, none, marginal, full)
- [img]

# Bibliography/ref/link

- Introduction to cryptography
  - The Code Book, Simon Singh (ISBN 1-85702-889-9)
  - Applied Cryptography, Bruce Schneier (ISBN (fr) 2-84180-036-9)
  - http://www.foo.be/docs-free/applied-cryptography/
  - Introduction to Cryptography with Coding Theory (0-13-061814-4)
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  - Network Security Essentials, William Stallings (ISBN 0-13-016093)
  - OpenPGP Message Format, RFC-2440 ftp://ftp.isi.edu/in-notes/rfc2440.txt
  - GNU privacy Guard http://www.gnupg.org/gph/en/manual.html
- Advanced cryptography and cryptosystem
  - Modelling and analysis of security protocols, Peter Ryan (ISBN 0-201-67471-8)
  - Making, Breaking Codes: Introduction to Cryptology, Paul Garrett (0-13-030369-0)

# Q&A

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