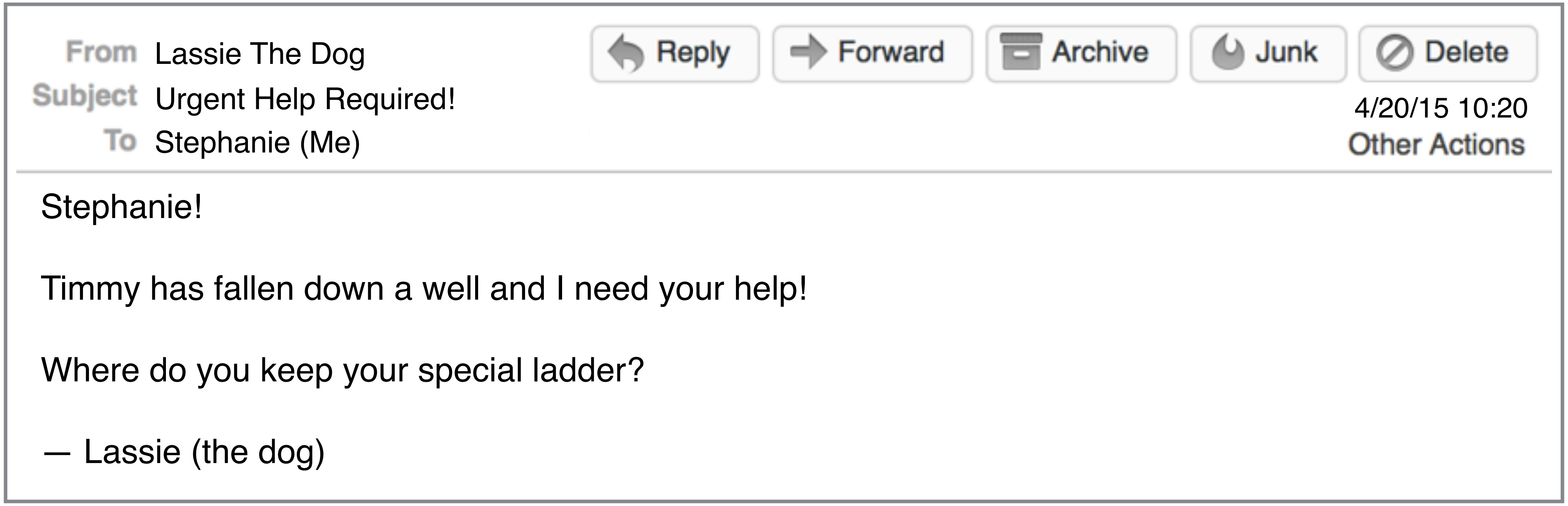
do you PGP?

(pretty good privacy)

@corcra
Stephanie Hyland

4/27/15, CryptoHarlem

suppose you receive an important message…



From Lassie The Dog
Subject Urgent Help Required!
To Stephanie (Me)

4/20/15 10:20

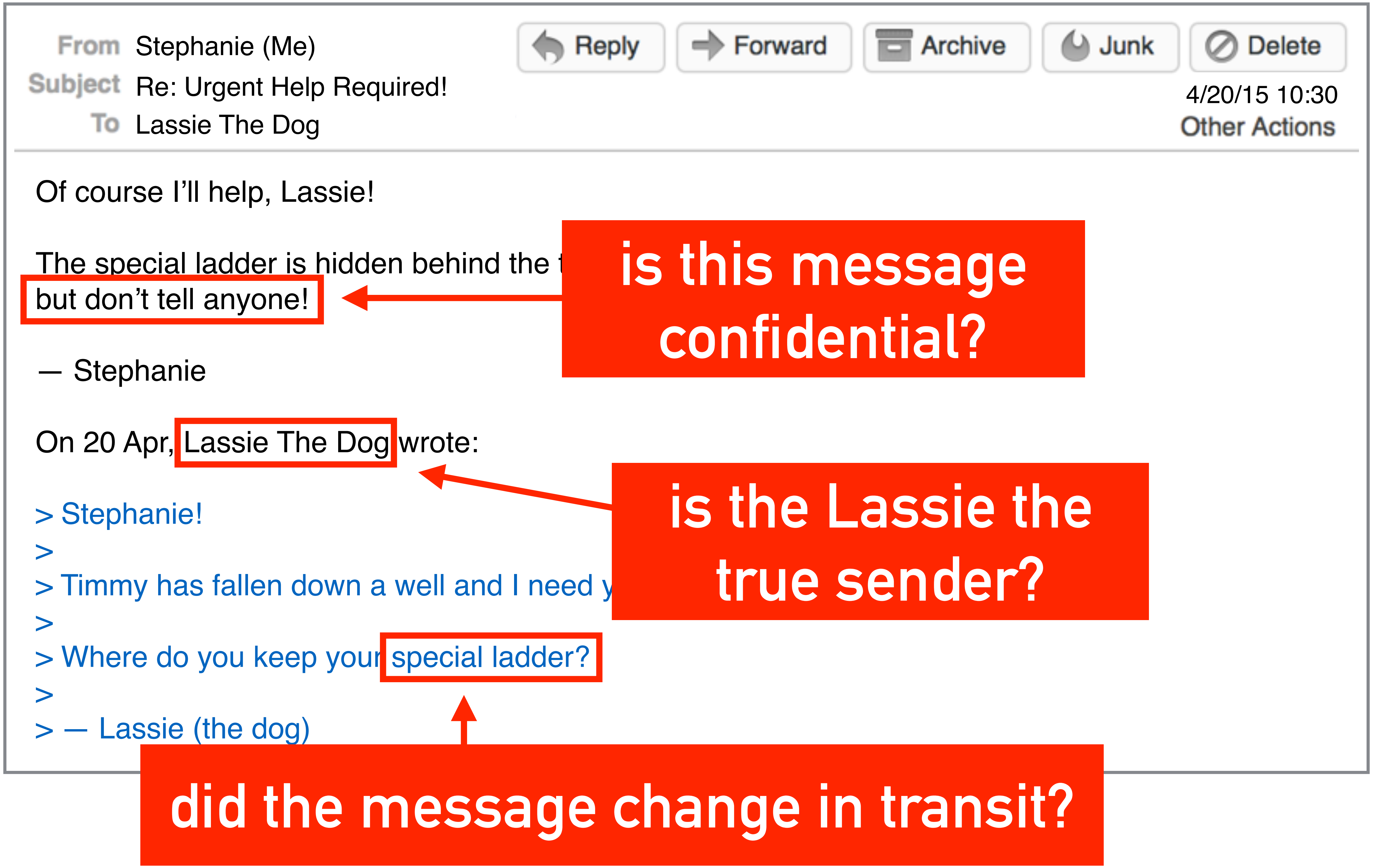
Stephanie!

Timmy has fallen down a well and I need your help!

Where do you keep your special ladder?

— Lassie (the dog)

DANGER!



From Stephanie (Me)
Subject Re: Urgent Help Required!
To Lassie The Dog

4/20/15 10:30

Of course I'll help, Lassie!

The special ladder is hidden behind the t
but don't tell anyone!

— Stephanie

On 20 Apr, Lassie The Dog wrote:

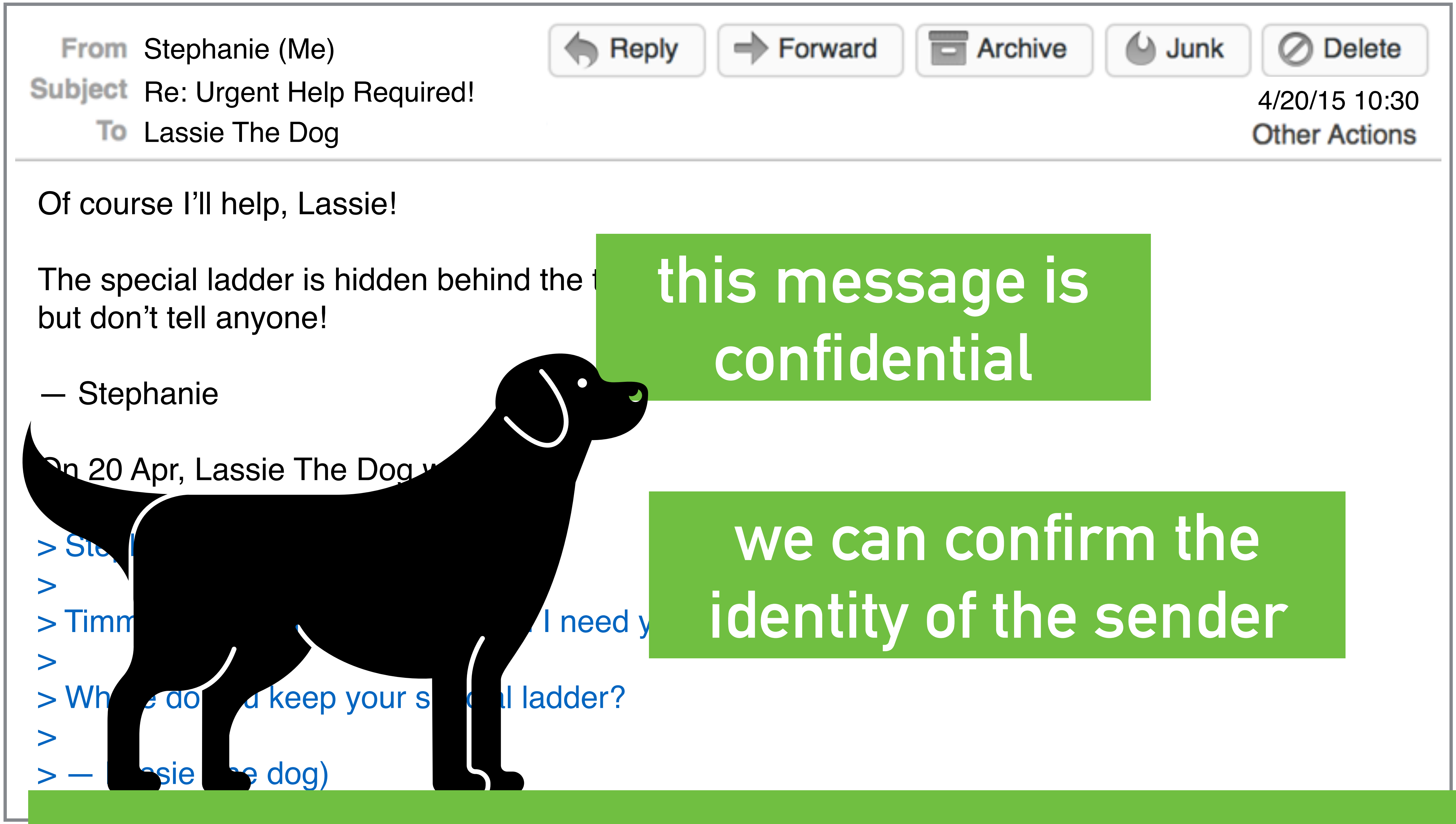
> Stephanie!
>
> Timmy has fallen down a well and I need y
>
> Where do you keep your special ladder?
>
> — Lassie (the dog)

is this message confidential?

is the Lassie the true sender?

did the message change in transit?

with PGP…



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— Stephanie

n 20 Apr, Lassie The Dog w

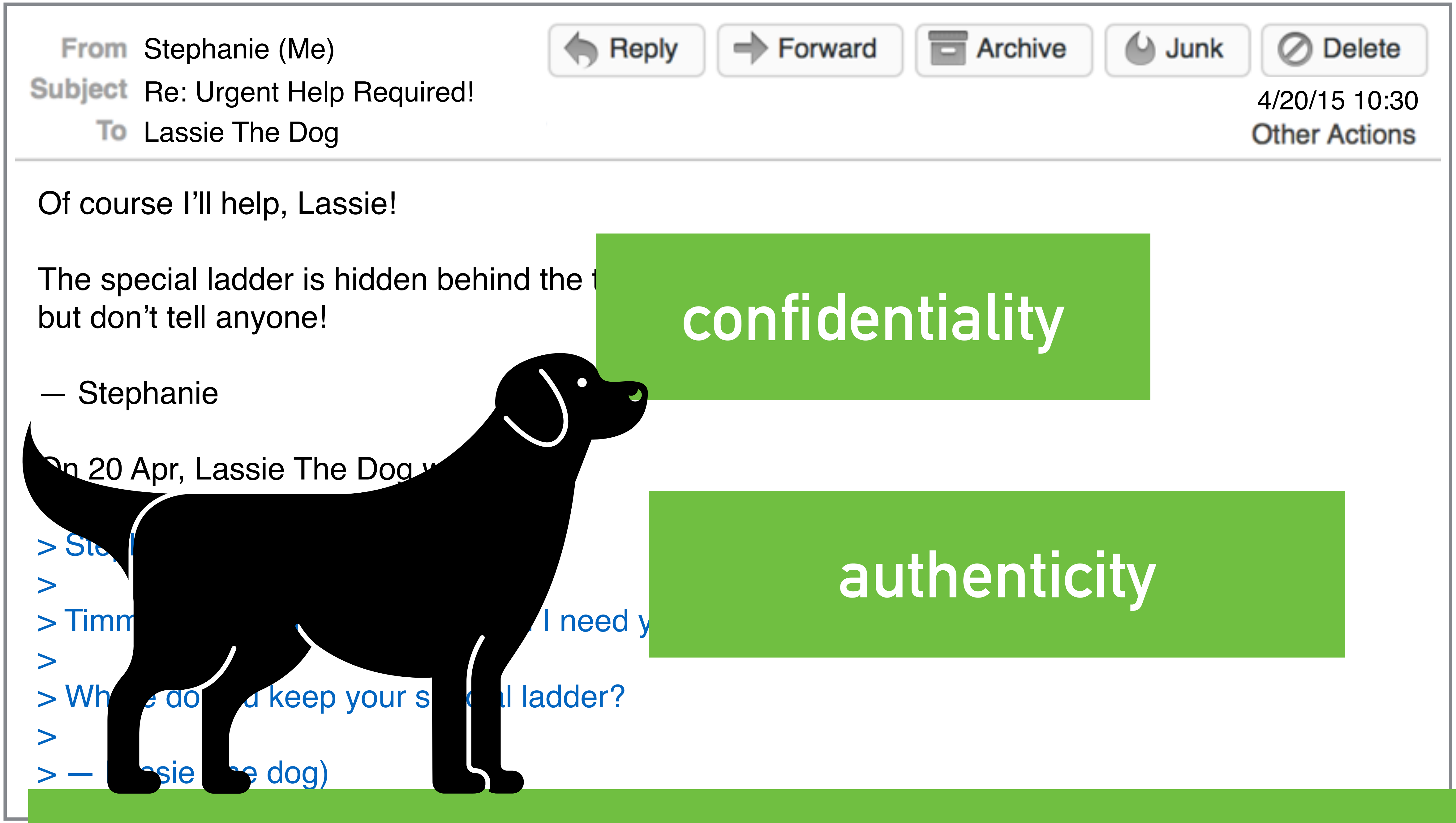
> Ste
>
> Timm I need y
>
> Wh e do u keep your s l ladder?
>
> — sie e dog)

this message is confidential

we can confirm the identity of the sender

we know if the message has been tampered with

with PGP…



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> Ste
>
> Timm I need y
>
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>
> — sie e dog)

confidentiality

authenticity

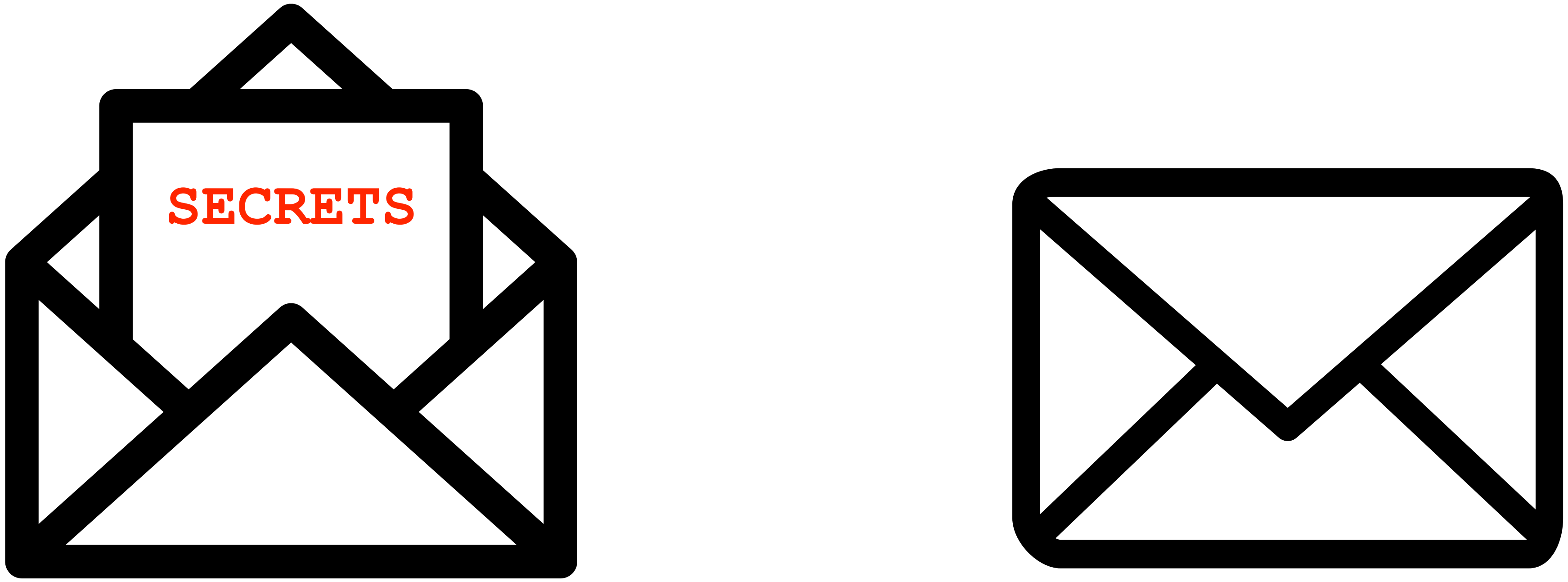
integrity

confidentiality

(preventing information disclosure to an unauthorized third party)

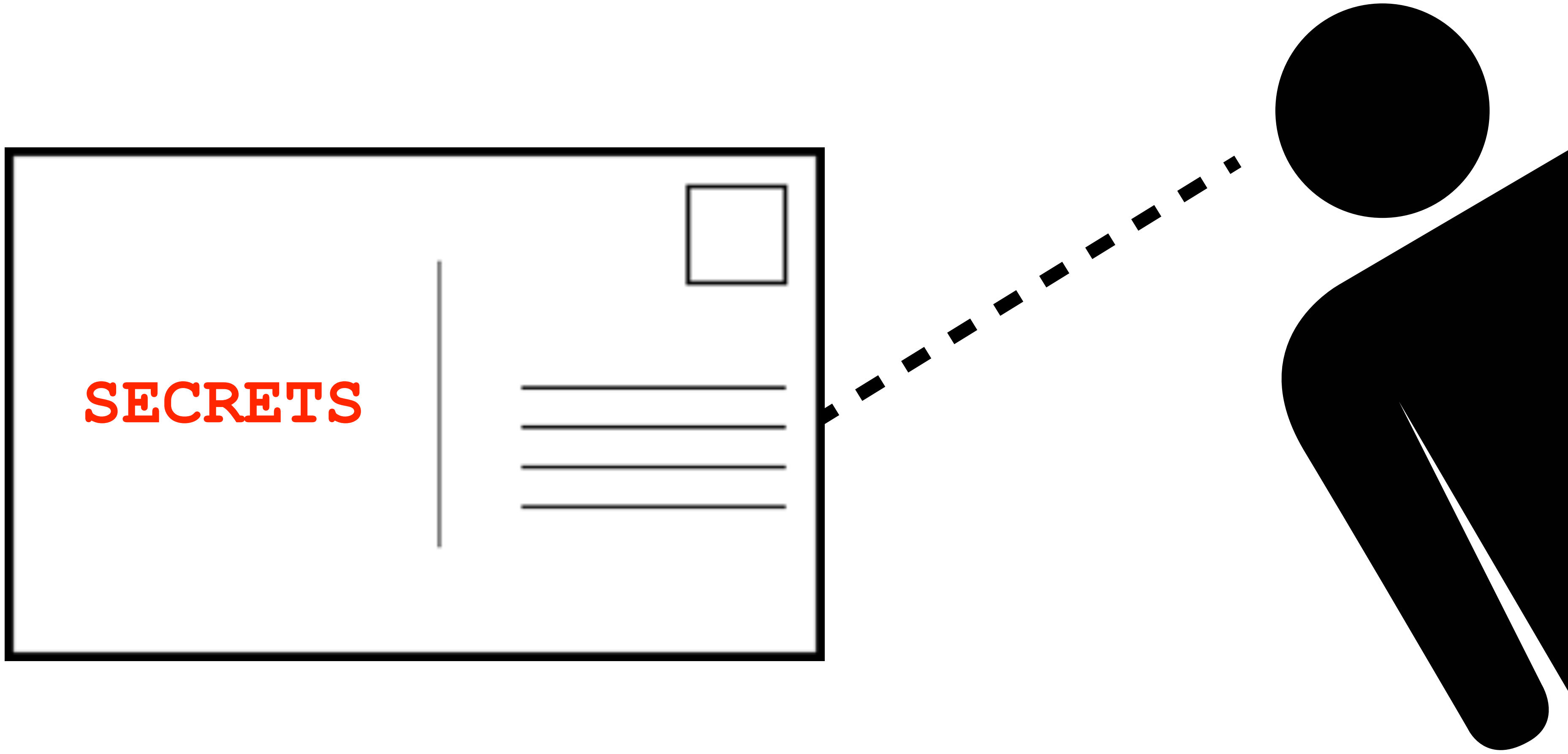
→ encrypt messages

a problem with email



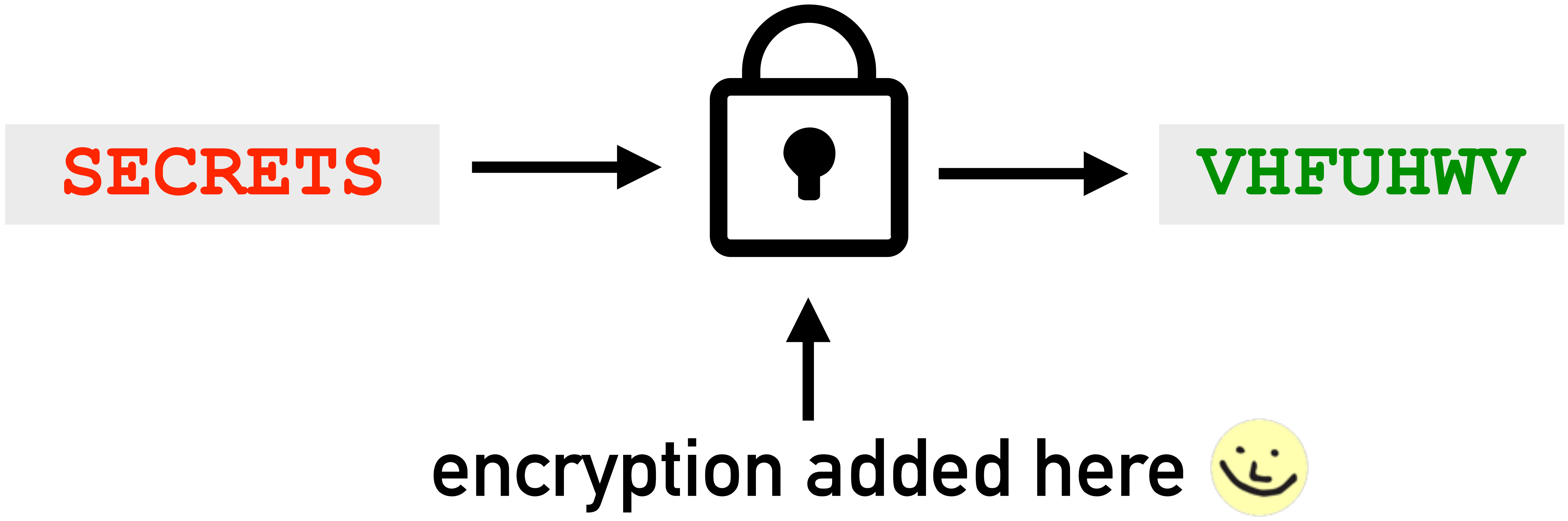
what you expect

a problem with email



what you get

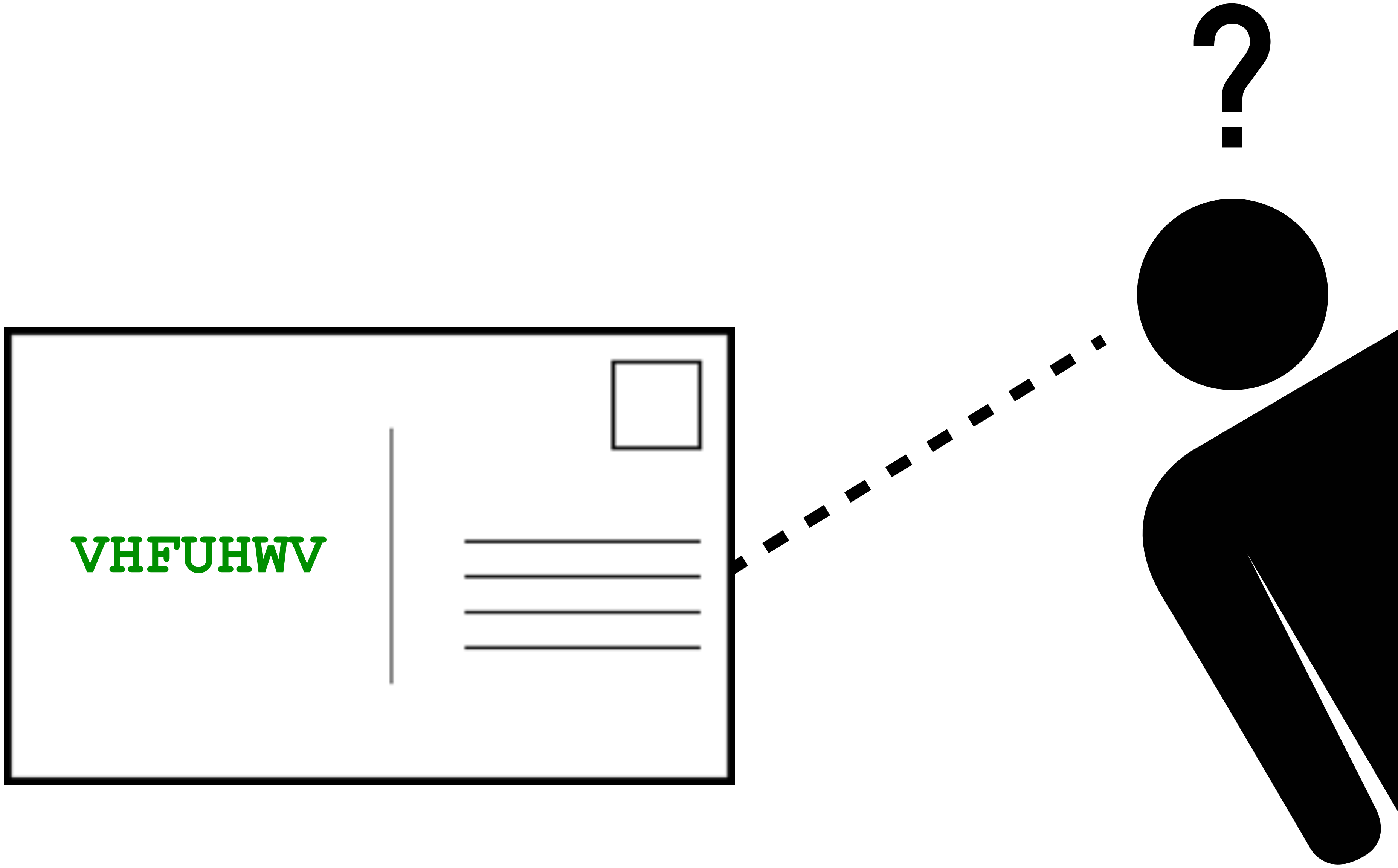
encryption to the rescue



SECRETS

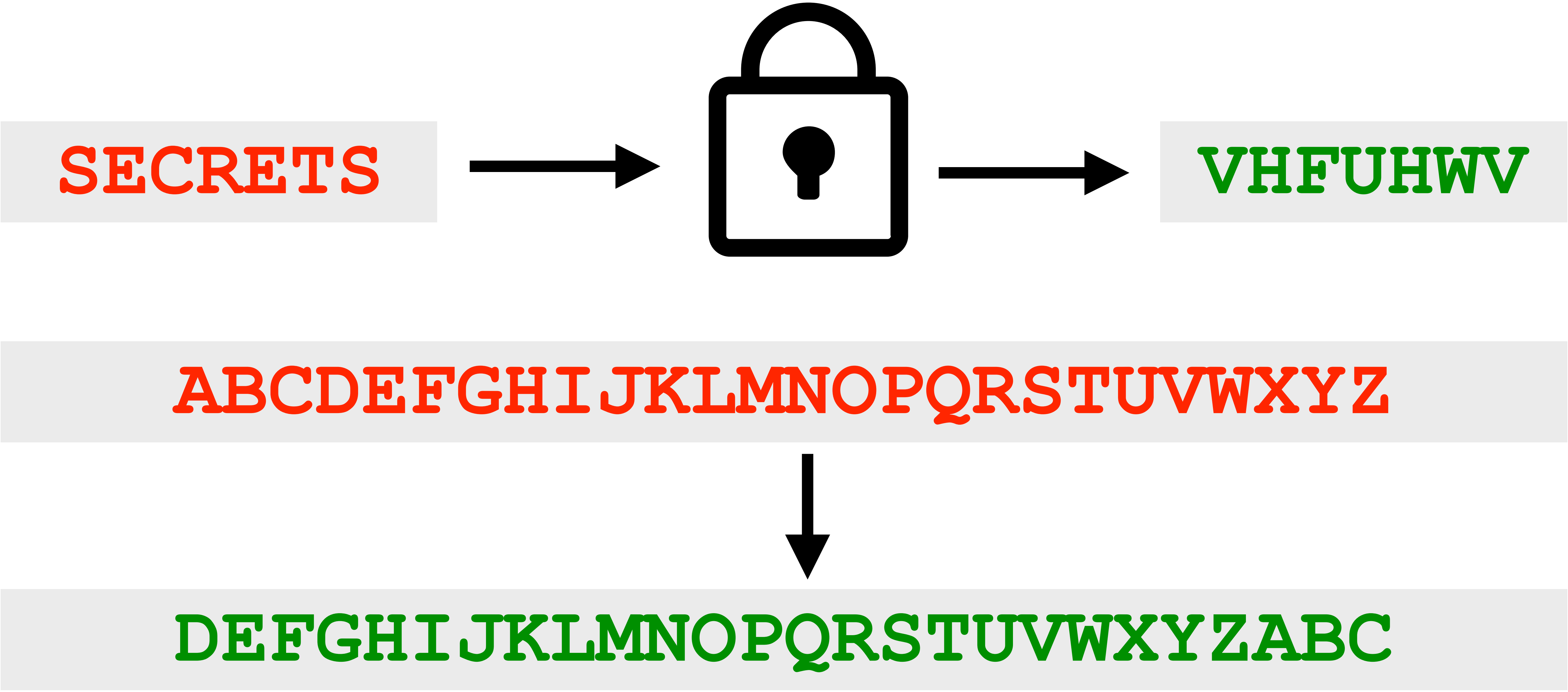
VHFUHWV

encryption added here


VHFUHWV
?

(shift/Caesar cipher)

a simple example



SECRETS → VHFUHWV

ABCDEFGHIJKLMNOPQRSTUVWXYZ

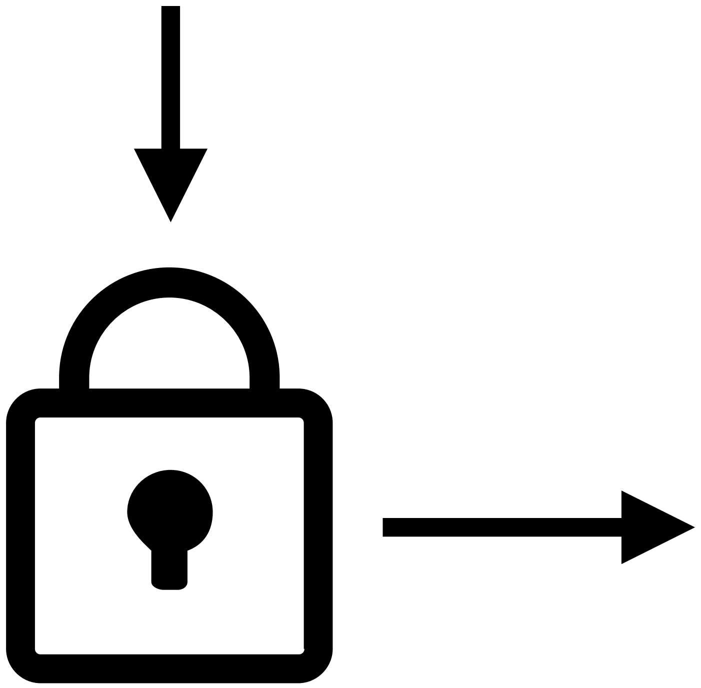
↓

DEFGHIJKLMNOPQRSTUVWXYZABC

Both parties must know the key (+3 letters)

a less simple example

SECRETS



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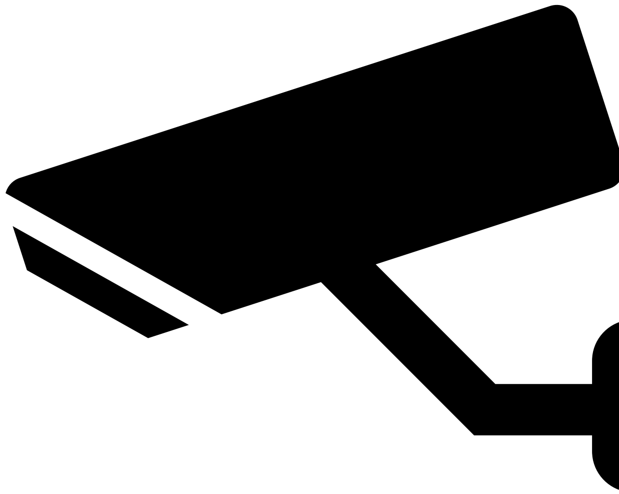
IMIY/CXRr7kL0t/xXdjpeRsj5nRlFZinOxCMNzVv+A==
=l6hy
-----END PGP MESSAGE-----
```

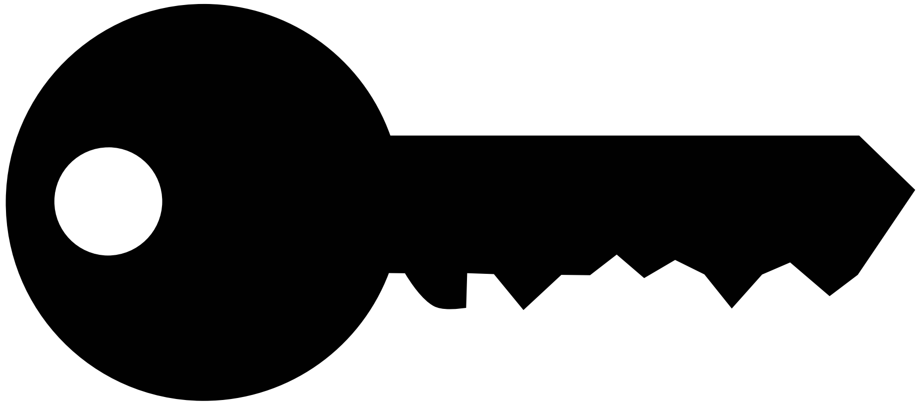
Without the right key,
this is extremely difficult to decrypt.

share a key,
communicate!

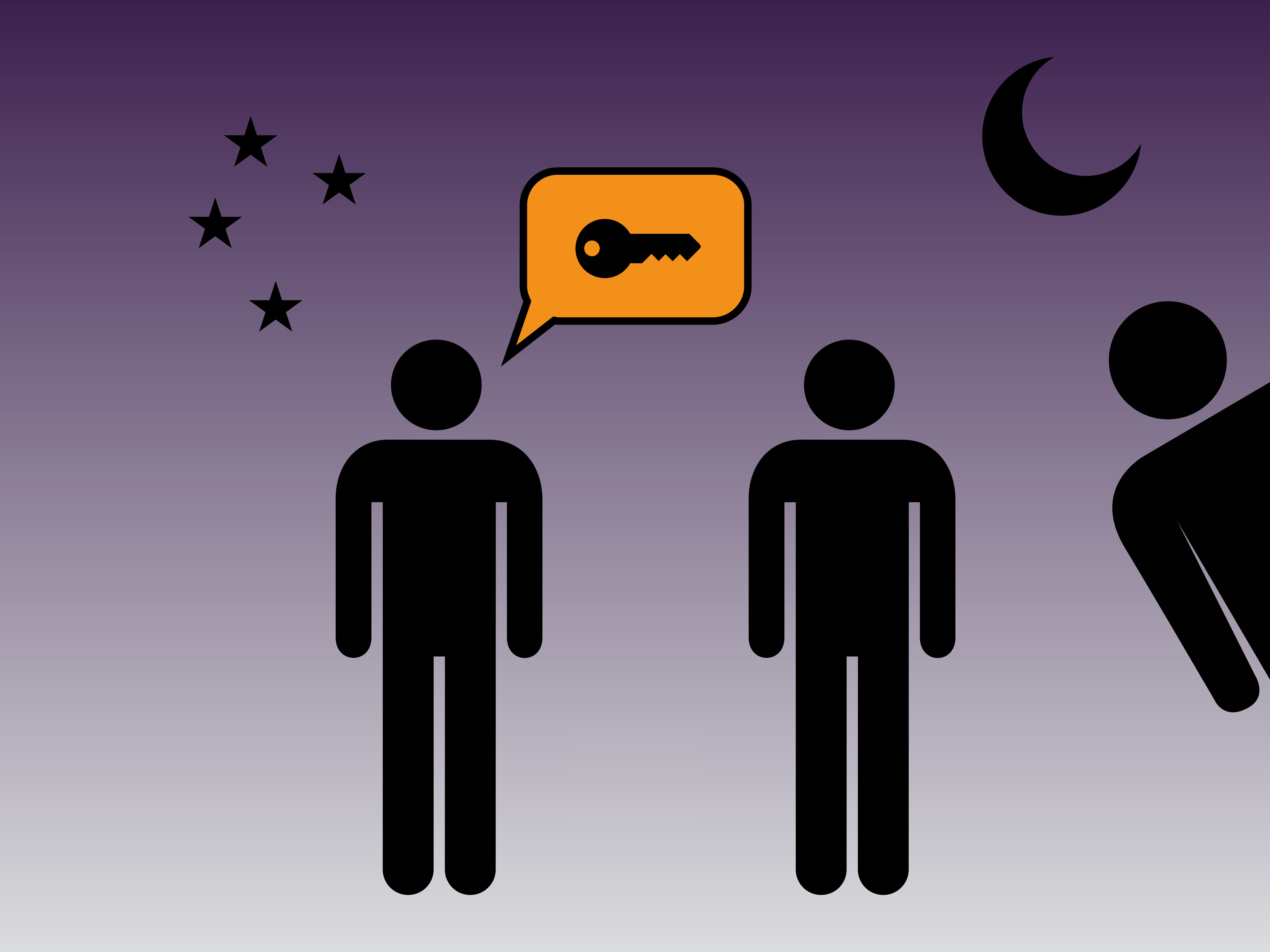
problem solved...?



unfortunately...



sharing secret information is hard



PGP uses public key cryptography

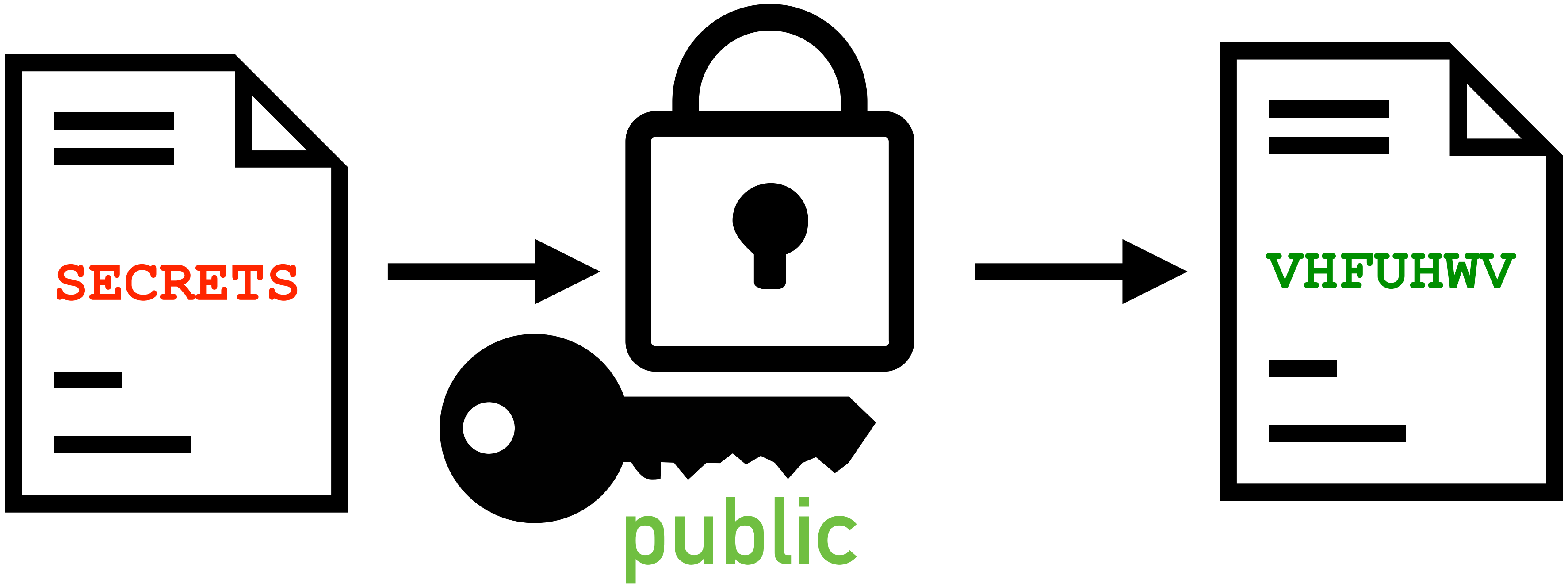
private key

public key

not secret,
easy to share!

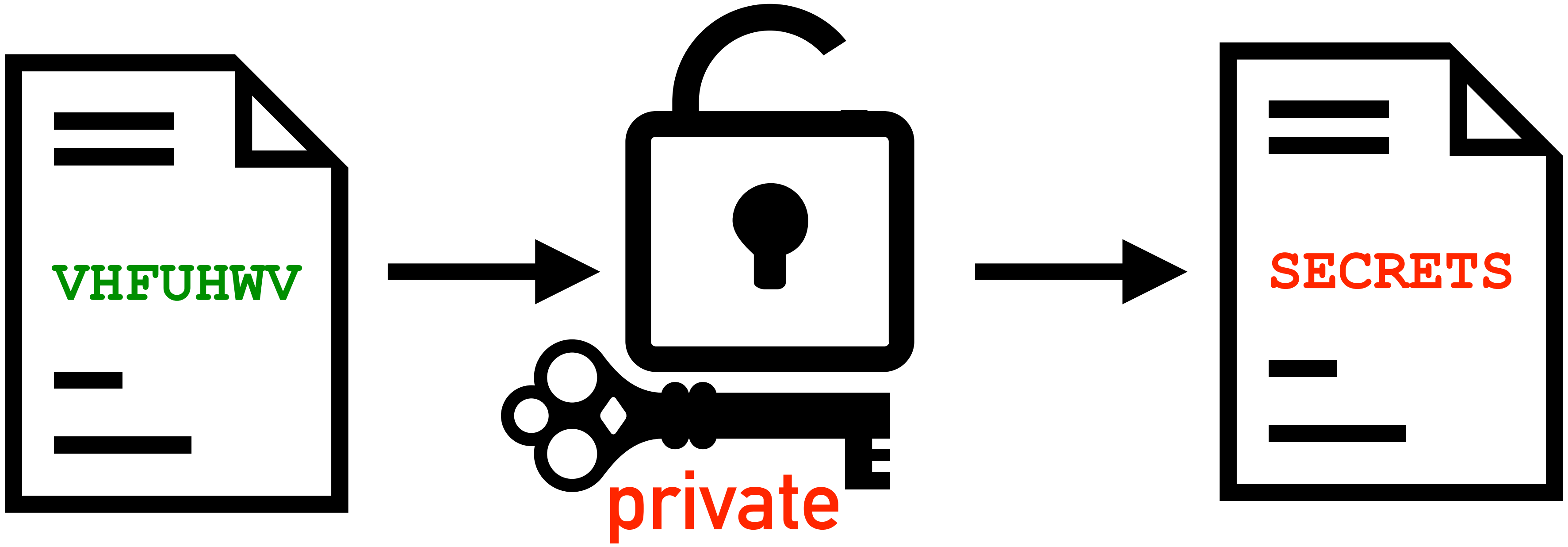
PGP uses public key cryptography

If someone knows my public key,
they can encrypt a message only I can read.



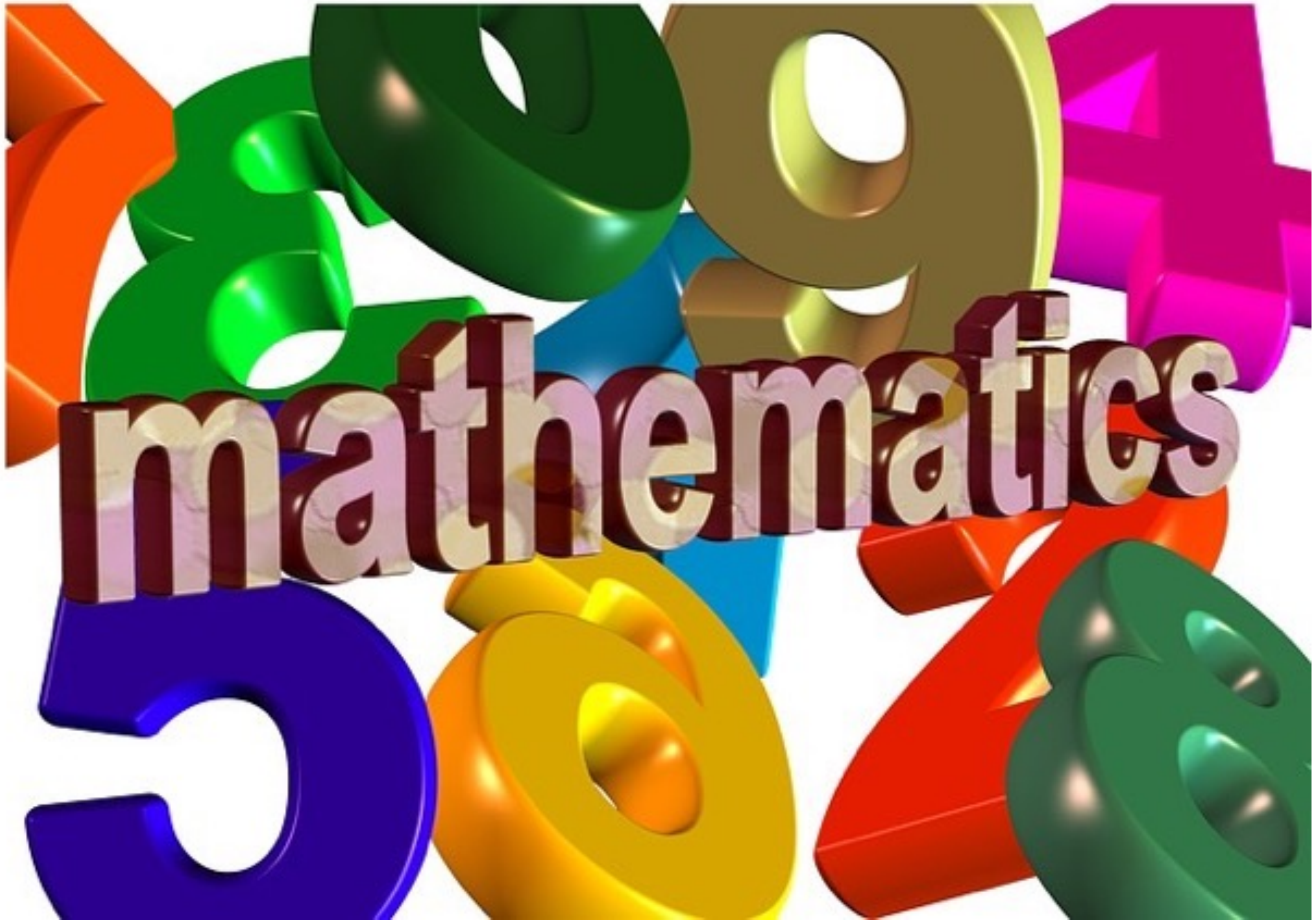
PGP uses public key cryptography

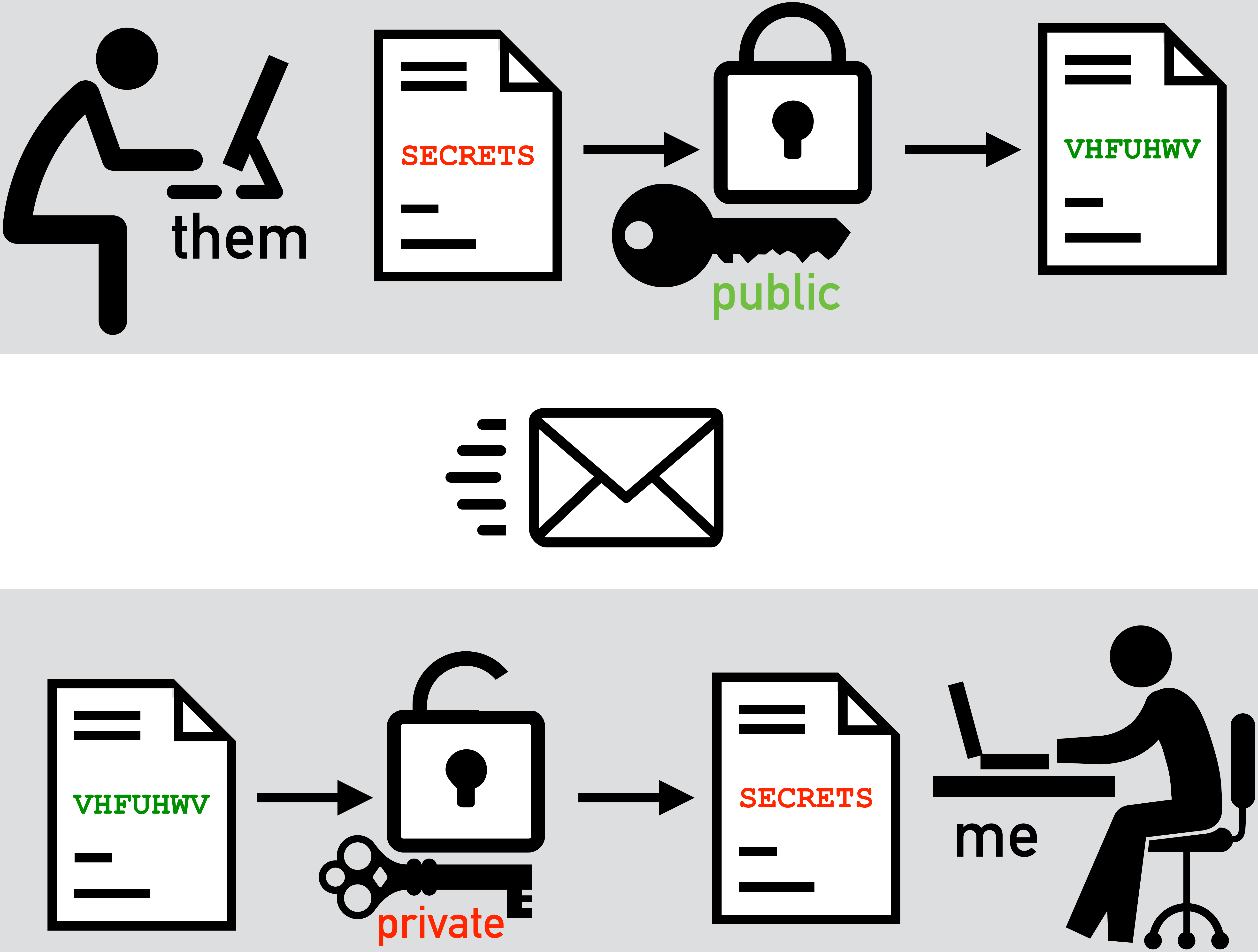
If I know my private key,
I can decrypt the message.



(anyone with my private key can decrypt the message!)

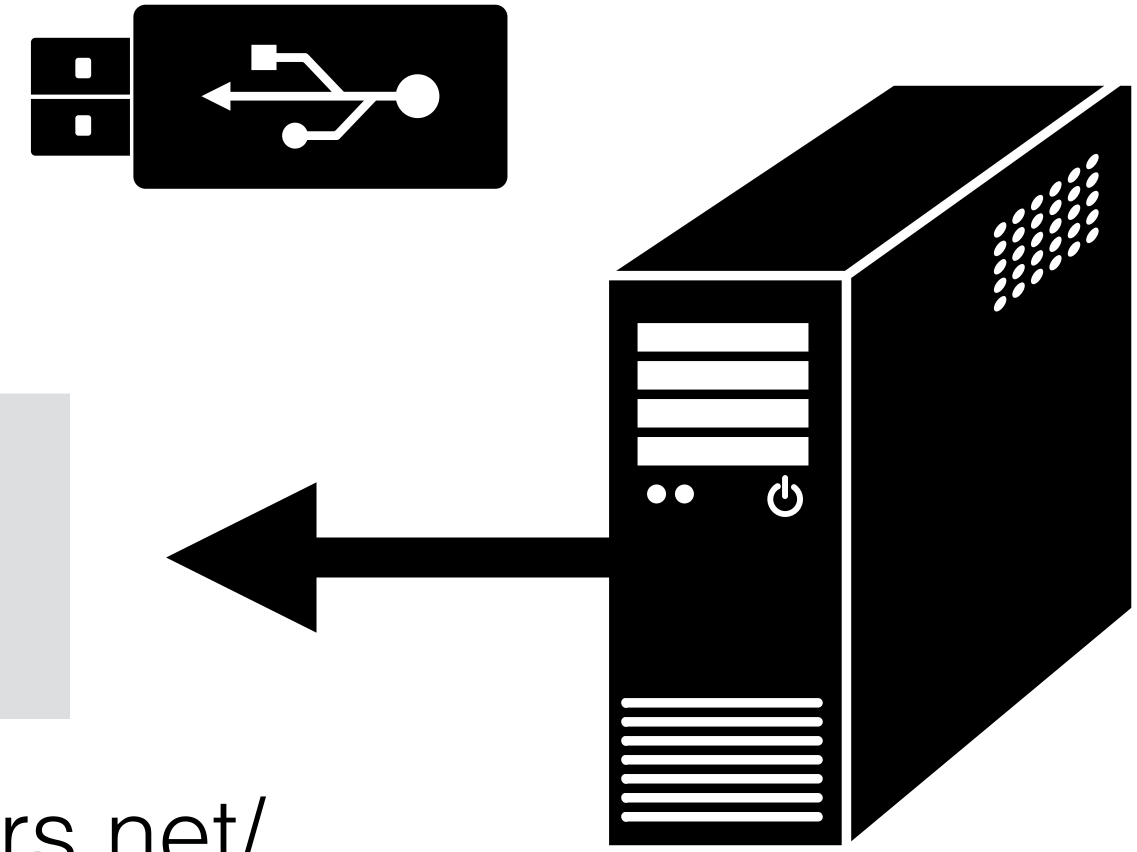
how is this possible?!




them
SECRETS
public
VHFUHWV
VHFUHWV
private
SECRETS
me

how does someone get my public key?

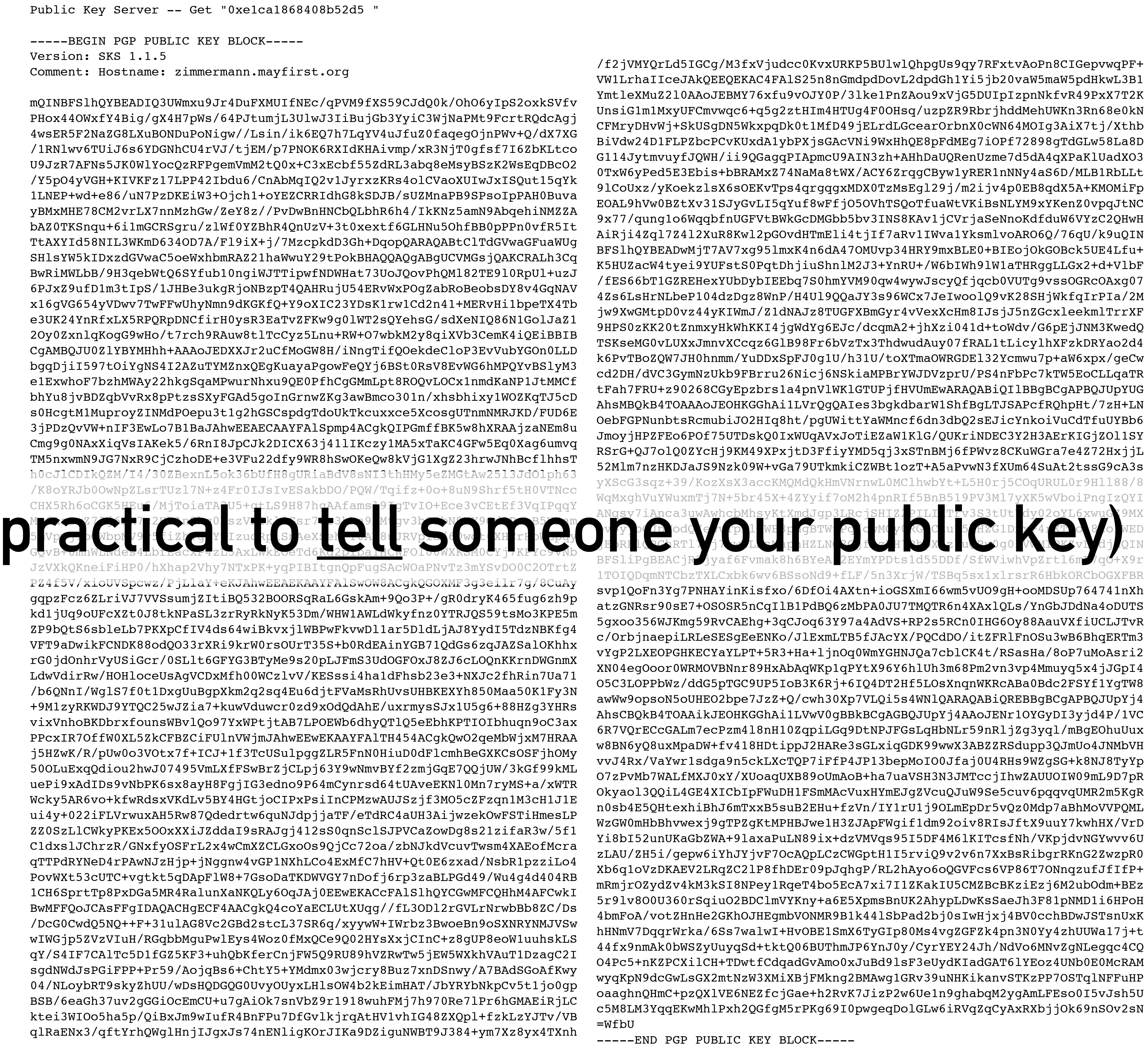
I give it to them



They download it from a key server

e.g. https://sks-keyservers.net/

(usually done through the PGP program)



Public Key Server -- Get "0xe1ca1868408b52d5 "

```
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Version: SKS 1.1.5
Comment: Hostname: zimmermann.mayfirst.org

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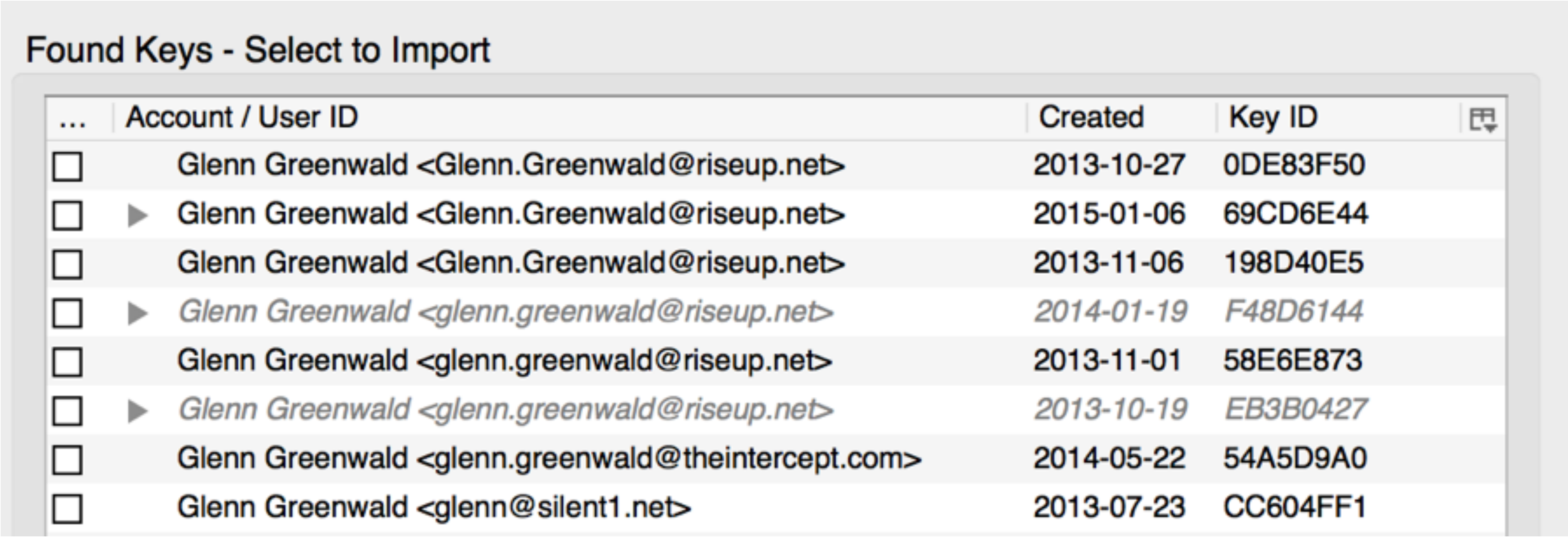
-----END PGP PUBLIC KEY BLOCK-----
```

(it is not practical to tell someone your public key)

DANGER!

Anyone can upload a key to a key server, claiming to be anyone!



Found Keys - Select to Import

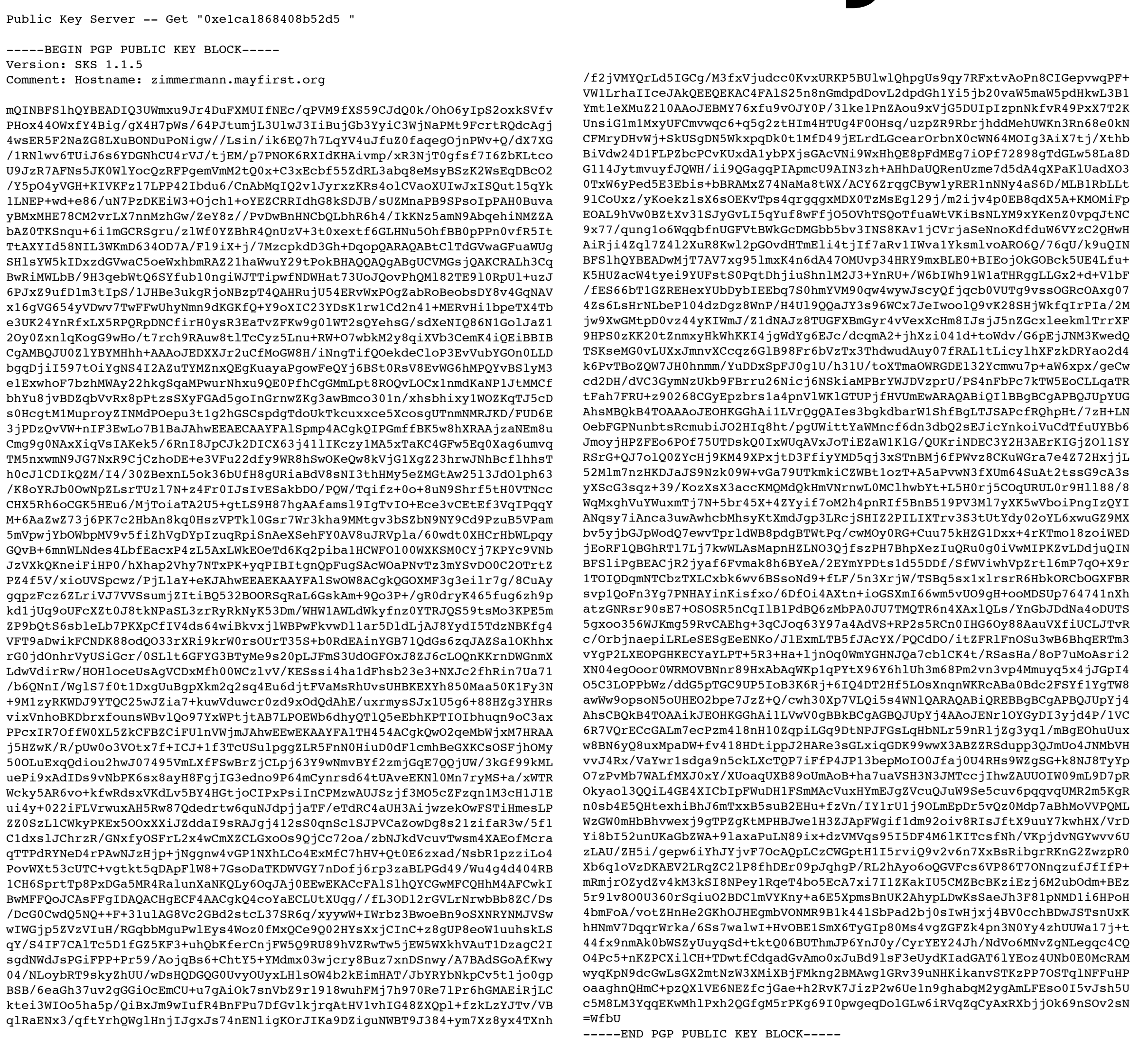
...	Account / User ID	Created	Key ID
□	Glenn Greenwald <Glenn.Greenwald@riseup.net>	2013-10-27	0DE83F50
□ ▶	Glenn Greenwald <Glenn.Greenwald@riseup.net>	2015-01-06	69CD6E44
□	Glenn Greenwald <Glenn.Greenwald@riseup.net>	2013-11-06	198D40E5
□ ▶	*Glenn Greenwald <glenn.greenwald@riseup.net>*	*2014-01-19*	*F48D6144*
□	Glenn Greenwald <glenn.greenwald@riseup.net>	2013-11-01	58E6E873
□ ▶	*Glenn Greenwald <glenn.greenwald@riseup.net>*	*2013-10-19*	*EB3B0427*
□	Glenn Greenwald <glenn.greenwald@theintercept.com>	2014-05-22	54A5D9A0
□	Glenn Greenwald <glenn@silent1.net>	2013-07-23	CC604FF1

Which key belongs to the person I want?

trusting keys

(important for preventing impersonation)

fingerprints are key identifiers



```
Public Key Server -- Get "0xe1ca1868408b52d5 "

-----BEGIN PGP PUBLIC KEY BLOCK-----
Version: SKS 1.1.5
Comment: Hostname: zimmermann.mayfirst.org

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Xb6q1oVzDKAEV2LRqZC2lP8fhDEr09pJqhgP/RL2hAyo6oQGVFcs6VP86T7ONnqzufJfIfP+
mRmjrOZydZv4kM3kSI8NPey1RqeT4bo5EcA7xi7I1ZKakIU5CMZBcBKziEzj6M2ubOdm+BEz
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O4Pc5+nKZPCXilCH+TDwtfCdqadGvAmo0xJuBd9lsF3eUydKIadGAT6lYEoz4UNb0E0McRAM
wyqKpN9dcGwLsGX2mtNzW3XMiXBjFMkng2BMAwg1GRv39uNHKikanvSTKzPP7OSTqlNFFuHP
oaaghnQHmC+pzQXlVE6NEZfcjGae+h2RvK7JizP2w6Ue1n9ghabqM2ygAmLFEso0I5vJsh5U
c5M8LM3YqqEKwMhlPxh2QGfgM5rPKg69I0pwgeqDolGLw6iRVqZqCyAxRXbjjOk69nSOv2sN
=WfbU
-----END PGP PUBLIC KEY BLOCK-----
```

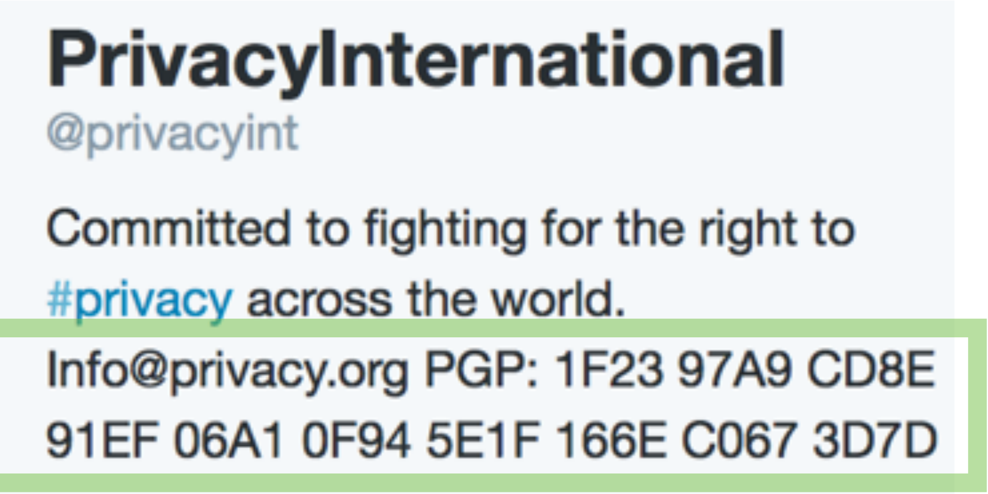
→

```
0F1D 8FA1
929F F077
7458 1191
E1CA 1868
408B 52D5
```

finding two keys with the same fingerprint is extremely difficult

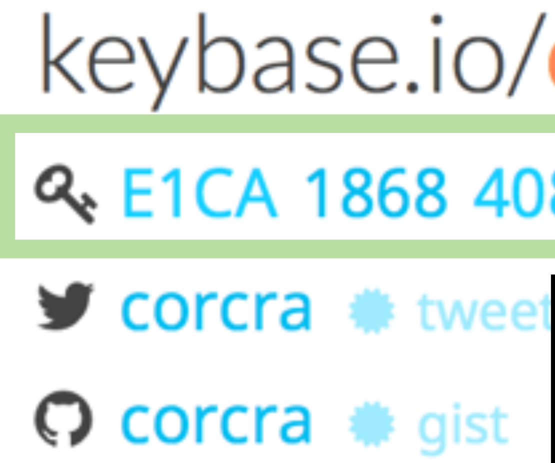
two reasons to trust a key

1: A public declaration of ownership



PrivacyInternational
@privacyint

Committed to fighting for the right to #privacy across the world.
Info@privacy.org PGP: 1F23 97A9 CD8E 91EF 06A1 0F94 5E1F 166E C067 3D7D

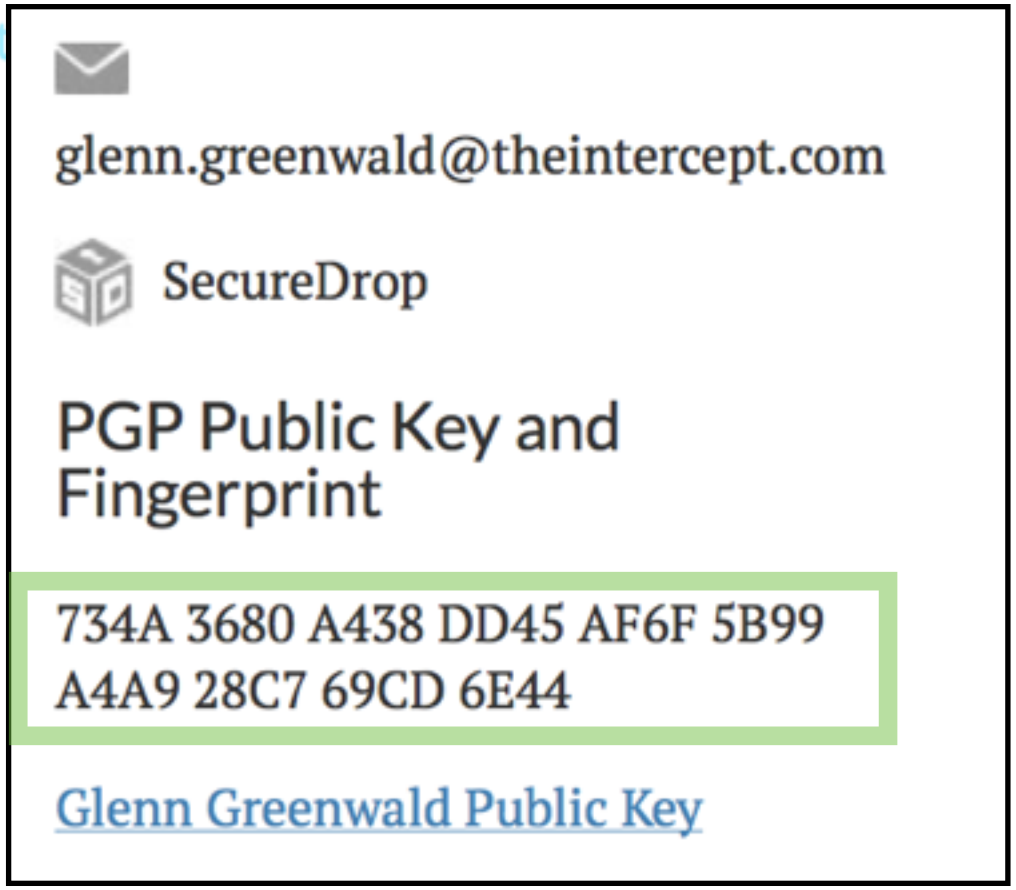


keybase.io/corcra

E1CA 1868 408B 52D5

corcra tweet

corcra gist



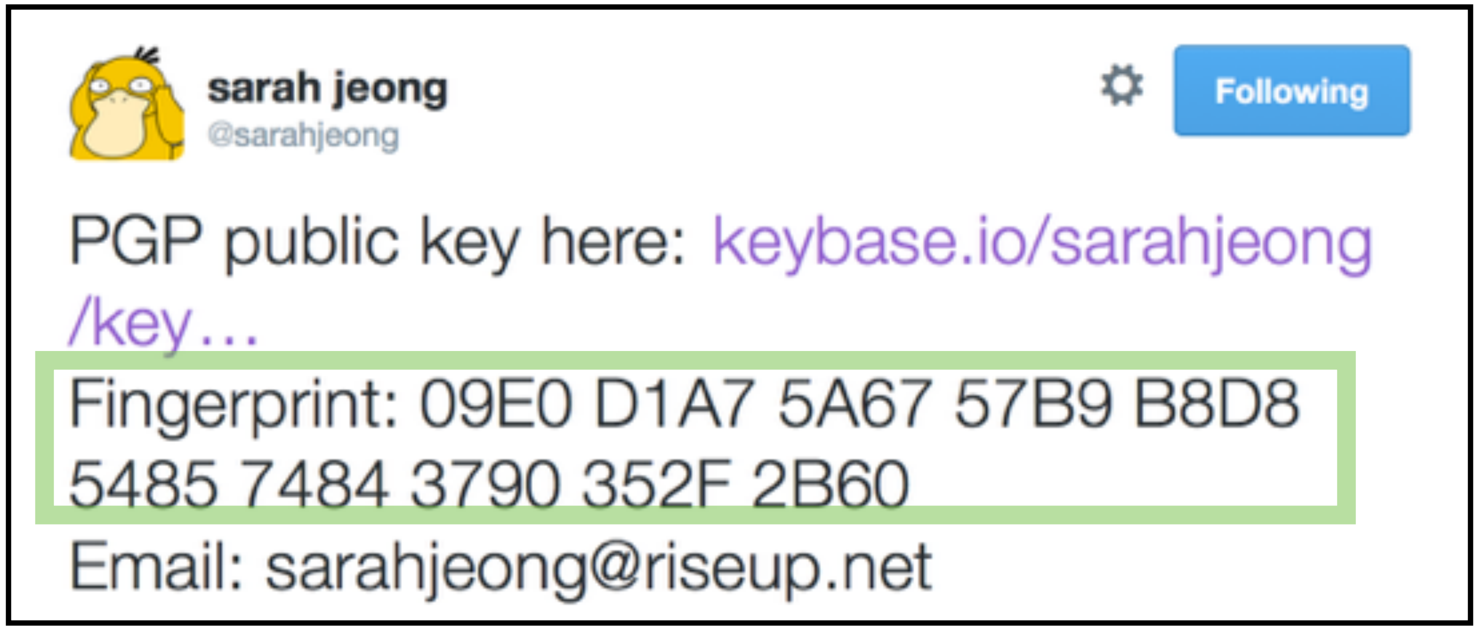
glenn.greenwald@theintercept.com

SecureDrop

PGP Public Key and Fingerprint

734A 3680 A438 DD45 AF6F 5B99 A4A9 28C7 69CD 6E44

Glenn Greenwald Public Key

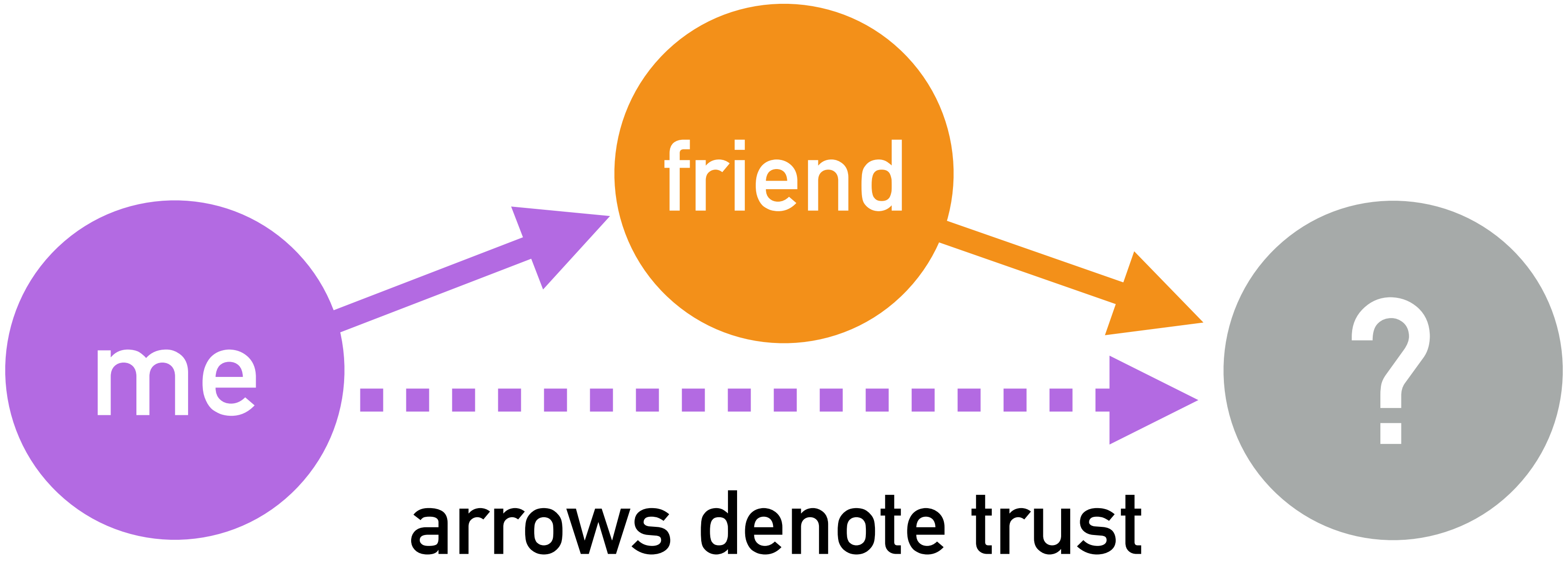


sarah jeong
@sarahjeong

PGP public key here: keybase.io/sarahjeong/key…
Fingerprint: 09E0 D1A7 5A67 57B9 B8D8 5485 7484 3790 352F 2B60
Email: sarahjeong@riseup.net

two reasons to trust a key

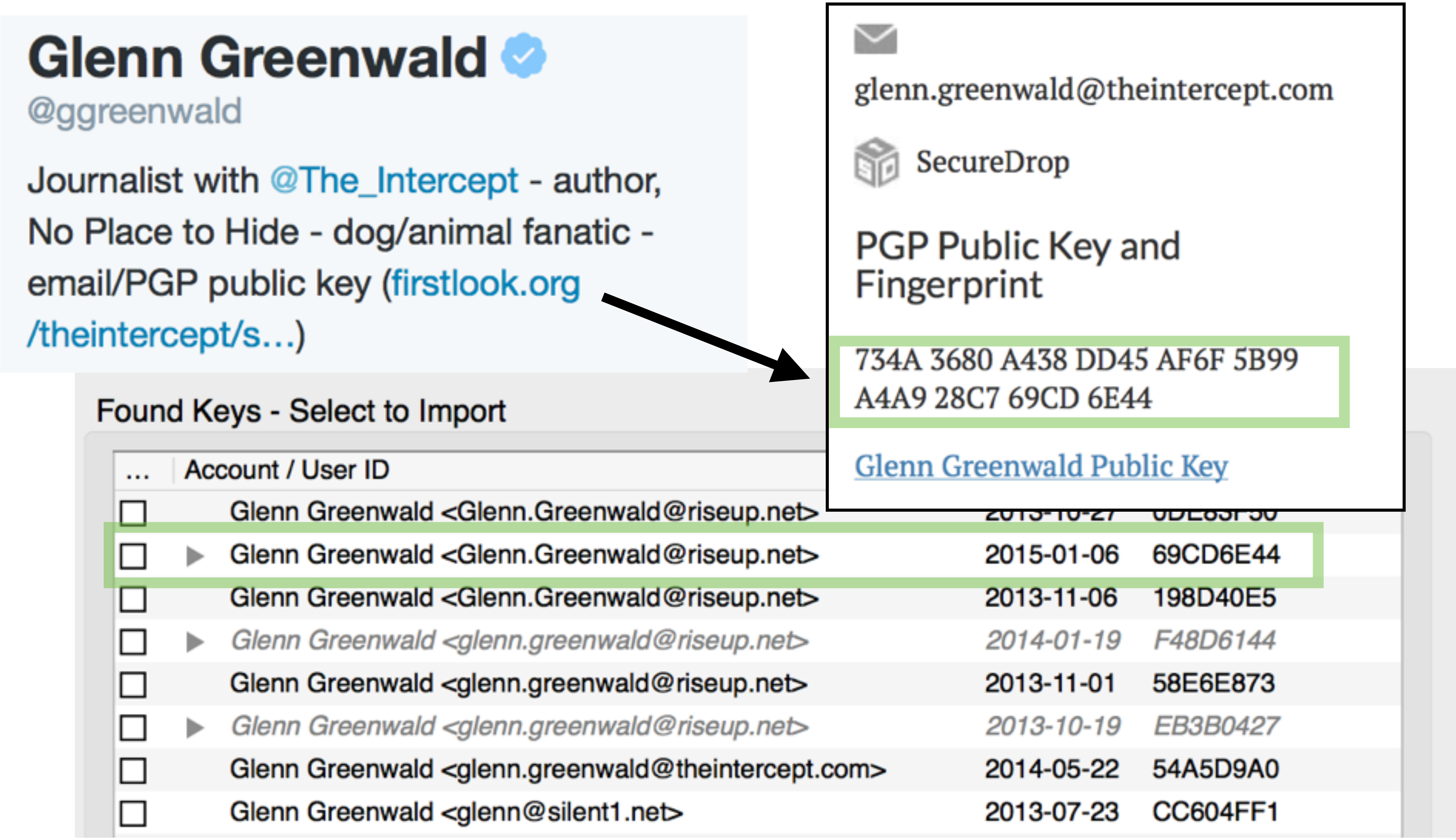
2: Confirmation from a trusted third party



PGP enables building a web of trust

(for more, see “keysigning”)

example: finding the right key



Glenn Greenwald

@ggreenwald

Journalist with @The_Intercept - author, No Place to Hide - dog/animal fanatic - email/PGP public key (firstlook.org/theintercept/s…)

glenn.greenwald@theintercept.com

SecureDrop

PGP Public Key and Fingerprint

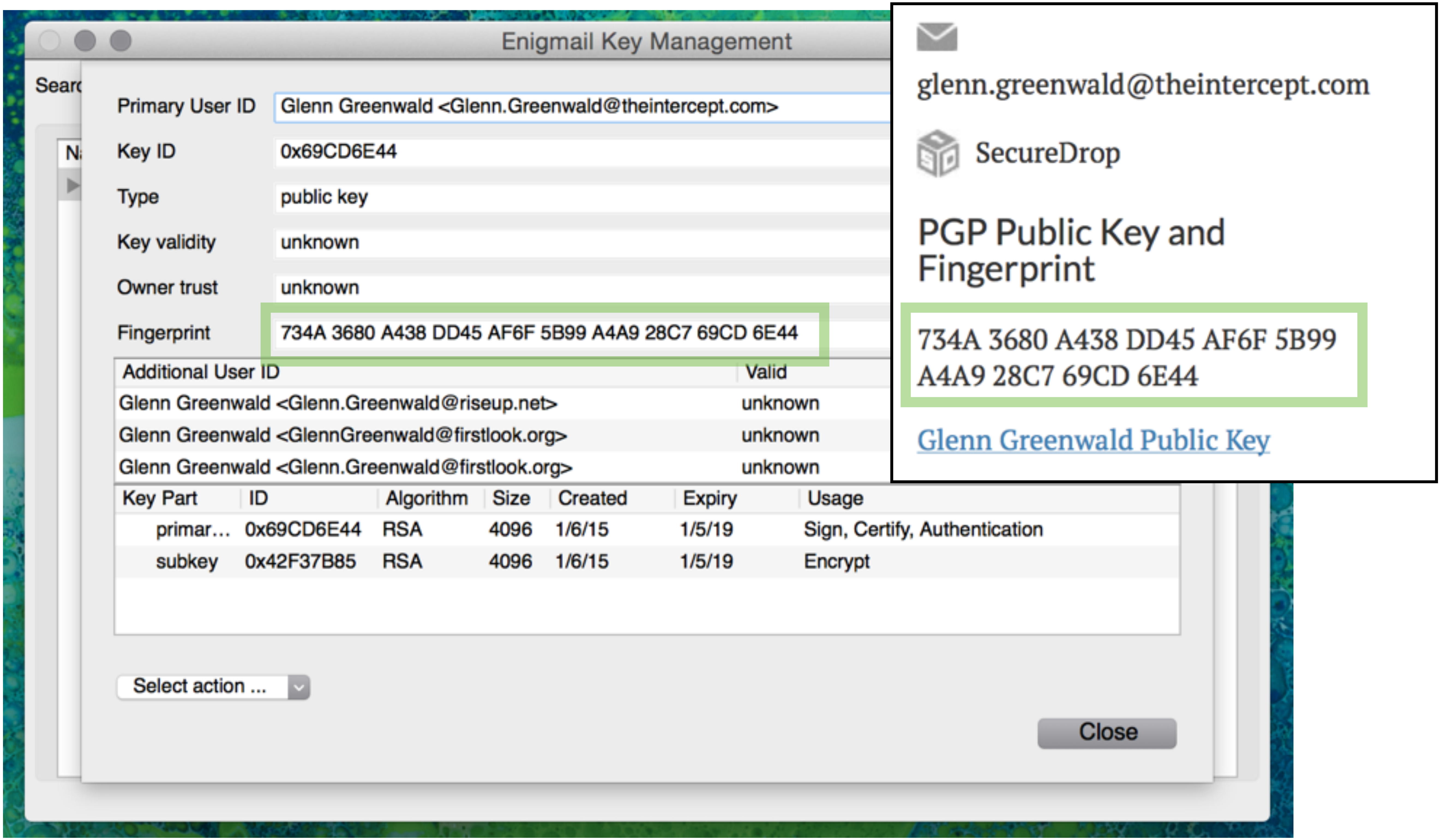
734A 3680 A438 DD45 AF6F 5B99
A4A9 28C7 69CD 6E44

Glenn Greenwald Public Key

Found Keys - Select to Import

…		Account / User ID		
□		Glenn Greenwald <Glenn.Greenwald@riseup.net>	2013-10-27	0DE83F50
□	▶	Glenn Greenwald <Glenn.Greenwald@riseup.net>	2015-01-06	69CD6E44
□		Glenn Greenwald <Glenn.Greenwald@riseup.net>	2013-11-06	198D40E5
□	▶	*Glenn Greenwald <glenn.greenwald@riseup.net>*	*2014-01-19*	*F48D6144*
□		Glenn Greenwald <glenn.greenwald@riseup.net>	2013-11-01	58E6E873
□	▶	*Glenn Greenwald <glenn.greenwald@riseup.net>*	*2013-10-19*	*EB3B0427*
□		Glenn Greenwald <glenn.greenwald@theintercept.com>	2014-05-22	54A5D9A0
□		Glenn Greenwald <glenn@silent1.net>	2013-07-23	CC604FF1

example: finding the right key



Enigmail Key Management

Primary User ID	Glenn Greenwald <Glenn.Greenwald@theintercept.com>
Key ID	0x69CD6E44
Type	public key
Key validity	unknown
Owner trust	unknown
Fingerprint	734A 3680 A438 DD45 AF6F 5B99 A4A9 28C7 69CD 6E44

Additional User ID	Valid
Glenn Greenwald <Glenn.Greenwald@riseup.net>	unknown
Glenn Greenwald <GlennGreenwald@firstlook.org>	unknown
Glenn Greenwald <Glenn.Greenwald@firstlook.org>	unknown

Key Part	ID	Algorithm	Size	Created	Expiry	Usage
primar...	0x69CD6E44	RSA	4096	1/6/15	1/5/19	Sign, Certify, Authentication
subkey	0x42F37B85	RSA	4096	1/6/15	1/5/19	Encrypt

glenn.greenwald@theintercept.com

SecureDrop

PGP Public Key and Fingerprint

734A 3680 A438 DD45 AF6F 5B99 A4A9 28C7 69CD 6E44

Glenn Greenwald Public Key

authenticity

(confirming the identity of
the purported sender)

&

integrity

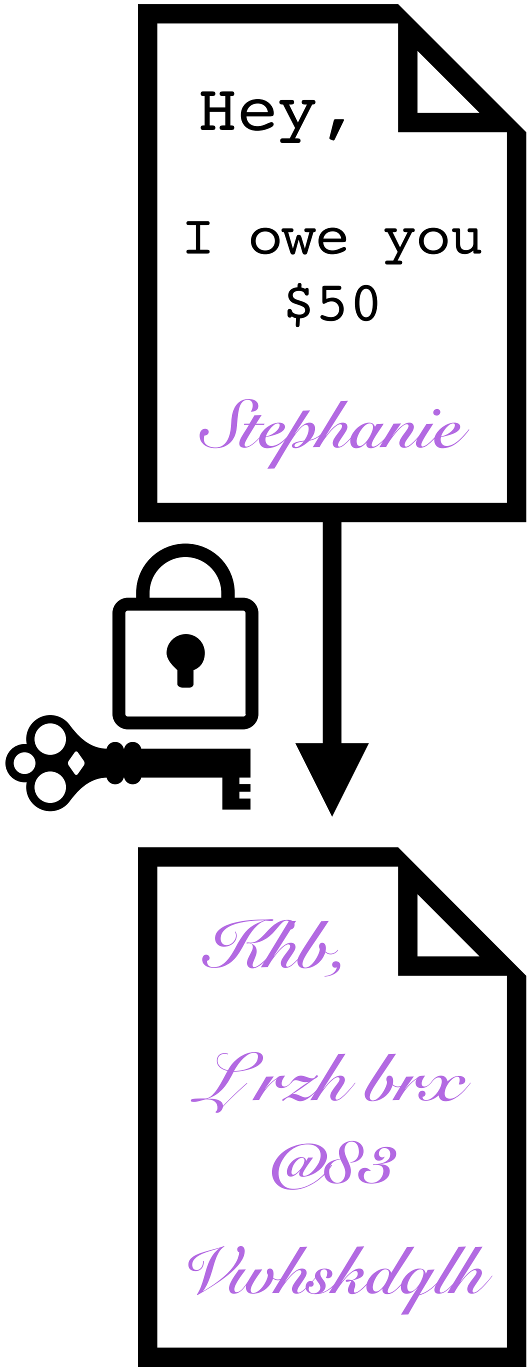
(ensuring the message was
not altered in transit)

→ sign messages

signing a message

My private key is unique to me

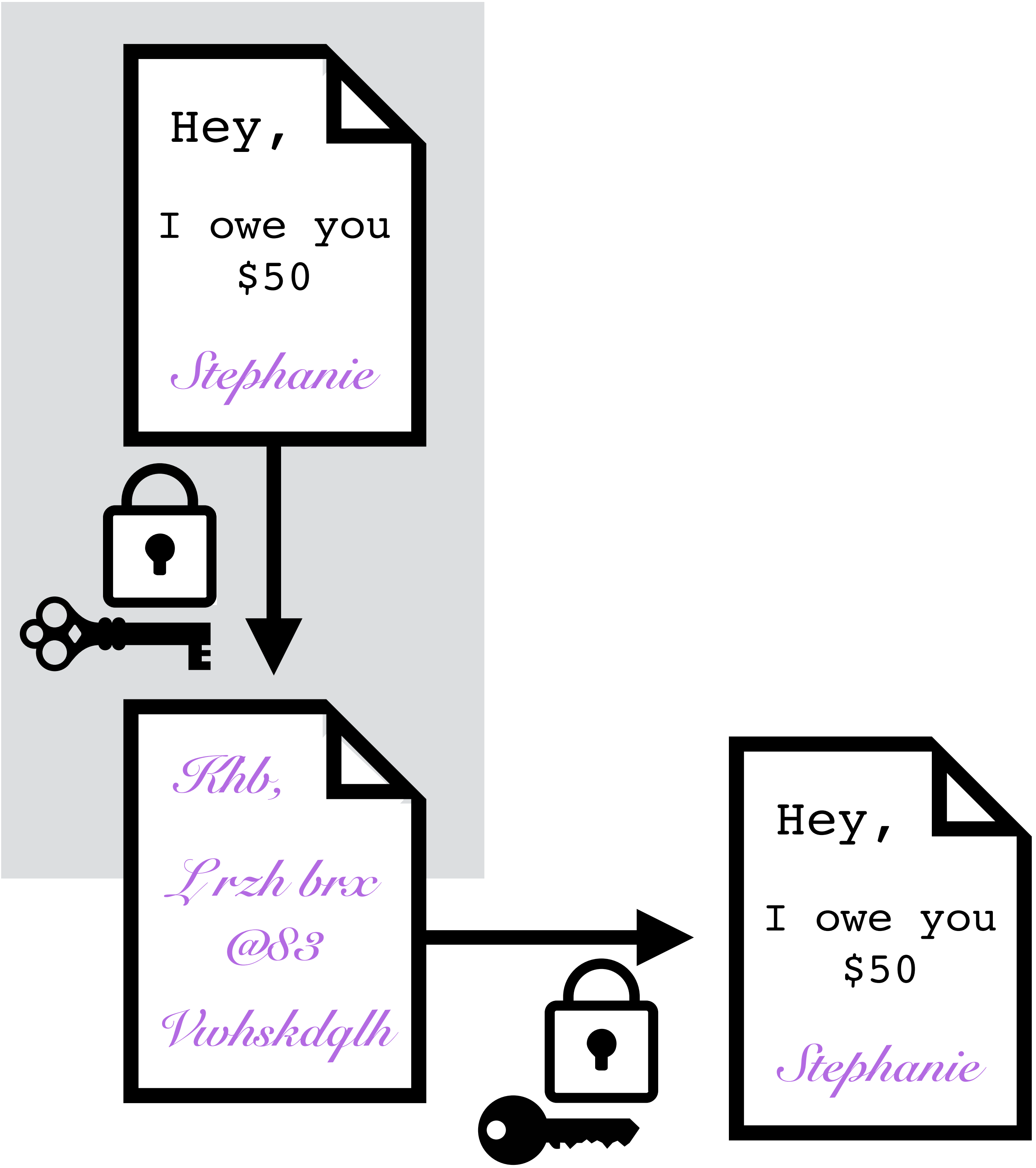
A message encrypted with my private key was encrypted by me.



signing a message

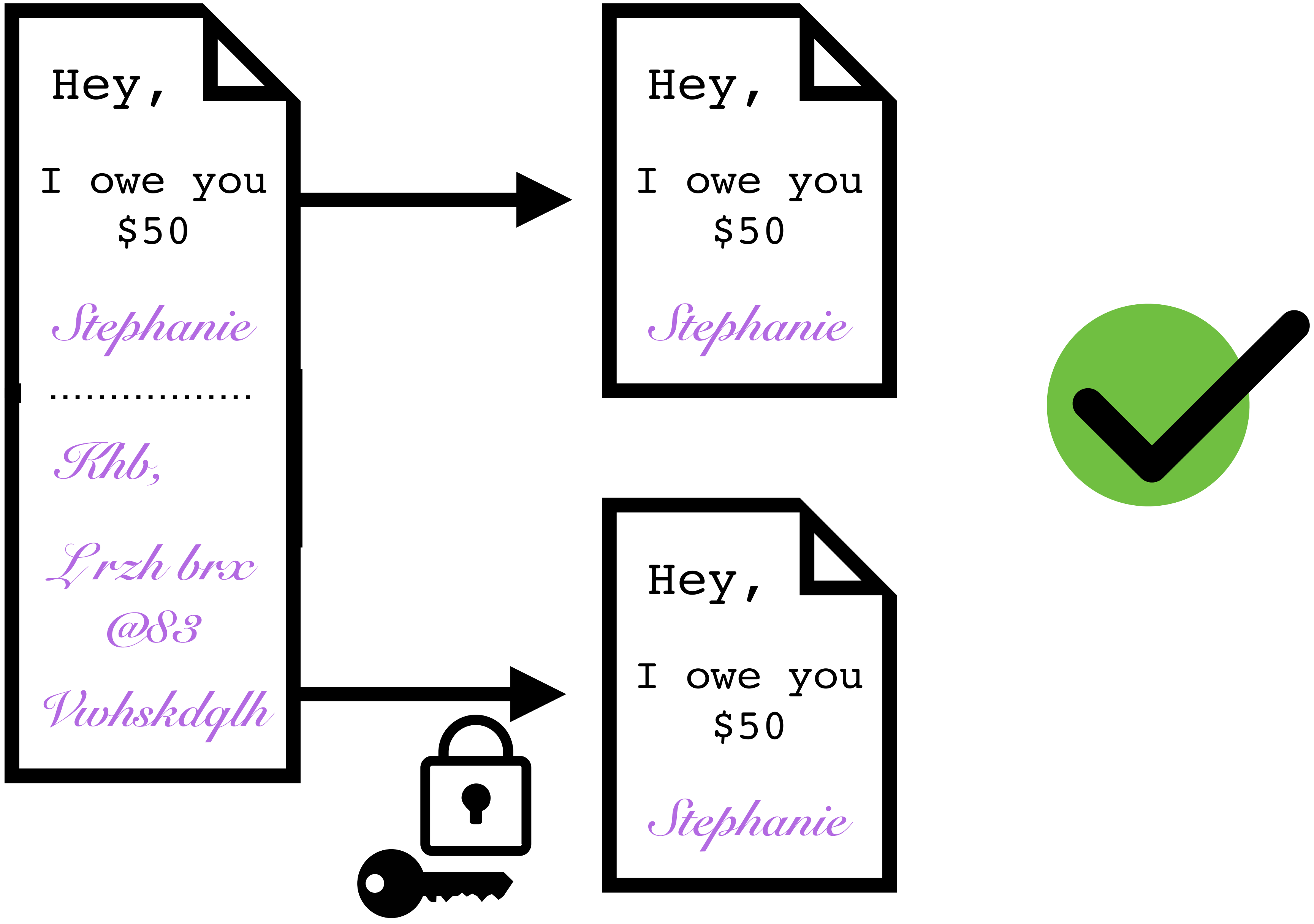
To prove a message was encrypted with my private key…

Decrypt it with my public key!

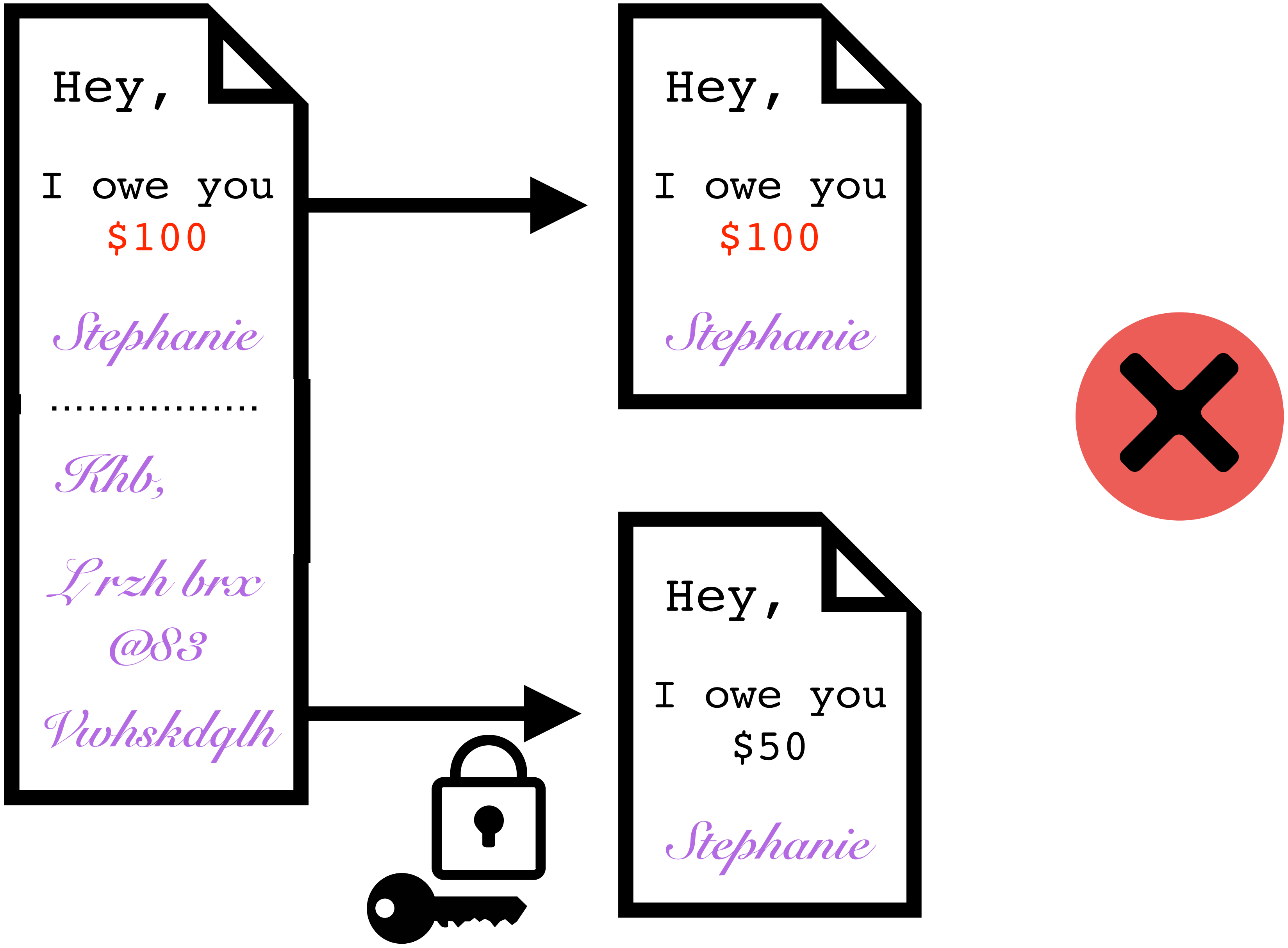


(public key cryptography is cool like that)

checking integrity



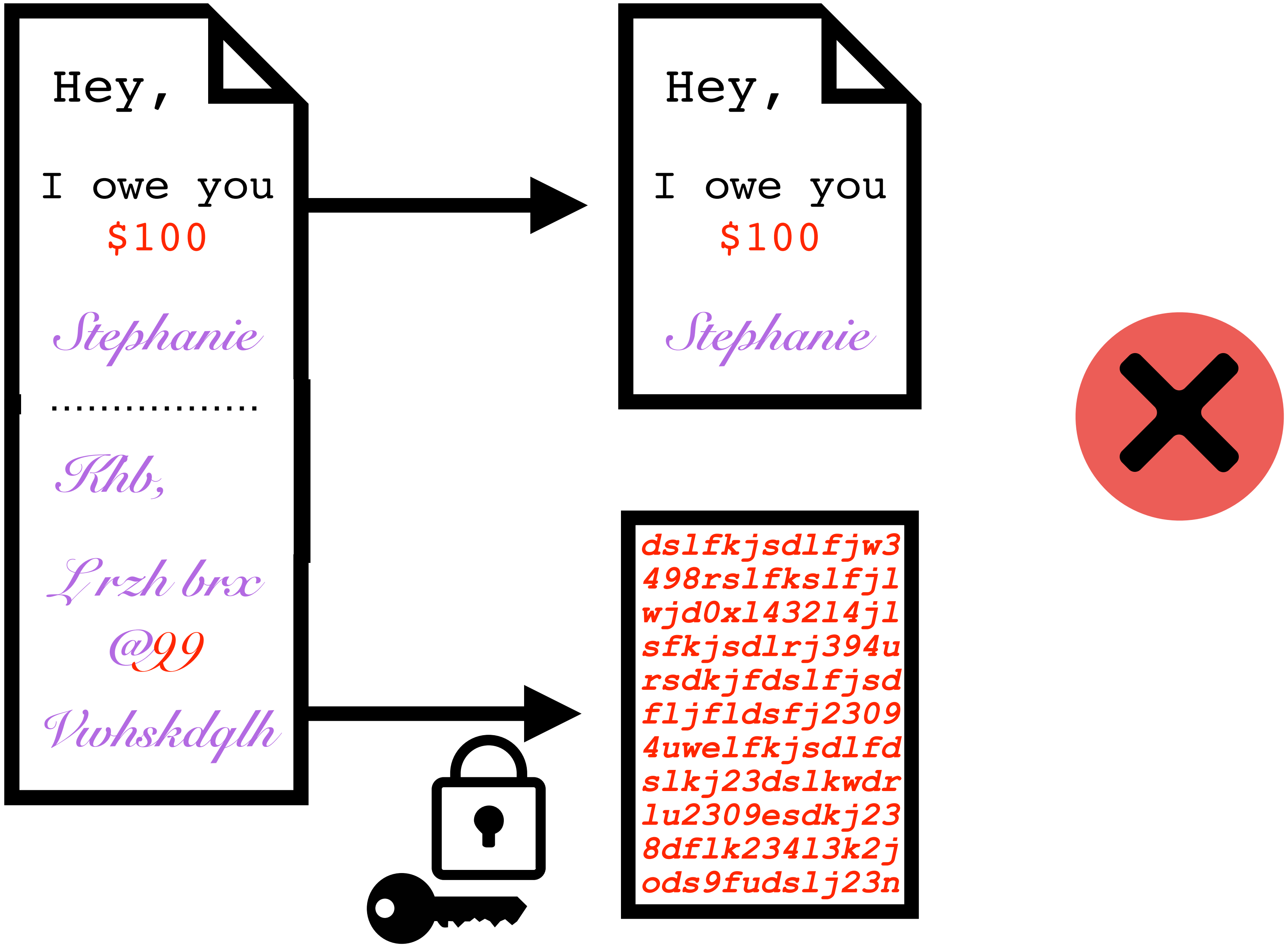
checking integrity



without my private key, this cannot be meaningfully modified

checking integrity

trying to change the ciphertext results in garbage



Hey,

I owe you $100

Stephanie

Khb,

Lrzh brx @99

Vwhskdqlh

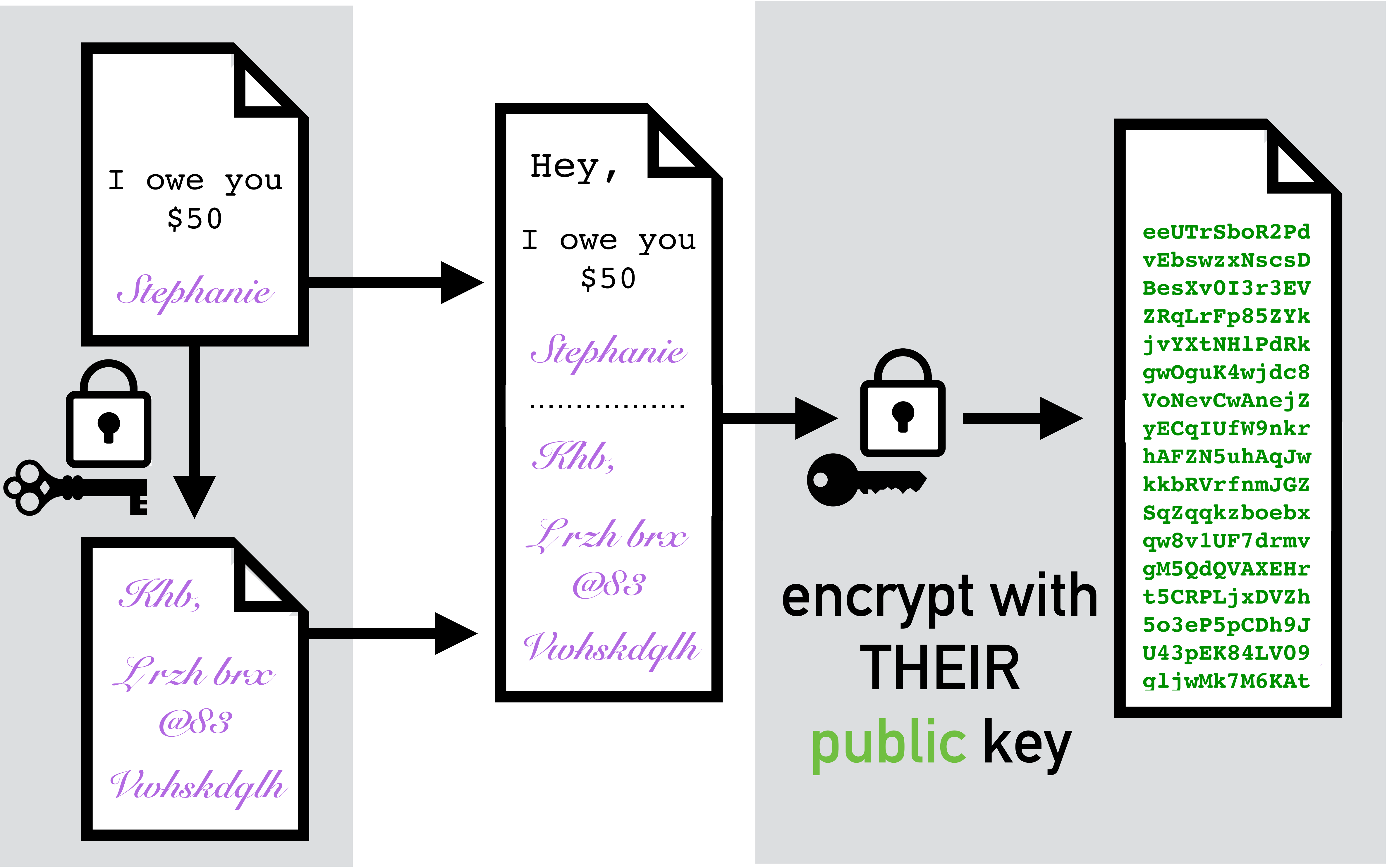
Hey,

I owe you $100

Stephanie

```
dslfkjsdlfjw3
498rslfkslfjl
wjd0xl43214jl
sfkjsdlrj394u
rsdkjfdslfjsd
fljfldsfj2309
4uwelfkjsdlfd
slkj23dslkwdr
lu2309esdkj23
8dflk23413k2j
ods9fudslj23n
```

signing with encryption



encrypt with
THEIR
public key

sign with MY private key

overview of key usage

	private	public
encryption	decrypt a message encrypted with the corresponding public key	encrypt a message that can be decrypted by the corresponding private key
authentication (+ free integrity check)	assert ownership/ authorship of a message	verify ownership of a message signed by the corresponding private key

overview of key usage

	private	public
encryption	I use my private key	I use their public key
authentication (+ free integrity check)	I use my private key	I use their public key

PGP gives us

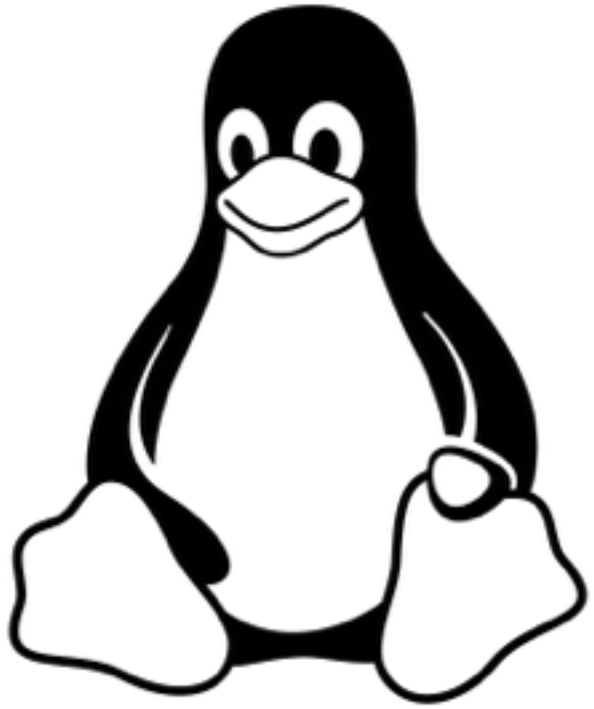
confidentiality & authenticity integrity

by using

encryption & signatures

(now we understand its awesomeness)

getting & using PGP



Mozilla Thunderbird

+ ENIGMAIL

Apple Mail

+

GPGTools

Outlook

+

GPG4WiN

many options :)

(https://en.wikipedia.org/wiki/Comparison_of_email_clients#General_features)

Mozilla
Thunderbird

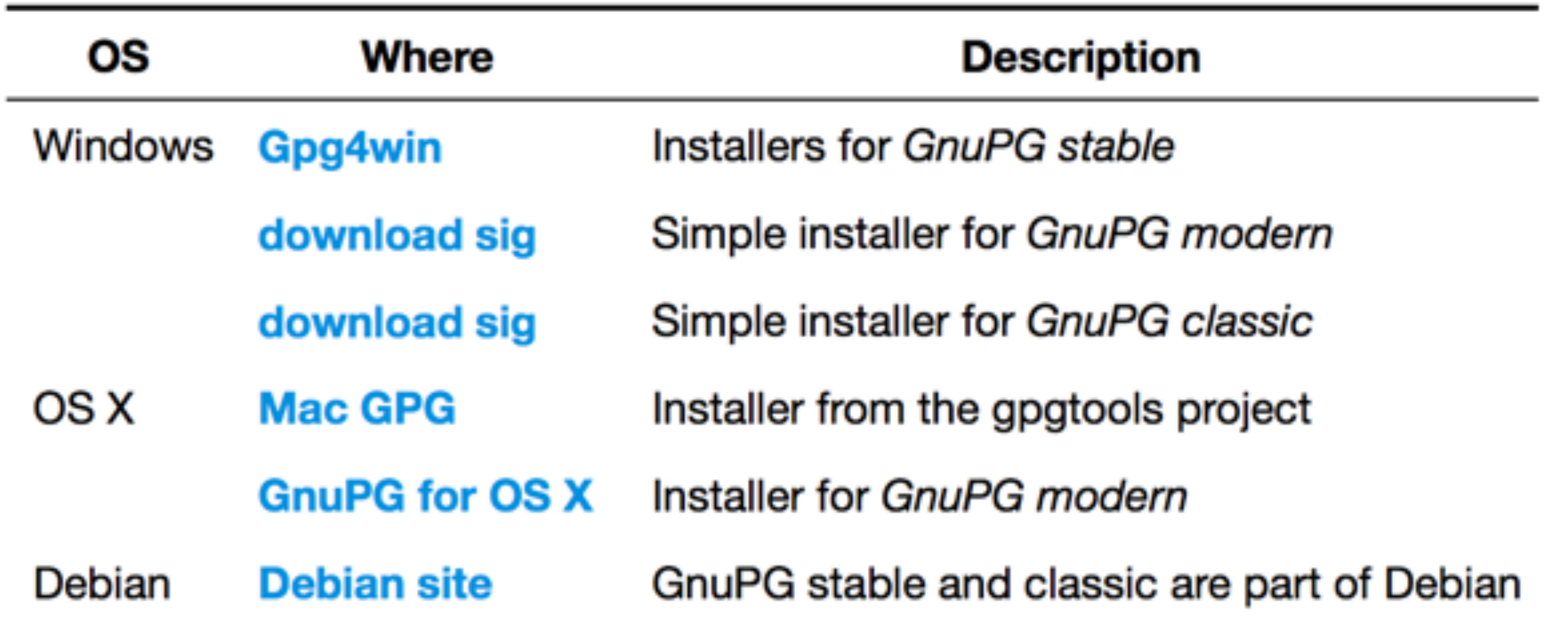
+ ENIGMAIL

Step 0: Get GNU Privacy Guard

(also known as GPG)

GnuPG

This step is platform-specific…

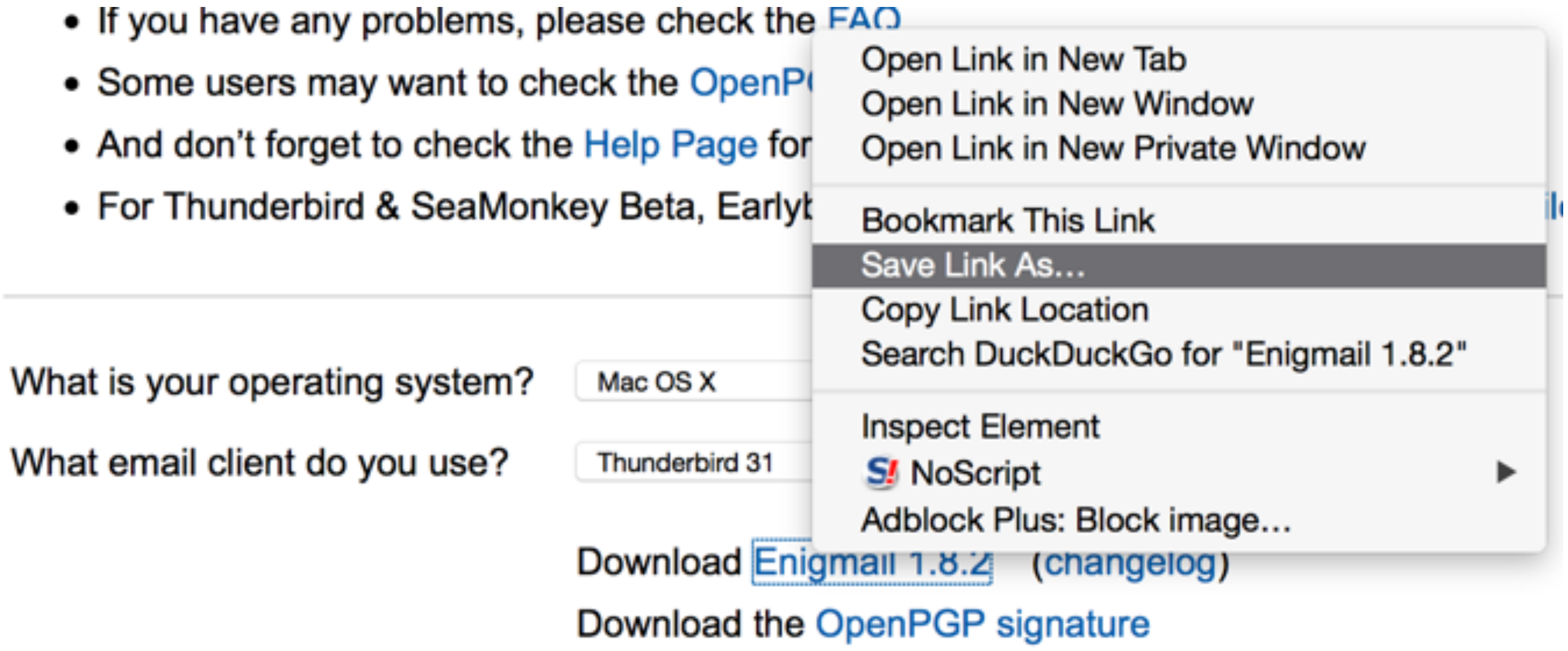


OS	Where	Description
Windows	Gpg4win	Installers for *GnuPG stable*
	download sig	Simple installer for *GnuPG modern*
	download sig	Simple installer for *GnuPG classic*
OS X	Mac GPG	Installer from the gpgtools project
	GnuPG for OS X	Installer for *GnuPG modern*
Debian	Debian site	GnuPG stable and classic are part of Debian

https://www.gnupg.org/download/

Mozilla Thunderbird + ENIGMAIL

Step 1: Download Enigmail



- If you have any problems, please check the FAQ
- Some users may want to check the OpenP
- And don't forget to check the Help Page for
- For Thunderbird & SeaMonkey Beta, Earlyb

What is your operating system? Mac OS X

What email client do you use? Thunderbird 31

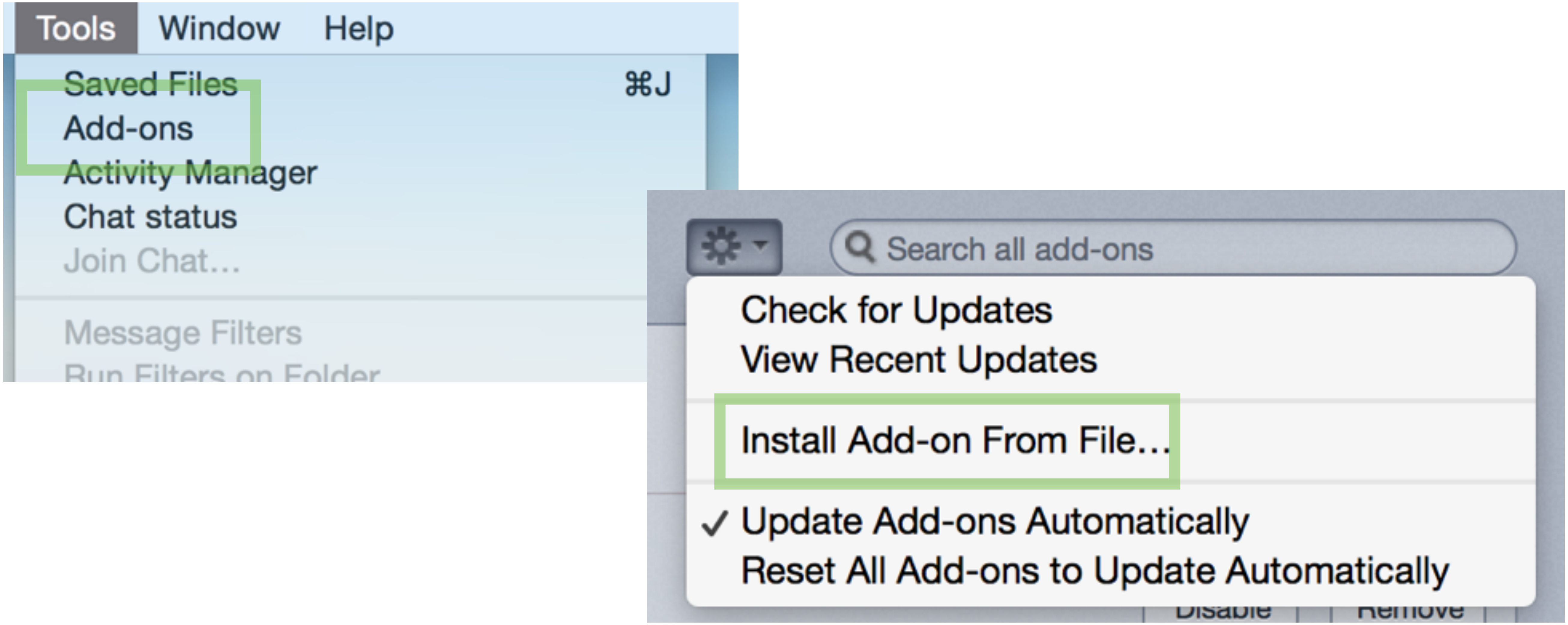
Download Enigmail 1.8.2 (changelog)

Download the OpenPGP signature

https://www.enigmail.net/download/

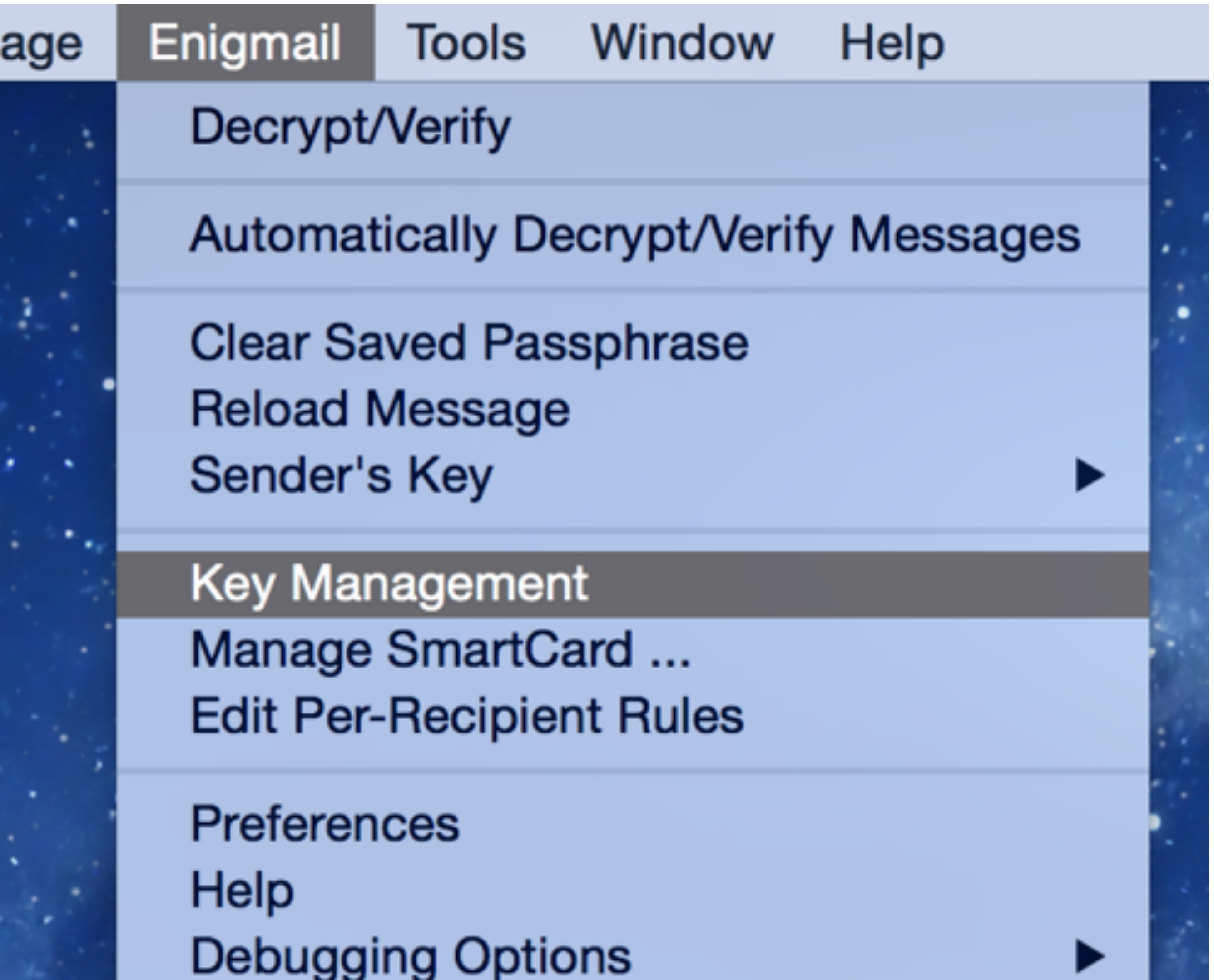
Mozilla Thunderbird + ENIGMAIL

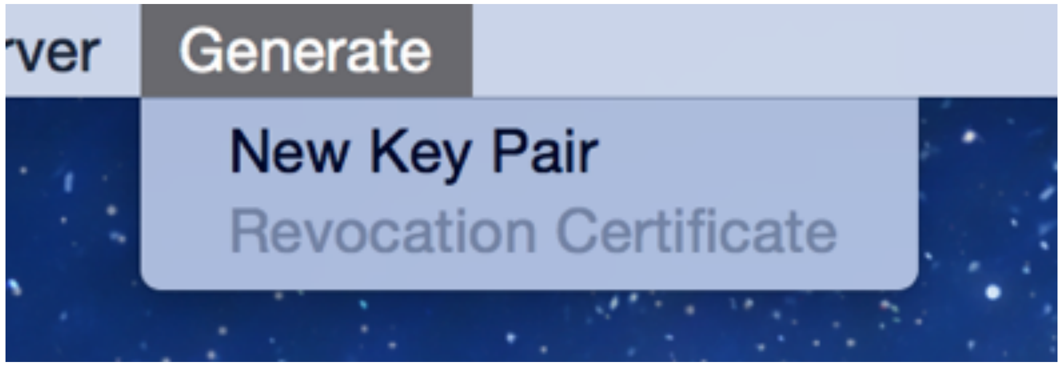
Step 1.5: Add Enigmail to Thunderbird



Mozilla Thunderbird + ENIGMAIL

Step 2: Create a key pair using Enigmail





private key
public key

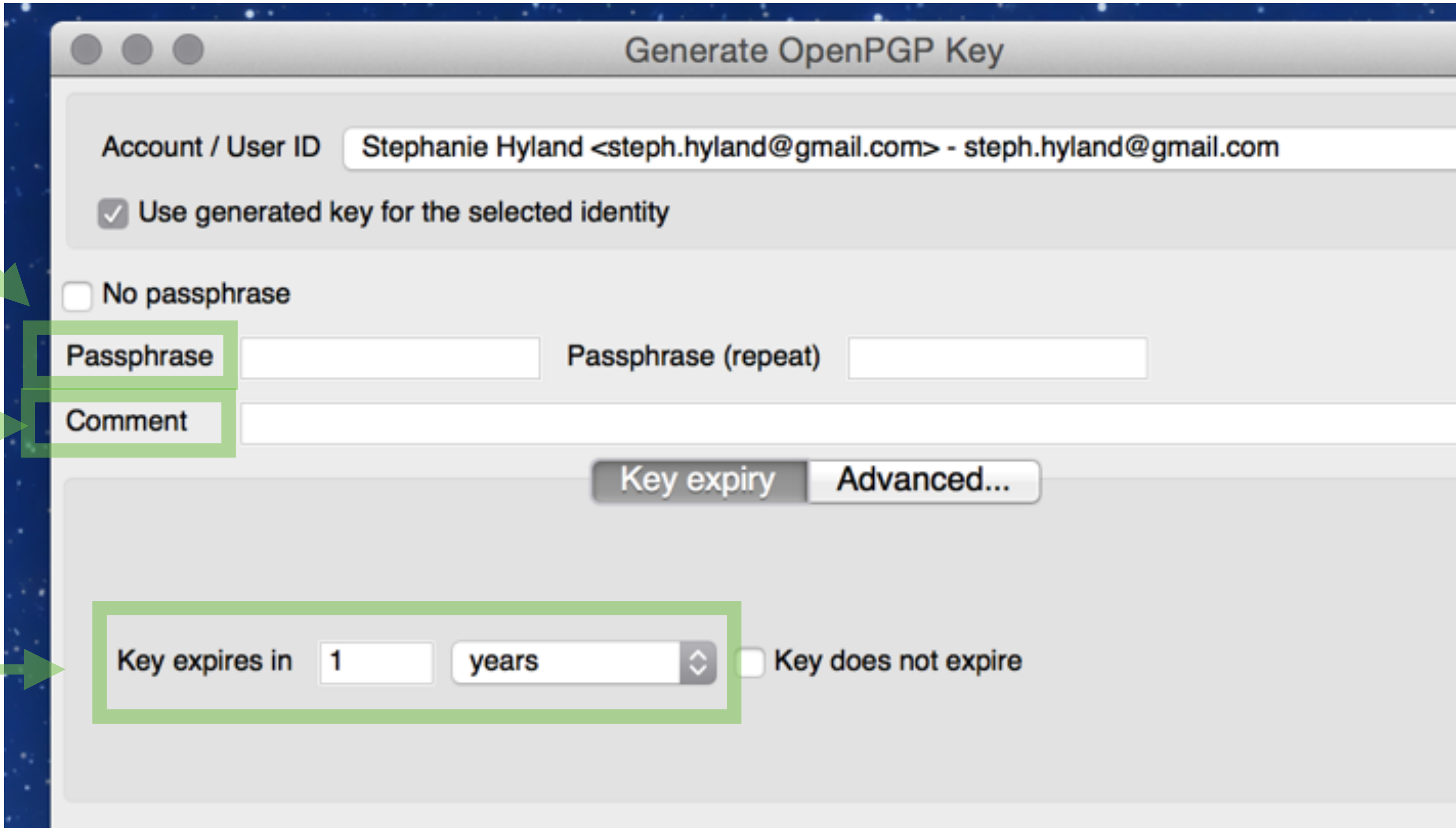
Mozilla Thunderbird + ENIGMAIL

Step 2: Create a key pair using Enigmail

a nonsense sentence is a good passphrase

no comment required

1 year is a good expiration time



Generate OpenPGP Key

Account / User ID: Stephanie Hyland <steph.hyland@gmail.com> - steph.hyland@gmail.com

☑ Use generated key for the selected identity

□ No passphrase

Passphrase:
Passphrase (repeat):

Comment:

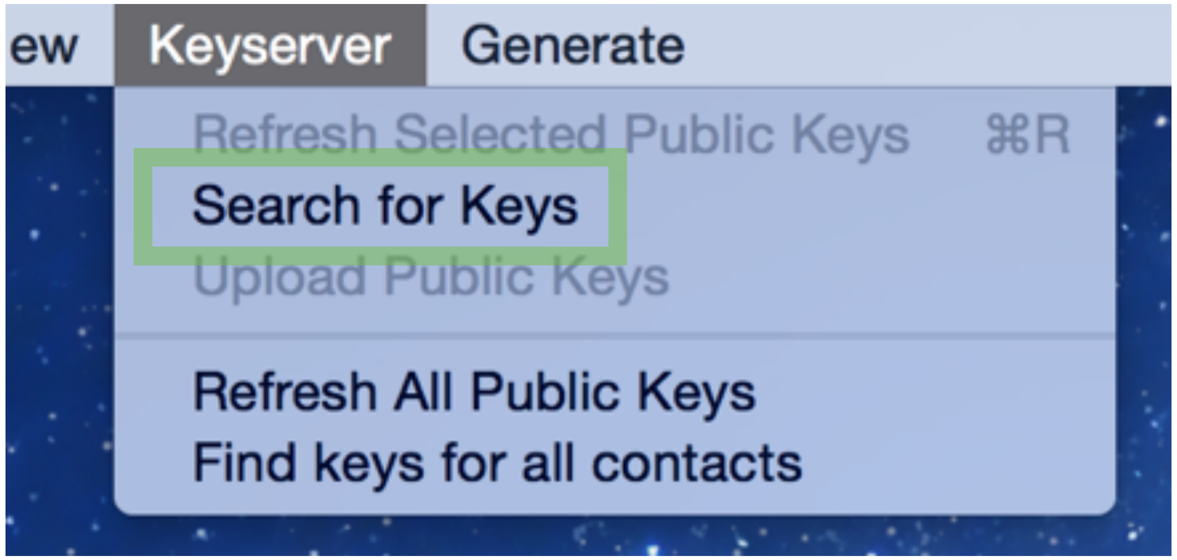
Key expires in: 1 years

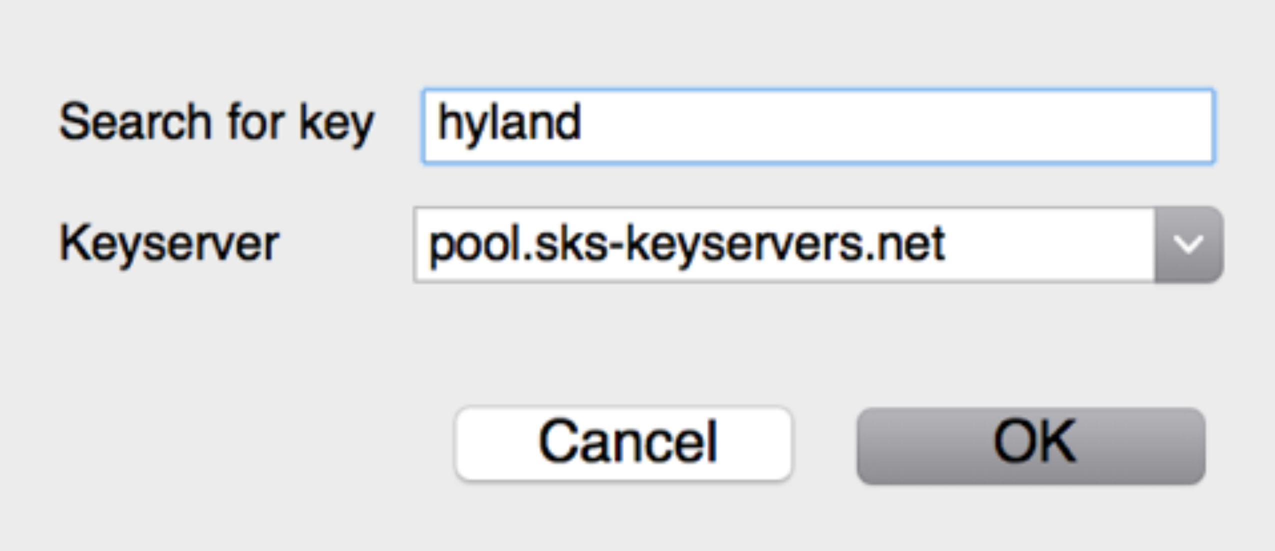
□ Key does not expire

Mozilla Thunderbird + ENIGMAIL

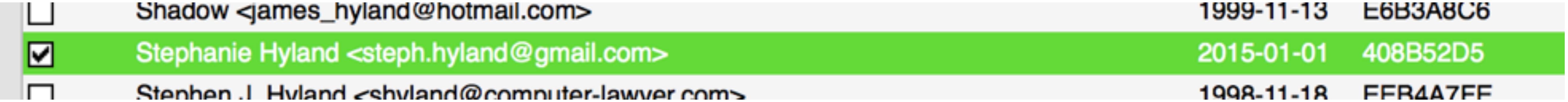
Step 3: Import someone else's public key.

(warning: make sure it's the right key!)




Search for key: hyland

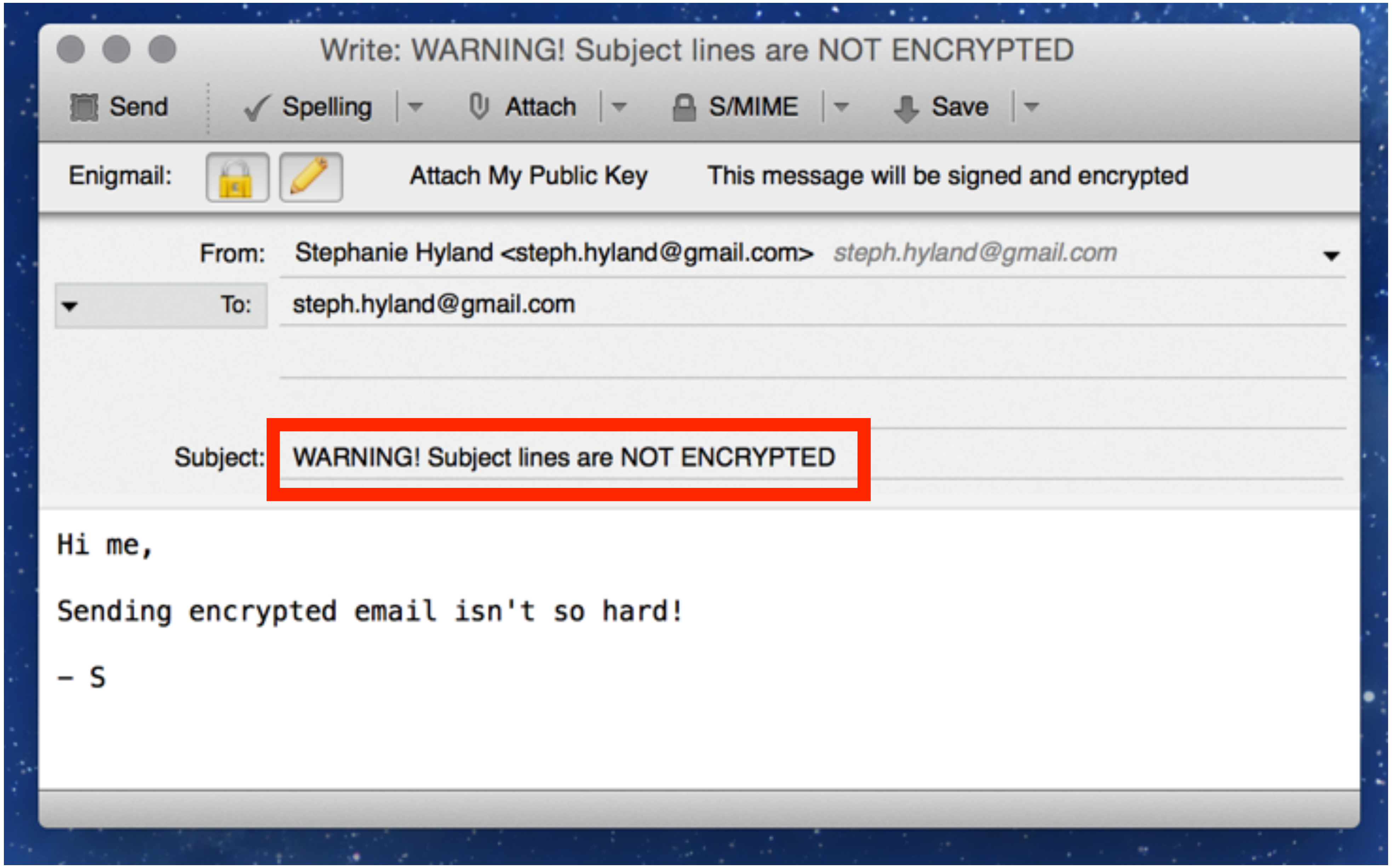
Keyserver: pool.sks-keyservers.net



☐	Shadow <james_hyland@hotmail.com>	1999-11-13	E6B3A8C6
☑	Stephanie Hyland <steph.hyland@gmail.com>	2015-01-01	408B52D5
☐	Stephen J. Hyland <shyland@computer-lawyer.com>	1998-11-18	EEB4A7EE

Mozilla Thunderbird + ENIGMAIL

Step 4: Send an encrypted email.



Write: WARNING! Subject lines are NOT ENCRYPTED

This message will be signed and encrypted

From: Stephanie Hyland <steph.hyland@gmail.com> *steph.hyland@gmail.com*

To: steph.hyland@gmail.com

Subject: WARNING! Subject lines are NOT ENCRYPTED

```
Hi me,

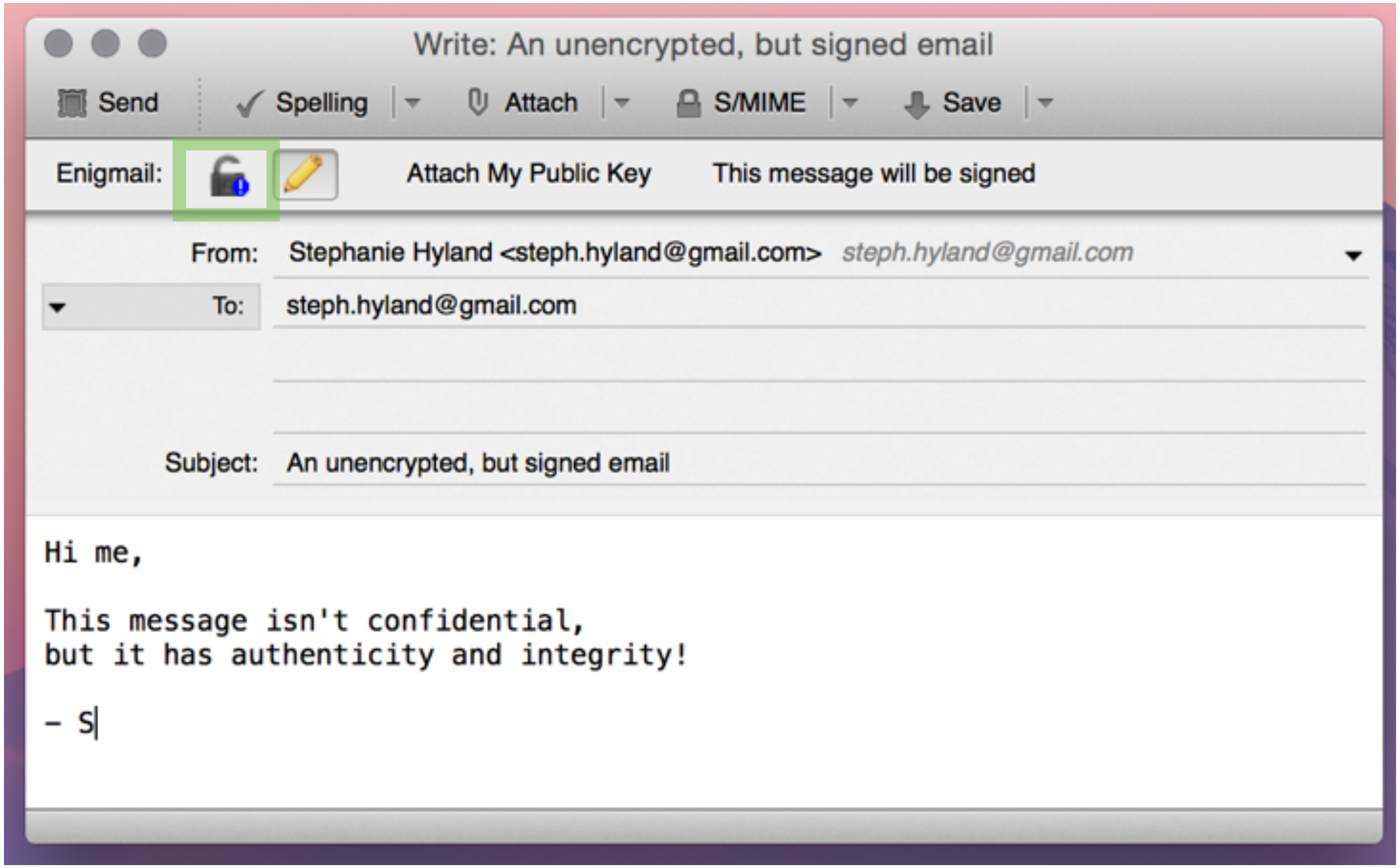
Sending encrypted email isn't so hard!

- S
```

encrypted emails
are always
signed

Mozilla Thunderbird + ENIGMAIL

Bonus: Send an unencrypted, signed email.



Write: An unencrypted, but signed email

This message will be signed

From: Stephanie Hyland <steph.hyland@gmail.com> steph.hyland@gmail.com

To: steph.hyland@gmail.com

Subject: An unencrypted, but signed email

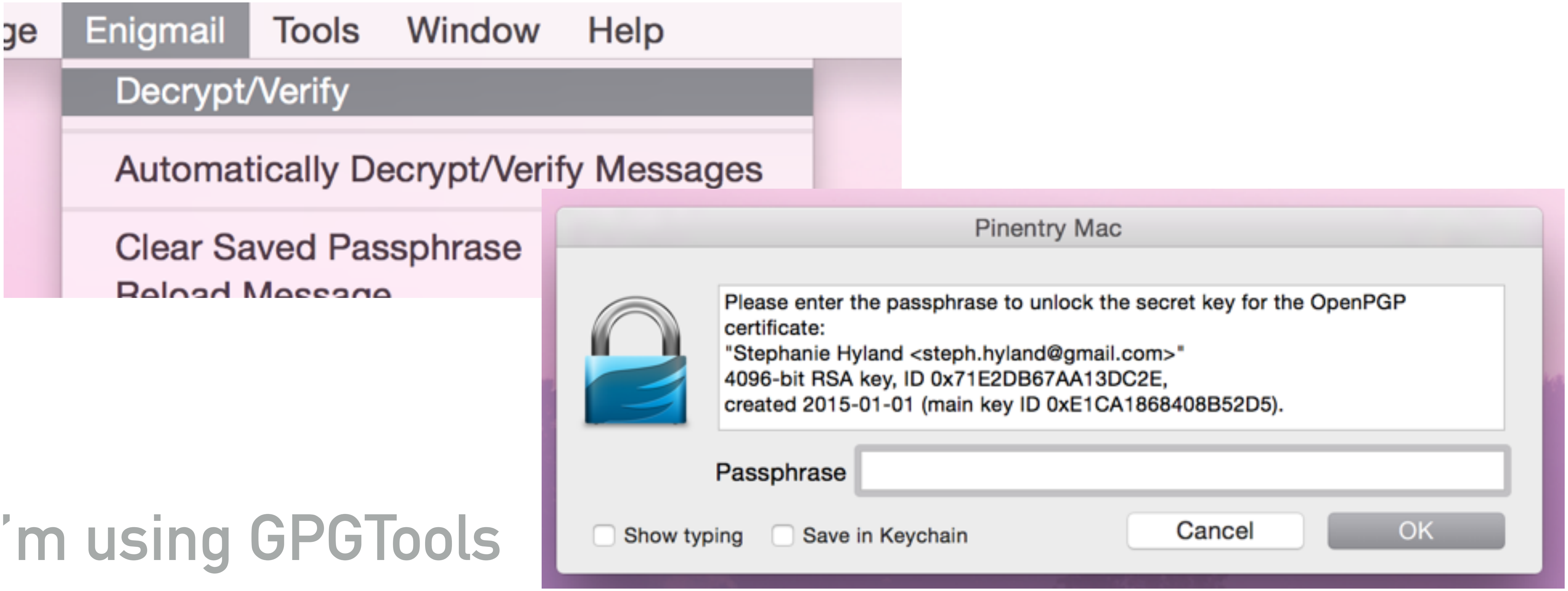
```
Hi me,

This message isn't confidential,
but it has authenticity and integrity!

- S
```

Mozilla Thunderbird + ENIGMAIL

Step 5: Decrypt an email.



Pinentry Mac

Please enter the passphrase to unlock the secret key for the OpenPGP certificate:
"Stephanie Hyland <steph.hyland@gmail.com>"
4096-bit RSA key, ID 0x71E2DB67AA13DC2E,
created 2015-01-01 (main key ID 0xE1CA1868408B52D5).

Passphrase

□ Show typing □ Save in Keychain

I'm using GPGTools

in summary…

do you PGP?

Yes!

@corcra
Stephanie Hyland
4/27/15, CryptoHarlem