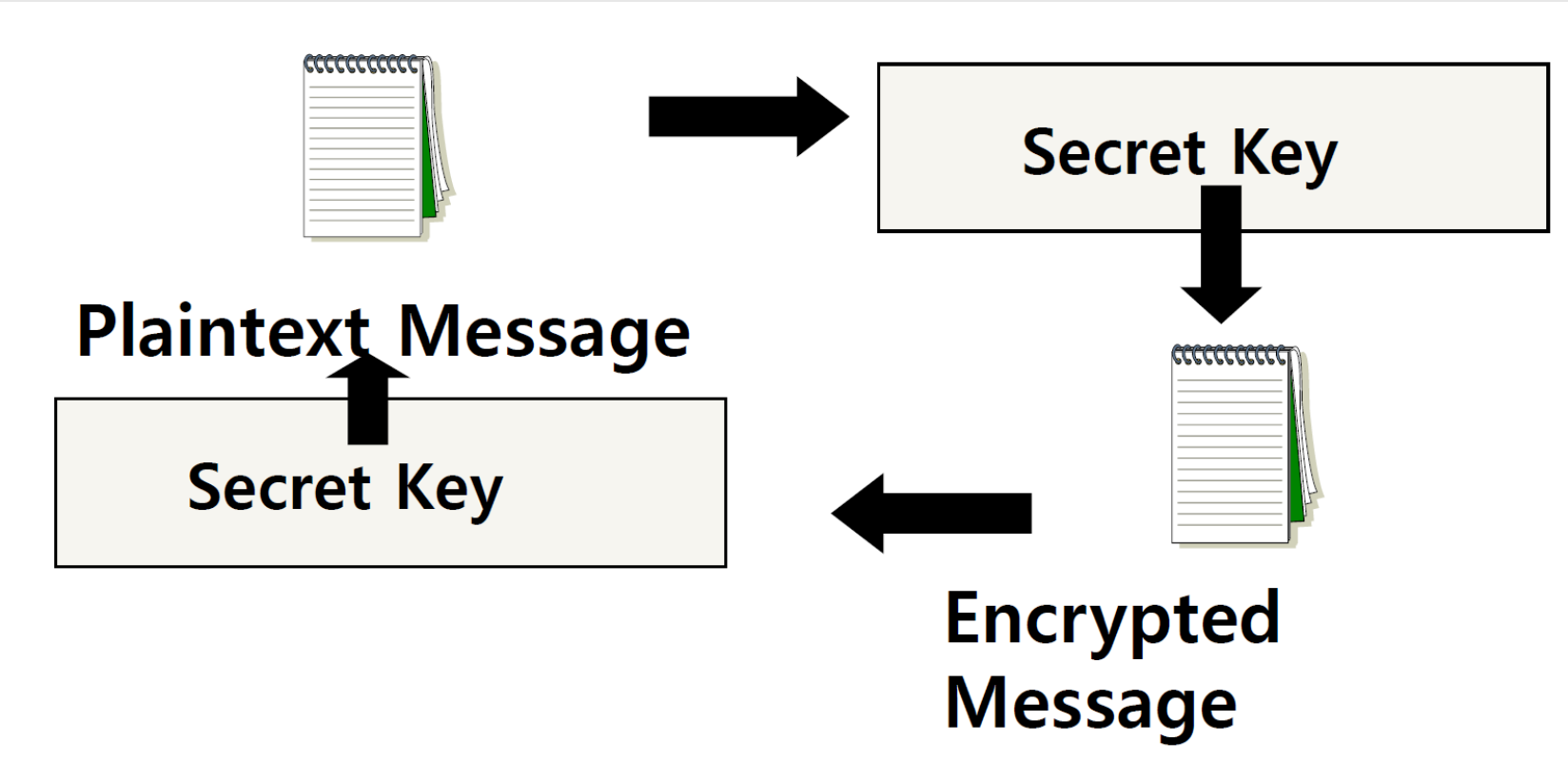
CS35L – Spring 2019

Slide set:	8.2
Slide topics:	Digital Signatures
Assignment:	8

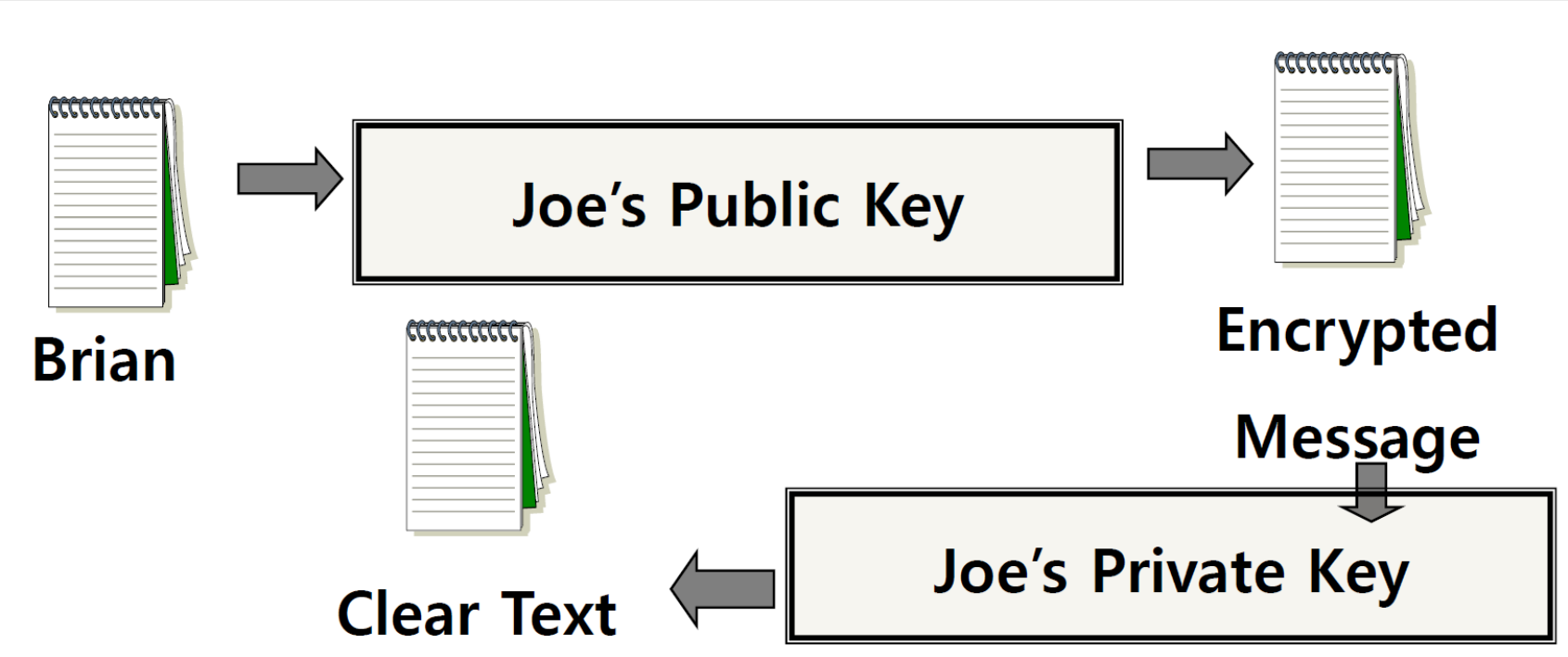
Secret Key (symmetric) Cryptography

A single key is used to both encrypt and decrypt a message



Public Key (asymmetric) Cryptography

Two keys are used: a public and a private key. If a message is encrypted with one key, it has to be decrypted with the other.



Digital Signature

An electronic stamp or seal

- almost exactly like a written signature, except more guarantees
- Is appended to a document
- Or sent separately (detached signature)

Ensures data integrity

- document was not changed during transmission

Steps for Generating a Digital Signature

SENDER:

1) Generate a *Message Digest*
   - The message digest is generated using a set of hashing algorithms
   - A message digest is a 'summary' of the message we are going to transmit
   - Even the slightest change in the message produces a different digest
2) Create a Digital Signature
   - The message digest is encrypted using the sender's *private* key. The resulting encrypted message digest is the *digital signature*
3) Attach digital signature to message and send to receiver

Steps for Generating a Digital Signature

RECEIVER:

1) Recover the *Message Digest*
   - Decrypt the digital signature using the sender's public key to obtain the message digest generated by the sender

2) Generate the Message Digest
   - Use the same message digest algorithm used by the sender to generate a message digest of the received message

3) Compare digests (the one sent by the sender as a digital signature, and the one generated by the receiver)
   - If they are not *exactly the same* => the message has been tampered with by a third party
   - We can be sure that the digital signature was sent by the sender (and not by a malicious user) because *only* the sender's public key can decrypt the digital signature and that public key is proven to be the sender's through the certificate.
   - If decrypting using the public key renders a faulty message digest, this means that either the message or the message digest are not exactly what the sender sent.

Digital Signature

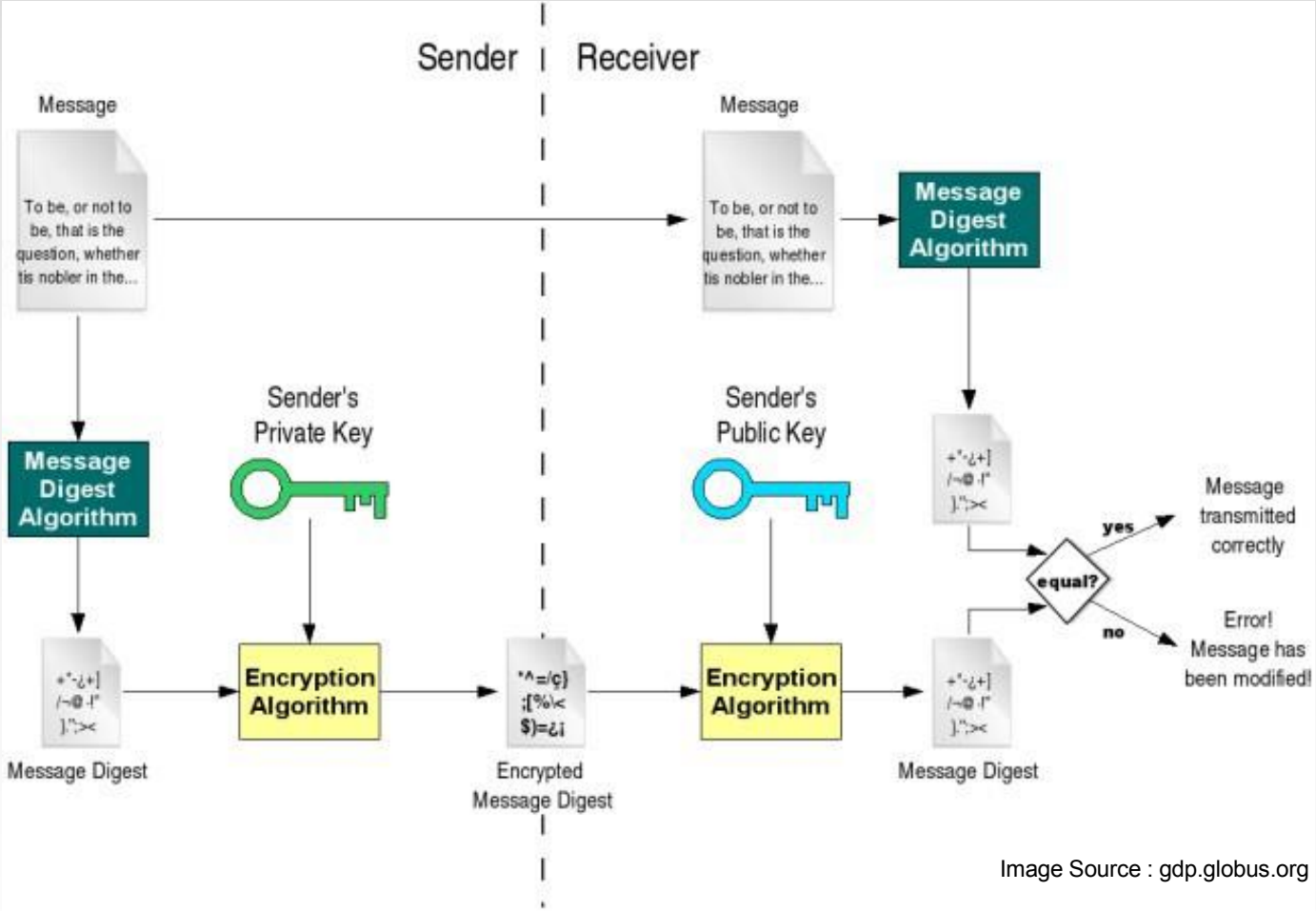


Image Source : gdp.globus.org

Detached Signature

- Digital signatures can either be *attached* to the message or *detached*
- A detached signature is stored and transmitted separately from the message it signs
- Commonly used to validate software distributed in compressed tar files
- You can't sign such a file internally without altering its contents, so the signature is created in a separate file

Homework 8

Answer 2 questions in the file `hw.txt`

A file `eeprom` that is a copy of the file `/sys/bus/i2c/devices/0-0050/eeprom` on your BeagleBone.

https://www.gnupg.org/gph/en/manual.html

Generate a key pair with the GNU Privacy Guard's commands (choose default options when prompted)

Export public key, in ASCII format, into `hw-pubkey.asc`

Use the private key you created to make a detached clear signature `eeprom.sig` for `eeprom`

Use given commands to verify signature and file formatting

- These can be found at the end of the assignment spec