

Assignment 1 report By Sean Stephen

Necessary Information to run the program

Additional packages other than pycryptodome (Crypto): base64 (for encoding and decoding into correct format), glob (for searching for files with search patterns) and os (for creating a directory to store the output)

Additional requirements to run the program: a1.py needs to be placed in a folder with text files that are intended to be encrypted and subsequently decrypted. After executing the program, no additional user input is needed as all functions act in sequence to fulfil all requirements.

Expected Outcomes

Output Files : 2x Public and Private RSA key pairs for sender and receiver, 1x name.namelist file that stores all names of the original files that were encrypted, 1x ivfile.iv that stores the initialisation vector for the AES cipher in plaintext, 1x symkey.key and 1x symkey_encrypted.key which is the AES symmetric key and its encrypted version after public key encryption with the receiver's public key, and all encrypted text files (*.txt.enc) and the text files after encryption (*.txt).

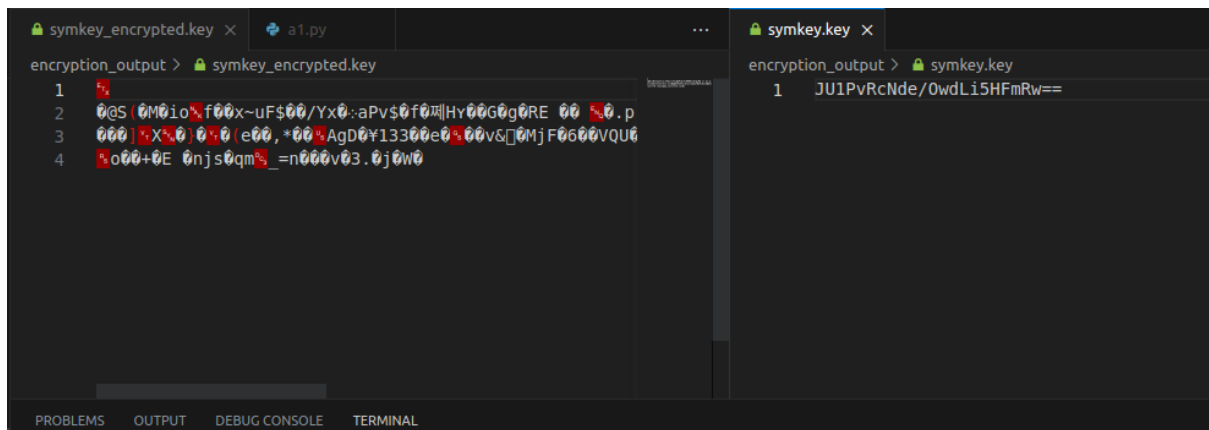
Output in terminal: Step by step description of which functions are being called.

Output Screenshots:

Before Running Program:

```
File Edit Selection View Go Run Terminal Help
EXPLORER
TEST EXPLORER
LAB3
test
virus1
virus2
a1.py
lab3_copy.py
lab3_some_contents.py
lab3.py
oindoianwdoin.txt
pypy.txt
yppypy.txt
a1.py
1 import glob # for file reading
2
3 import os # for creating directory
4
5 # for symmetric encryption
6
7 from base64 import b64encode
8 from Crypto.Cipher import AES
9 from Crypto.Util.Padding import pad
10 from Crypto.Random import get_random_bytes
11
12 from base64 import b64decode
13 from Crypto.Util.Padding import unpad
14
15 # for public key encryption
16
17 from Crypto.PublicKey import RSA
18 from Crypto.Cipher import PKCS1_OAEP
19
20
21 # create directory to store all outputs of the encryption
22
23 path = "./encryption_output"
24
25 if not os.path.exists(path):
26     os.mkdir(path)
27 else:
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```

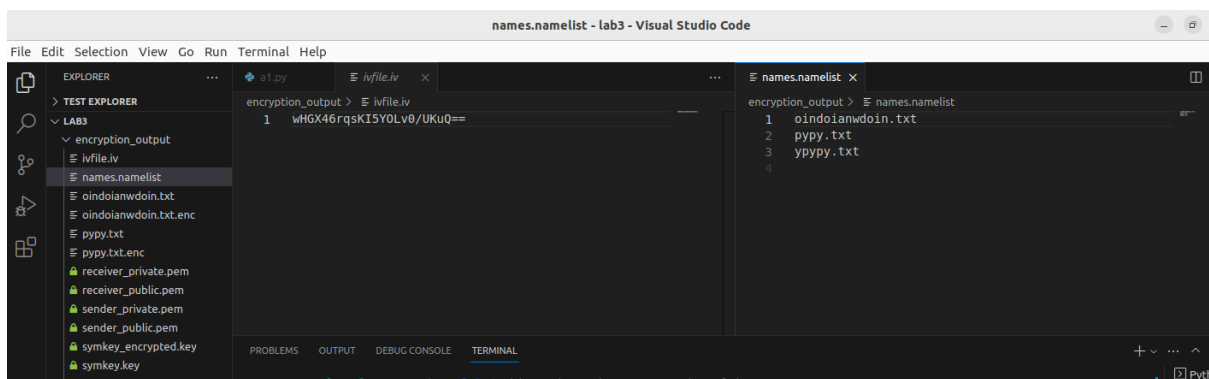
Symmetric Keys (encrypted and unencrypted)



```
symkey_encrypted.key x a1.py
encryption_output > symkey_encrypted.key
1 0@S(0M0io%f00x~uF$00/Yx0:aPv$0f0叫Hy00G0g0RE 00 %0.p
2 000)%X%00(e00,*00%AgD0¥13300e000vS[]0mjF0600VQU0
3 000+0E 0njs0qm$=n000v03.0j0w0
4

symkey.key x
encryption_output > symkey.key
1 JU1PvRcNde/0wdLi5HFmRw==
```

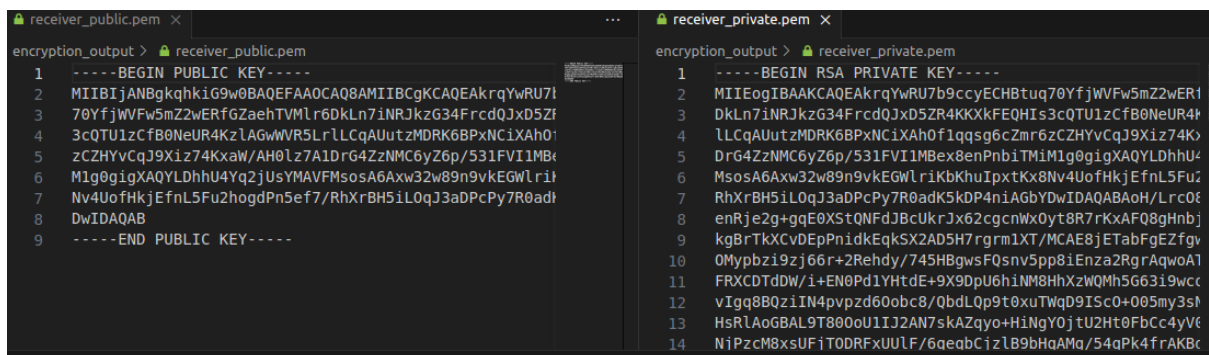
IV and Namelist



```
names.namelist - lab3 - Visual Studio Code
File Edit Selection View Go Run Terminal Help
EXPLORER
TEST EXPLORER
LAB3
  encryption_output
  ivfile.iv
  names.namelist
  oindoiawdoin.txt
  oindoiawdoin.txt.enc
  pypy.txt
  pypy.txt.enc
  receiver_private.pem
  receiver_public.pem
  sender_private.pem
  sender_public.pem
  symkey_encrypted.key
  symkey.key
  symkey_decrypted.key

names.namelist x
encryption_output > names.namelist
1 oindoiawdoin.txt
2 pypy.txt
3 yypy.txt
4
```

Receiver Key Pair



```
receiver_public.pem x receiver_private.pem
encryption_output > receiver_public.pem
1 -----BEGIN PUBLIC KEY-----
2 MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAKrqYwRU7l
3 70YfjjwVfW5mZ2wERfGZaehTVMLr6DkLn7iNRJkzG34FrcdQJxD5Zf
4 3cQTU1zCfB0NeUR4KzLAGwWVR5LrLLCqAUutzMDRK6BPxNCiXAh0i
5 zCHYvCqJ9XiZ74KxaW/AH0lz7A1DrG4ZzNMC6yZ6p/531FVI1MB:
6 M1g0gigXAQYLDhhu4Yq2jUsYMAVFMsosA6Axw32w89n9vkEGwLri:
7 Nv4UofHkjEfnL5Fu2hogdPn5ef7/RhXrBH5iL0qJ3aDPcPy7R0ad:
8 DwIDAQAB
9 -----END PUBLIC KEY-----

receiver_private.pem x
encryption_output > receiver_private.pem
1 -----BEGIN RSA PRIVATE KEY-----
2 MIIEogIBAAKCAQEAKrqYwRU7b9ccyECHBtuq70YfjjwVfW5mZ2wERf
3 DkLn7iNRJkzG34FrcdQJxD5ZR4KKXkFEQHIs3cQTU1zCfB0NeUR4K
4 lLCqAUutzMDRK6BPxNCiXAh0f1qqsg6cZmr6zCHYvCqJ9XiZ74K
5 DrG4ZzNMC6yZ6p/531FVI1MBx8enPnbiTmiM1g0gigXAQYLDhhu4
6 MsosA6Axw32w89n9vkEGwLriKbKhuIpxtKx8Nv4UofHkjEfnL5Fu:
7 RhXrBH5iL0qJ3aDPcPy7R0adK5kDP4niAGbYDwIDAQABAoH/Lrc0f
8 enRje2g+ggE0XStQNFDJBcUkrJx62cgcNwX0yt8R7rKxAFQ8gHnbj
9 kgBrTkXcVDEpPnidkEqkSX2AD5H7rgm1XT/MCAE8jETabFgEZfgv
10 0MyPbzi9zj66r+2Rehdy/745HBgwsFQsnv5pp8iEnza2RgrAqwoA1
11 FRXCDTDW/i+EN0Pd1YHtdE+9X9DpU6hiNM8HhXzWQMh5G63i9wcc
12 vIqg8B0ziIN4pvpzd60obc8/QbdLQp9t0xuTWqD9ISc0+005my3st
13 HsRlAoGBAL9T800ouI1J2AN7skaZqyo+HiNgY0jtU2Ht0FbCc4yV6
14 NiPzcM8xsUFiT0DRFxUULF/6aeabCijzLB9bHqAma/54qPk4frAKBc
```

Sender Key Pair

```
File Edit Selection View Go Run Terminal Help

EXPLORER
LAB3
  encryption_output
  ivfile.iv
  names.namelist
  oindoianwdoin.txt
  oindoianwdoin.txt.enc
  pypy.txt
  pypy.txt.enc
  receiver_private.pem
  receiver_public.pem
  sender_private.pem
  sender_public.pem
  symkey_encrypted.key
  symkey.key
  yppy.txt
  yppy.txt.enc
  test
  virus1
  virus2

sender_private.pem x sender_private.pem
encryption_output > sender_private.pem
1 \ PRIVATE KEY-----
2 JEA0TocogjxLrRZ8zYh0Aq2xj4aDSVo0iHySfvDCargremSjew
3 >FB435Y0AB6zcOwL8vRa505H8HoeYRI4rG6cldZJFLUpvrbiv
4 JemesTbZwQgN7ck6btulpr/uc/6G+F/EorsWw5CLuVLcCHHW5xJ
5 JEP50GULXPWpKYpho5/8TyS9XoN3dE++ZPmwJ3QZPPTJexA2K+Q
6 nkQ1Nm37kgxwSvIGZdegHfG1ztm+81Y6gVhp2x7ZJiUjpdC+nv3
7 JYosPnx+oMvCLqY53r6w2sowIDAQABAoH/K1qXN4X59LXdLBBB
8 <0lpRztq9d6BzzSv7616VlhbJwc0ApGgh9m1QIUerFmAw2La0J
9 lHuTp8TnzaJ68T08rL7ph0dGX50u6b94H0F40zKLLBAmnYXWnnL
10 jm0QunN6pLPZLFw4bVkiD4J9QJ0kwhGg+hi0jnuxKk8ldQE3S
11 7Ea7b6SE/BcAWuUchUgrL6m93zTGCLsRkRaql6mr0vjvHE17Mn
12 4DhL95Qc/pAn0T7c+CzmPkfLWFw3TG5d6sTj3UZf8N3Y5M0fL
13 JitvptPz4KwDR1kiIs9zQ+5/LcRmVLG+Ny7YSAUXWAtHbJG6XK
14 FvYY+FX8msn5ompo1SH4QPBNIq/Bi9JNeNvSRdYm+v45JMKw5

sender_public.pem x sender_public.pem
encryption_output > sender_public.pem
1 -----BEGIN PUBLIC KEY-----
2 MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEA0Tocogj>
3 2xj4aDSVo0iHySfvDCargremSjew0pJPMiyuK9i4sPfB435Y0AB6>
4 H8H0oeYRI4rG6cldZJFLUpvrbiv2P11BciUmI+q9emesTbZwQg>
5 uC/6G+F/EorsWw5CLuVLcCHHW5xJ2APW847mqK+K9EPS0GULXPW>
6 9XoN3dE++ZPmwJ3QZPPTJexA2K+QAJz9FvJ0MBGZmkQ1Nm37kgx>
7 1ztm+81Y6gVhp2x7ZJiUjpdC+nV3HSDy6sajNNDUvDYosPnx+oMv>
8 owIDAQAB
9 -----END PUBLIC KEY-----

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
sean@sean-VirtualBox:~/Desktop/lab3$ /bin/python3 /home/sean/Desktop/lab3/a1.py
Finding all .txt files in the directory...

Found target files. Created a list of all files. Encrypting with symmetric encryption now.

Generating key pairs for sender and receiver...
```

Text Files: Encrypted and Decrypted

```
EXPLORER
LAB3
  encryption_output
  ivfile.iv
  names.namelist
  oindoianwdoin.txt
  oindoianwdoin.txt.enc
  pypy.txt
  pypy.txt.enc
  receiver_private.pem
  receiver_public.pem
  symkey_encrypted.key
  symkey.key
  yppy.txt
  yppy.txt.enc
  test
  virus1
  virus2

oindoianwdoin.txt x oindoianwdoin.txt
encryption_output > oindoianwdoin.txt
1 Scripts.com
2 Bee Movie
3 By Jerry Seinfeld
4
5 NARRATOR:
6 (Black screen with text; The sound of buzzing bees )
7 According to all known laws
8 of aviation,
9 :
10 there is no way a bee
11 should be able to fly.
12 :

oindoianwdoin.txt.x oindoianwdoin.txt.x
encryption_output > oindoianwdoin.txt.x
1 +B9qbWAK9YrAttu0sfdJ606uMQuB5efbL6UED1zVF10VSD5Yd
2 1uIg8WNlxbtEcaw/
3 FxyvCiWw0gtwDQkXpzjsZmcbpTi7sK0ekTNvKmxsATHboq2Qs
4 egzoh+tkg9o/ZLxs1pm58TVF08Z2dYfkUq518ylqKbNSmAf7n
5 tKXW0Ezpf0ASCjDwUq2z+CGRELp8Gg6ExY04UadZc1LSujkgp
6 +DVhAqhi/n38oJ4VGKK/cn6KpnezUcTffSCjvXn21JtLfh2Nb
7 +C/0ZQTfVLtG4Zh0/
8 Ykicgm10Ty6CbAhEpGNNOCpXpymjS4bnA8Y2YarMTYQfQrfig
9 CLiF8Yvig3K/EeQa/
10 l7hbQ93HDLYNspDKivabHRRlC8kl0FBQanN2bZBX2dzXfXGNS
11 QnT9PPcFst0hBjmnUqfDL6d5NLJQKQTLVJL6xf0TL0wA9TSy
12 +p0c7hgt0/c0
```

```
Edit Selection View Go Run Terminal Help

EXPLORER
LAB3
  encryption_output
  ivfile.iv
  names.namelist
  oindoianwdoin.txt
  oindoianwdoin.txt.enc
  pypy.txt
  pypy.txt.enc
  receiver_private.pem
  receiver_public.pem
  symkey_encrypted.key
  symkey.key
  yppy.txt
  yppy.txt.enc
  test
  virus1
  virus2

pypy.txt x pypy.txt
encryption_output > pypy.txt
1 dada

pypy.txt.x pypy.txt.x
encryption_output > pypy.txt.x
1 jhrsCZzCuQvus24dsnc1zw==
```

```
Edit Selection View Go Run Terminal Help

EXPLORER
LAB3
  encryption_output
  ivfile.iv
  names.namelist
  oindoianwdoin.txt
  oindoianwdoin.txt.enc
  pypy.txt
  pypy.txt.enc
  receiver_private.pem
  receiver_public.pem
  symkey_encrypted.key
  symkey.key
  yppy.txt
  yppy.txt.enc
  test
  virus1
  virus2

yppy.txt.x yppy.txt.x
encryption_output > yppy.txt.x
1 D8u2G5uqz5I8ABXNB4NkF/LNc0px3deH5rTZ5WoleJ37RUGSI
2 +p5Kxh17pJ2P8S8Z35yta/gdqXRmoVh3jXk6/r8hvW0Cq0jSDE/
3 H0pVsUg3Jvcv69iVolnj+1mxllCCek2d50LR1b0Pue66jq0frx/
4 atQ8pjzXs1h+llRw70gkZqf3VLR03HWqQ
5 +QxAc3BdvXze5LZbR00/
6 3Tdho13hcr1RNcv88mus20bufNizVYR6tausC8ArACWuCRiQ2AW
7 0g5j2tLWXgGLBNb4oVENPNY57JoamRCUimOhcZWEktFKqoLx58y1
8 b/EuI6g8ZPa+dffhuxxBGJ9vTcEZvTWf5Rj1TD0p48kwhh
9 +YpryCF5k1jtIAZhI3wHydubU6xKxvr1qrIPTJN/
10 saZJDoZ3AGjq6629JdmakUQmaaH2377J2u0/
11 4veP8x1tYvftWEzAxf2krclB/00Wqi/
12 ryEiFTn0y1JAPE2EYjmh1c8NNczWANCwqQqNqrQHSzo0L159oZa
13 Vfkj/
14 ZCS7aKF88v80AEPBqKsT5pkuYucnTLCh04N030pCv8t3a5129fp
```

