A Powerful and Easy to Use Lockbox

Easy to use correctly, hard to use incorrectly

Lab7

Easy to Use Correctly: NaCl “box” concept

Remember

There is no 100% security

Security, like all engineering, involves tradeoffs

Know what you are trying to secure

The adversary…

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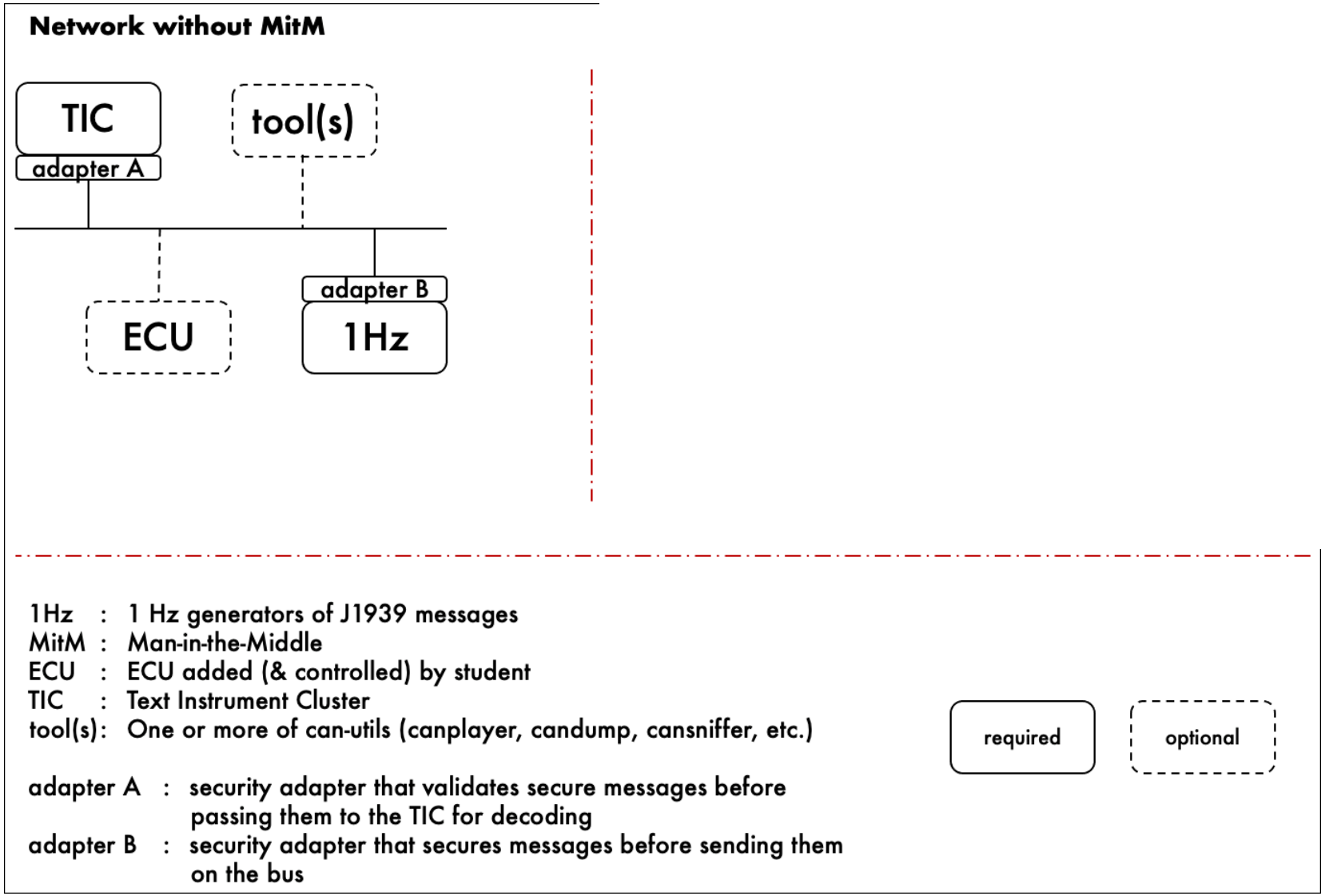
Network Configuration

Simple Network for this Lab



Notes

Complexity is the enemy of security.

- Bruce Schneier

TweetNaCl demonstrates a full library in 100 tweets.

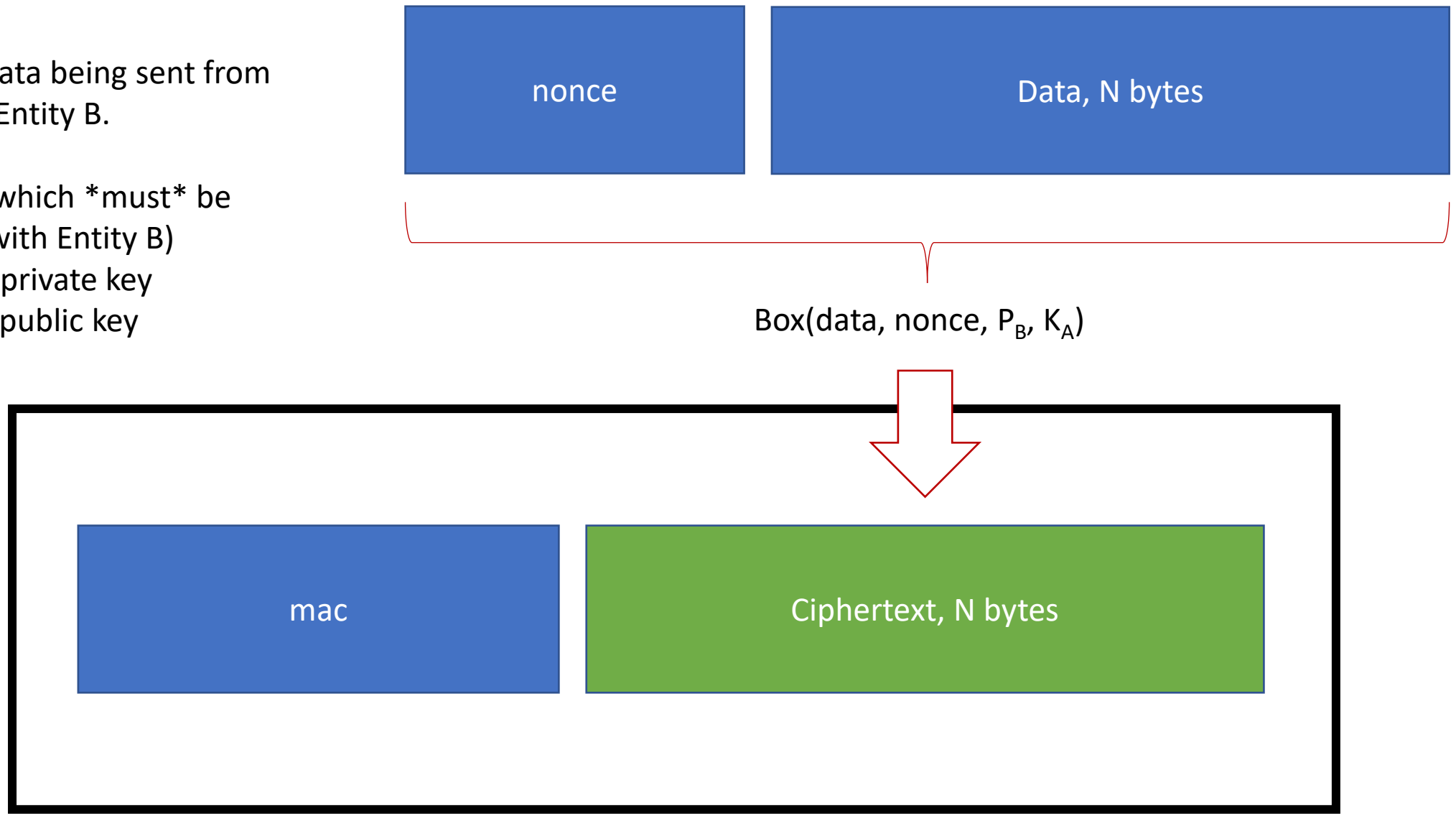
- All elliptic curve code
- All encryption and hashing code

NaCl – easy to use correctly, hard to use incorrectly

“Box”

To secure data being sent from Entity A to Entity B.

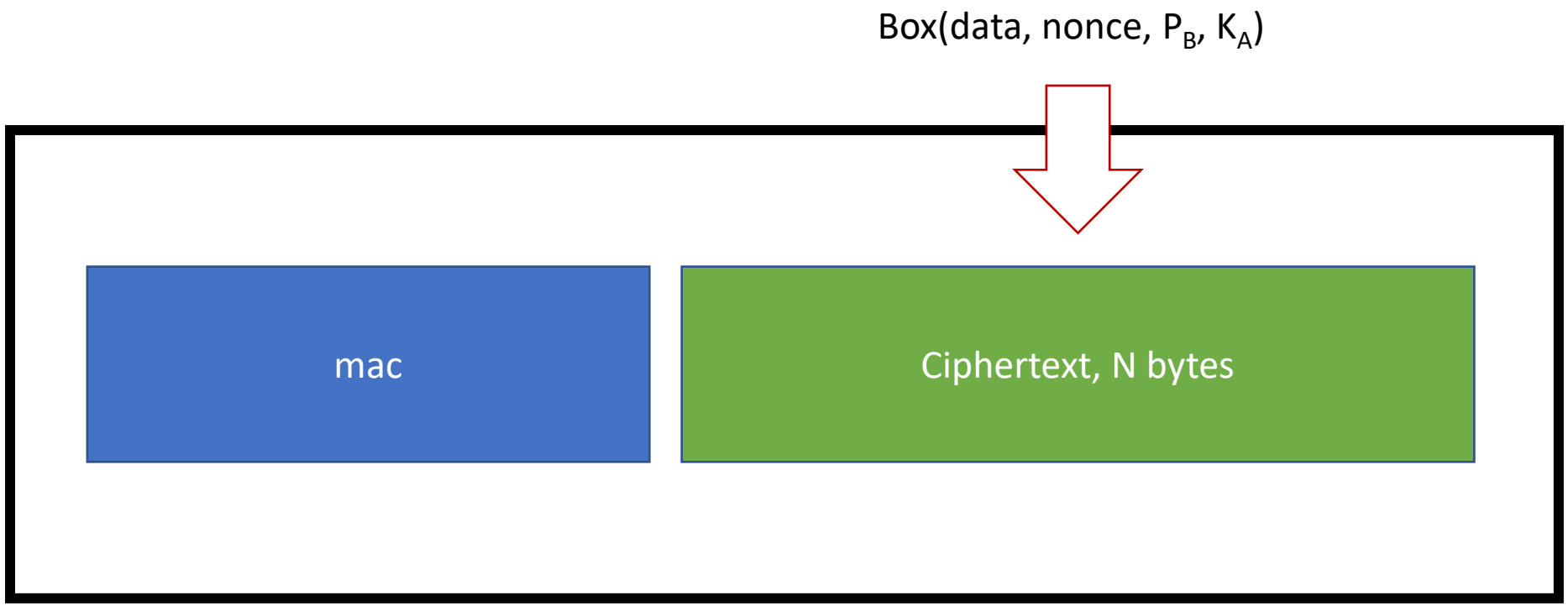
- Data
- Nonce (which *must* be shared with Entity B)
- Entity A private key
- Entity B public key



“Box”

To secure data being sent from Entity A to Entity B.

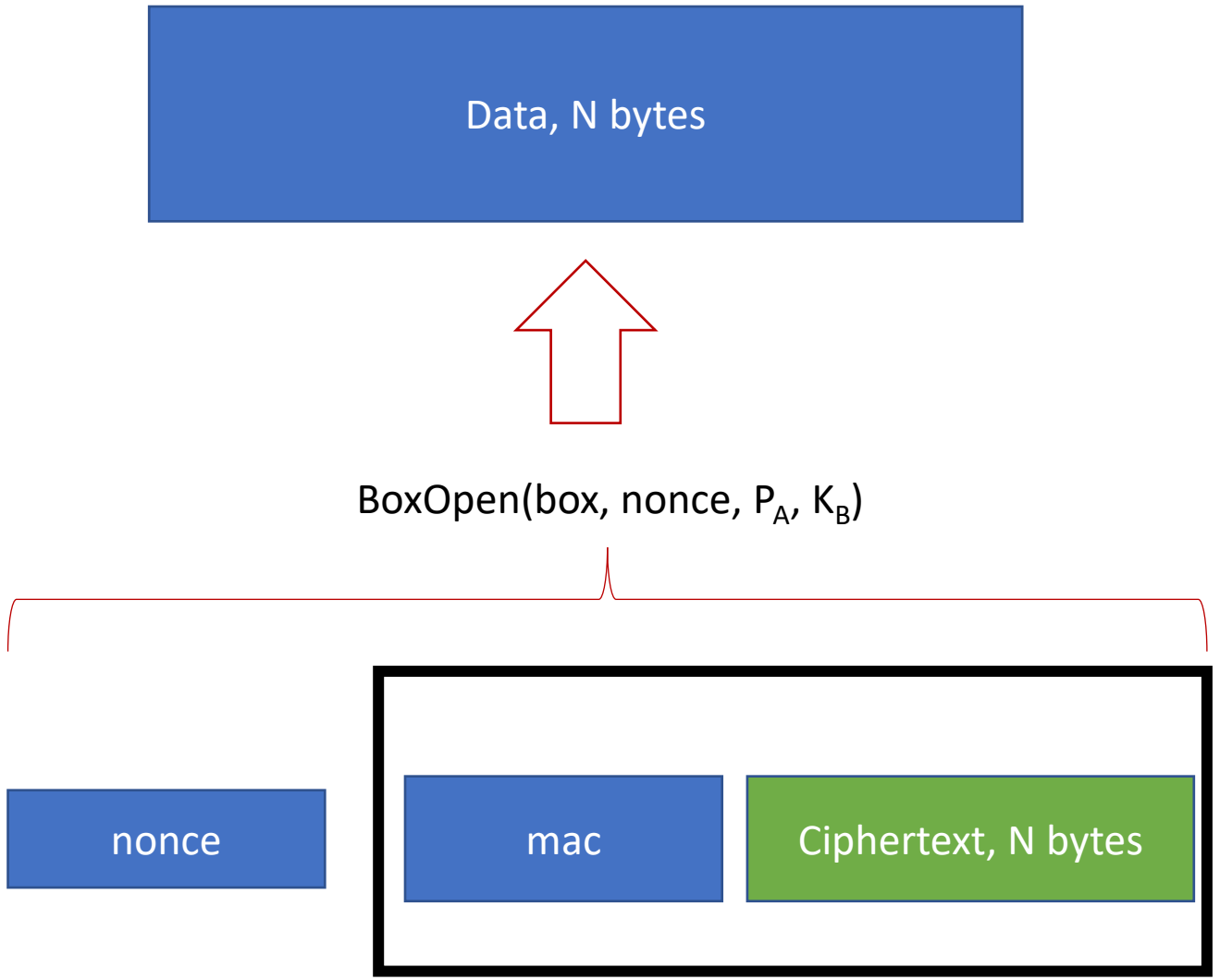
- Every time data is sent, a new nonce is required.



“BoxOpen”

To validate and decrypt data being sent from Entity A to Entity B.

- “box” (mac || ct)
- Nonce (which was provided by Entity A)
- Entity A public key
- Entity B private key



Notes

- Every library seems to label the functions a little differently
- In “TweetNaCl” the functions are very straightforward:
  - nacl.box()
  - nacl.boxopen()
- In python library it takes a couple of steps.

Notes

Used to put data into box and get it out.

```
> cat -n using_nacl.py
     1  #
     2  # reference:
     3  # https://pynacl.readthedocs.io/en/latest/public/#nacl-public-box
     4
     5  import nacl.utils
     6  from nacl.public import PrivateKey, Box
     7
     8  # notes on key naming
     9  # P/Kx  -- Public/Private keypair for entity x
    10  # Sx    -- Symmetric key for entity x
    11
    12  # Generate Bob's private key (!! keep this secret !!)
    13  Kb = PrivateKey.generate()
    14
    15  # Use the private key to create the public key -- this must be shared
    16  Pb = Kb.public_key
    17
    18  # Alice does the same thing
    19  Ka = PrivateKey.generate()
    20  Pa = Ka.public_key
    21
    22  # <here Alice and Bob exchange public keys>
    23
    24  # Bob wants to box some data for Alice;
    25  # He needs his private key and Alice's public key
    26  boxerBA = Box(Kb, Pa)
    27
```

Notes

‘encrypt’ puts data into box

‘decrypt’ unboxes the data

```
28  data = bytes.fromhex("00000000 11111111 22222222 33333333")
29  print("data to secure")
30  print(data.hex(" ", 4))
31
32  # the library automatically created a nonce for us.
33  # using boxerBA results in a box that is:
34  # mac || nonce || data   === 16 bytes || 24 bytes || len(data)
35  # so total length is 40 bytes longer than data
36  box = boxerBA.encrypt(data)
37
38
39  ### Alice is given the box, 'box', and needs to open it.
40
41  # create a box opener, she uses Bob's public key and her private key
42  boxopenerBA = Box(Ka, Pb)
43
44  # use the opener
45  pt = boxopenerBA.decrypt(box)
46
47  print("data received by Alice")
48  print(pt.hex(" ", 4))
```

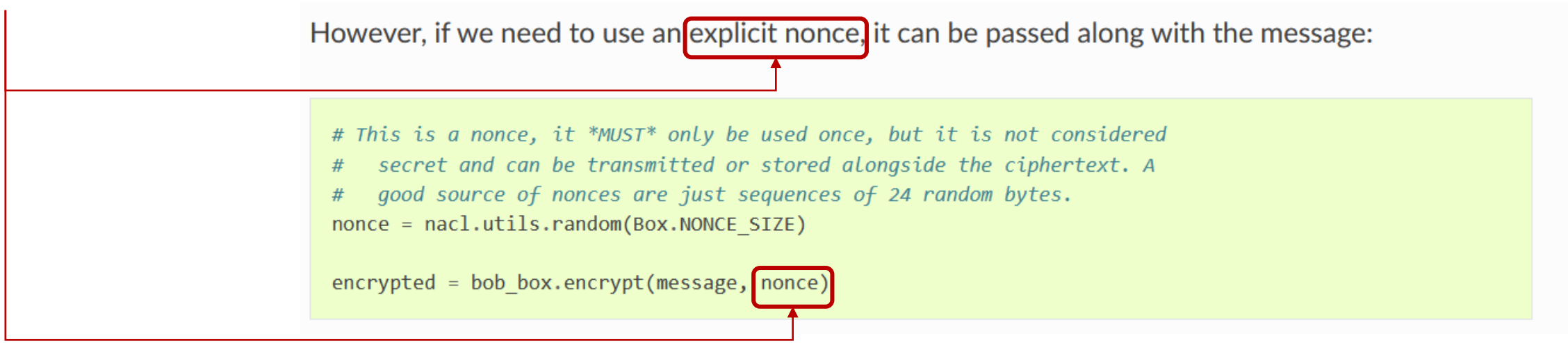
```
> python3 using_nacl.py
data to secure
00000000 11111111 22222222 33333333
data received by Alice
00000000 11111111 22222222 33333333
```

Lab

- The only code required is for:
  - adapterA.py
  - adapterB.py

Lab

nonce



https://pynacl.readthedocs.io/en/latest/public/#nacl-public-box