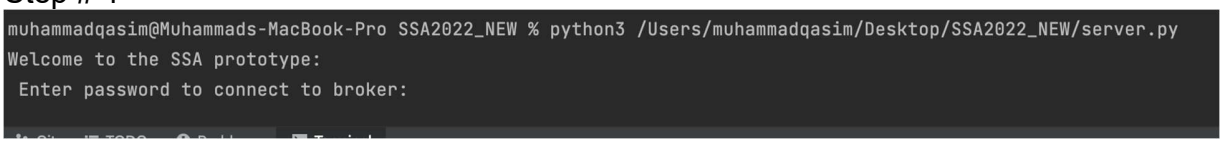
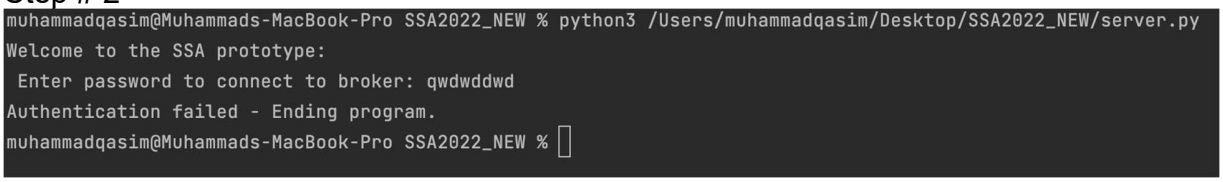
Test Cases

TEST SCENARIO 1: Server Authentication with Incorrect Password				**Test Case**: PASS
Step #	**Step Details**	**Expected Results**	**Actual Results**	**Pass / Fail / Not Executed / Suspended**
1	Run server.py	Welcome message appears and user is prompted for a password to connect to broker	As expected	Pass
2	Enter INCORRECT password	Authentication fails and program ends	As expected	Pass

Step # 1

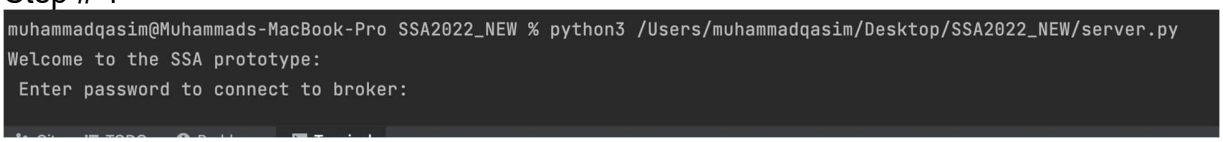


Step # 2

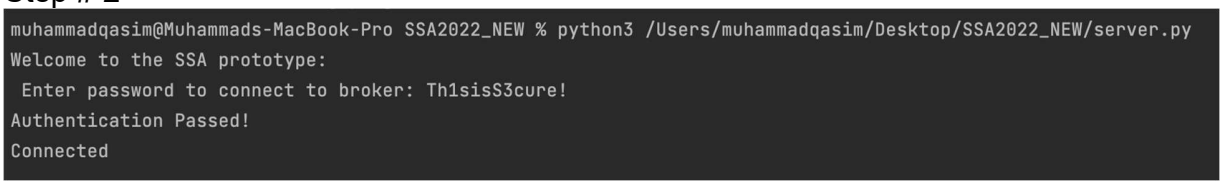


TEST SCENARIO 2: Server Authentication with Correct Password				**Test Case**: PASS
Step #	**Step Details**	**Expected Results**	**Actual Results**	**Pass / Fail / Not Executed / Suspended**
1	Run server.py	Welcome message appears and user is prompted for a password to connect to broker	As expected	Pass
2	Enter CORRECT password	Authentication is successful and user is connected to broker	As expected	Pass

Step # 1



Step # 2

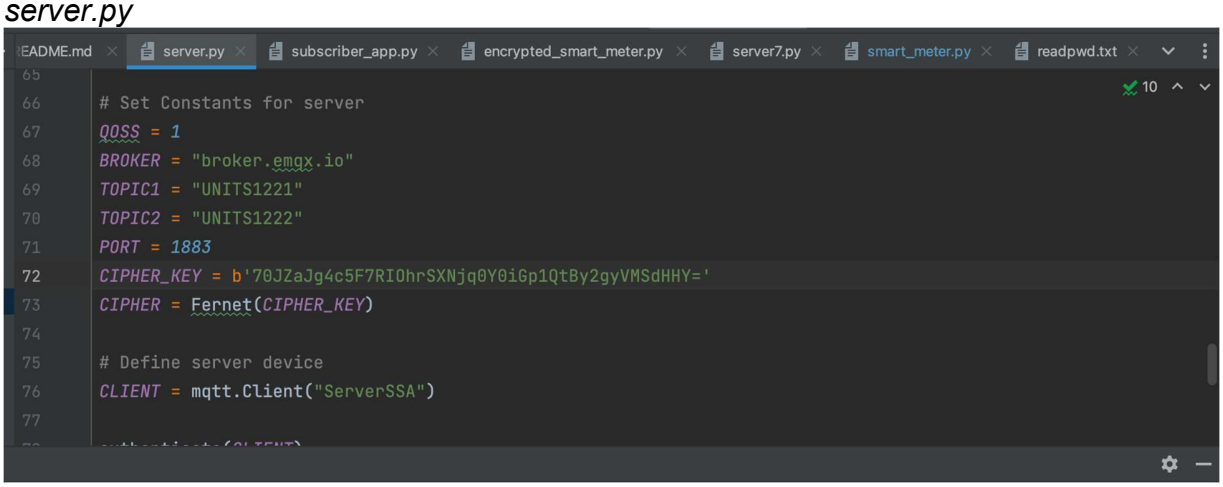


TEST SCENARIO 3: Encrypted payload is decrypted with a VALID key				**Test Case**: PASS
Step #	**Step Details**	**Expected Results**	**Actual Results**	**Pass / Fail / Not Executed / Suspended**
1	Edit *CIPHER_KEY* on smart_meter.py	*CIPHER_KEY* on smart_meter.py does not match server.py	As expected	Pass
2	Run smart_meter.py	Connected message should appear	As expected	Pass
3	Run server.py	Welcome message appears and user is prompted for a password to connect to broker	As expected	Pass
4	Enter CORRECT password	Authentication is successful and user is connected to broker	As expected	Pass
5	Successfully connected to broker	Smart_meter.py displays InvalidToken error messages. Server.py may receive the last successfully published message, then doesn't receive anything from the broker.	As expected	Pass

Step # 1

smart_meter.py

server.py



Step # 2

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/smart_meter.py
Connected
```

Step # 3

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/server.py
Welcome to the SSA prototype:
 Enter password to connect to broker:
```

Step # 4

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/server.py
Welcome to the SSA prototype:
 Enter password to connect to broker: Th1sisS3cure!
Authentication Passed!
Connected
```

Step # 5

smart_meter.py

```
cryptography.fernet.InvalidToken
Exception in thread Thread-23 (_thread_main):
Traceback (most recent call last):
  File "/Library/Frameworks/Python.framework/Versions/3.10/lib/python3.10/site-packages/cryptography/fernet.py", line 167, in _decrypt_data
    unpadded += unpadder.finalize()
  File "/Library/Frameworks/Python.framework/Versions/3.10/lib/python3.10/site-packages/cryptography/hazmat/primitives/padding.py", line 159, in finalize
    result = _byte_unpadding_check(
  File "/Library/Frameworks/Python.framework/Versions/3.10/lib/python3.10/site-packages/cryptography/hazmat/primitives/padding.py", line 101, in _byte_unpadding_check
    raise ValueError("Invalid padding bytes.")
ValueError: Invalid padding bytes.
```

server.py

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/server.py
Welcome to the SSA prototype:
 Enter password to connect to broker: Th1sisS3cure!
Authentication Passed!
Connected

Total Units =  517
Total Cost (@£0.00039 per unit): £ 0.2016

Waiting to continue.  Press ENTER any time to end program)
```

TEST SCENARIO 4: Messages pause and resume without error when server is interrupted				**Test Case**: PASS
Step #	**Step Details**	**Expected Results**	**Actual Results**	**Pass / Fail / Not Executed / Suspended**
1	Run smart_meter.py	Connected message should appear	As expected	Pass
2	Run server.py	Welcome message appears and user is prompted for a password to connect to broker	As expected	Pass
3	Enter CORRECT password	Authentication is successful and user is connected to broker	As expected	Pass
4	Successfully connected to broker	Smart_meter.py displays unit confirmations. Server.py starts receiving published messages.	As expected	Pass
5	Stop server.py	Smart_meter.py will stop receiving unit confirmations	As expected	Pass
6	Run server.py	Welcome message appears and user is prompted for a password to connect to broker	As expected	Pass
7	Enter CORRECT password	Authentication is successful and user is	As expected	Pass

		connected to broker		
8	Successfully connected to broker	Smart_meter.py continues to display unit confirmations from where it left off. Server.py starts receiving published messages again.	As expected	Pass

Step # 1

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/smart_meter.py
Connected
```

Step # 2

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/server.py
Welcome to the SSA prototype:
 Enter password to connect to broker:
```

Step # 3

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/server.py
Welcome to the SSA prototype:
 Enter password to connect to broker: Th1sisS3cure!
Authentication Passed!
Connected
```

Step # 4

smart_meter.py

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/smart_meter.py
Connected
Unit total confirmation from server =  1668
Unit total confirmation from server =  1668
Unit total confirmation from server =  1668
Unit total confirmation from server =  1668
Unit total confirmation from server =  1674
```

server.py

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/server.py
Welcome to the SSA prototype:
 Enter password to connect to broker: Th1sisS3cure!
Authentication Passed!
Connected

Total Units =  1668
Total Cost (@£0.00039 per unit): £ 0.6505

Waiting to continue.  Press ENTER any time to end program)
Total Units =  1668
Total Cost (@£0.00039 per unit): £ 0.6505
Total Units =  1668
Total Cost (@£0.00039 per unit): £ 0.6505
Total Units =  1668
Total Cost (@£0.00039 per unit): £ 0.6505
Total Units =  1674
Total Cost (@£0.00039 per unit): £ 0.6529
Total Units =  1680
Total Cost (@£0.00039 per unit): £ 0.6552
Total Units =  1680
```

Step # 5

server.py

```
Terminal:  Local  Local (2)
Authentication Passed!
Connected

Total Units =  1668
Total Cost (@£0.00039 per unit): £ 0.6505

Waiting to continue.  Press ENTER any time to end program)
Total Units =  1668
Total Cost (@£0.00039 per unit): £ 0.6505
Total Units =  1668
Total Cost (@£0.00039 per unit): £ 0.6505
Total Units =  1668
Total Cost (@£0.00039 per unit): £ 0.6505
Total Units =  1674
Total Cost (@£0.00039 per unit): £ 0.6529
Total Units =  1680
Total Cost (@£0.00039 per unit): £ 0.6552
Total Units =  1680
Total Cost (@£0.00039 per unit): £ 0.6552
Total Units =  1681
Total Cost (@£0.00039 per unit): £ 0.6556
Total Units =  1685
Total Cost (@£0.00039 per unit): £ 0.6572
Total Units =  1691
Total Cost (@£0.00039 per unit): £ 0.6595
^CTraceback (most recent call last):
  File "/Users/muhammadqasim/Desktop/SSA2022_NEW/server.py", line 85, in <module>
    inp = input("\nWaiting to continue.  Press ENTER any time to end program)\n")
KeyboardInterrupt

muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW %
```

smart_meter.py

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/smart_meter.py
Connected
Unit total confirmation from server =  1668
Unit total confirmation from server =  1668
Unit total confirmation from server =  1668
Unit total confirmation from server =  1668
Unit total confirmation from server =  1674
Unit total confirmation from server =  1680
Unit total confirmation from server =  1680
Unit total confirmation from server =  1681
Unit total confirmation from server =  1685
```

Step # 6

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/server.py
Welcome to the SSA prototype:
 Enter password to connect to broker:
```

Step # 7

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/server.py
Welcome to the SSA prototype:
 Enter password to connect to broker: Th1sisS3cure!
Authentication Passed!
Connected
```

Step # 8

server.py

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/server.py
Welcome to the SSA prototype:
 Enter password to connect to broker: Th1sisS3cure!
Authentication Passed!
Connected

Total Units =  1691
Total Cost (@£0.00039 per unit): £ 0.6595

Waiting to continue.  Press ENTER any time to end program)
Total Units =  1698
Total Cost (@£0.00039 per unit): £ 0.6622
Total Units =  1698
Total Cost (@£0.00039 per unit): £ 0.6622
Total Units =  1700
Total Cost (@£0.00039 per unit): £ 0.663
Total Units =  1705
Total Cost (@£0.00039 per unit): £ 0.665
```

smart_meter.py

```
muhammadqasim@Muhammads-MacBook-Pro SSA2022_NEW % python3 /Users/muhammadqasim/Desktop/SSA2022_NEW/smart_meter.py
Connected
Unit total confirmation from server =  1668
Unit total confirmation from server =  1668
Unit total confirmation from server =  1668
Unit total confirmation from server =  1668
Unit total confirmation from server =  1674
Unit total confirmation from server =  1680
Unit total confirmation from server =  1680
Unit total confirmation from server =  1681
Unit total confirmation from server =  1685
Unit total confirmation from server =  1691
Unit total confirmation from server =  1698
Unit total confirmation from server =  1698
Unit total confirmation from server =  1700
Unit total confirmation from server =  1705
Unit total confirmation from server =  1707
```

TEST SCENARIO 5: Test for lost messages				**Test Case**: **Pass / Fail / Not Executed / Suspended**
Step #	**Step Details**	**Expected Results**	**Actual Results**	**Pass / Fail**
1	Run server.py and smart_meter.py with QOS set to 1 and retain flag set to True. sum_of_units set to 0	Messages stored at broker and are retrieved by the server	Messages are retrieved but last message not stored by the broker and sum_of_units value reset when program is launched	Fail
2	Run server.py and smart.meter.py with QOS 1 set to 1 and retain flag set to True. A second topic is introduced to receive confirmation back from the server, creating a continuous loop. Smart meter uses this figure to continue counting from, instead of 0.	Messages stored at broker and are retrieved by the server. Continuous unit total is retained from last connection because of the second topic.	As expected	Pass
3	Run server.py and smart_meter.py on topic names: “topic1” and “topic2”	Messages being received at both ends continuously	Irregular pattern of received messages successfully and unsuccessfully	Fail
4	Run server.py and smart_meter.py	Messages being received	As expected	Pass

	on topics: “UNITS1221” and “UNITS1222”	at both ends continuously		

Step #1 (Output)

```
message =  <paho.mqtt.client.MQTTMessage object at 0x0000027003337140>
message payload =  b'gAAAAABjKMT42CTXkm-YW2xmPmSD9___Lv-cu8XeM2npC3AqiWgm8px59XeLbLyDG6gT-Ggn9I3IU4fHH8xozQFP8nMWIh6qzg=
='

Total Units =  1731
Total Cost (@£0.00039 per unit): £ 0.6751
message topic= UNITS1221
message qos= 1
message retain flag= 1
cipher =  <cryptography.fernet.Fernet object at 0x000002700338B4E20>
message =  <paho.mqtt.client.MQTTMessage object at 0x0000027003337140>
message payload =  b'gAAAAABjKMWj6ezJiDsHl_x-y_7WVufBy5eysy-wRGTriqd4VCT6T8xyLzMzZHgKAYvh0lKglJ41w8YeerRDXlcVONoAlcFXMw=
='

Total Units =  11
Total Cost (@£0.00039 per unit): £ 0.0043
message topic= UNITS1221
message qos= 1
message retain flag= 0
Waiting to continue:cipher =  <cryptography.fernet.Fernet object at 0x000002700338B4FD0>
message =  <paho.mqtt.client.MQTTMessage object at 0x0000027003337140>
message payload =  b'gAAAAABjKMWn86qZ2jQmDOYf95r5WIhZrw9EX3byF_IJUga4F-SNS8R7u5LMpjnvvxngSPe3BpTvPQu5QSQqSbz81Kxzbb5YeQ=
='

Total Units =  16
Total Cost (@£0.00039 per unit): £ 0.0062
message topic= UNITS1221
message qos= 1
message retain flag= 0
```

Step #1 (Code)

```
def on_message(client, userdata, message):
    print("message payload = ", message.payload)
    #decrypted_message = cipher.decrypt(message.payload)
    #msg=int(decrypted_message.decode("utf-8"))
    #print("\nTotal Units = ",str(decrypted_message.decode("utf-8")))
    #r_messages.append(msg)
    print("message qos=",message.qoss)
    print("message retain flag=",message.retain)

def sub(client,topic,qos):
    logging.info("  topic= "+topic +" qos="+str(qos))
    client.subscribe(topic,qos)
    print("Subscribed to: " + topic)

sum_of_units = 0
cipher_key = b'7OJZaJg4c5F7RIOhrSXNjq0Y0iGp1QtBy2gyVMSdHHY='
cipher = Fernet(cipher_key)
broker='broker.emqx.io'
port = 1883
qoss = 1
CLEAN_SESSION = False
```

Unit total needed a value to be set as variable to count from. However, this would reset each time the program was opened.

Step #2 (Output)

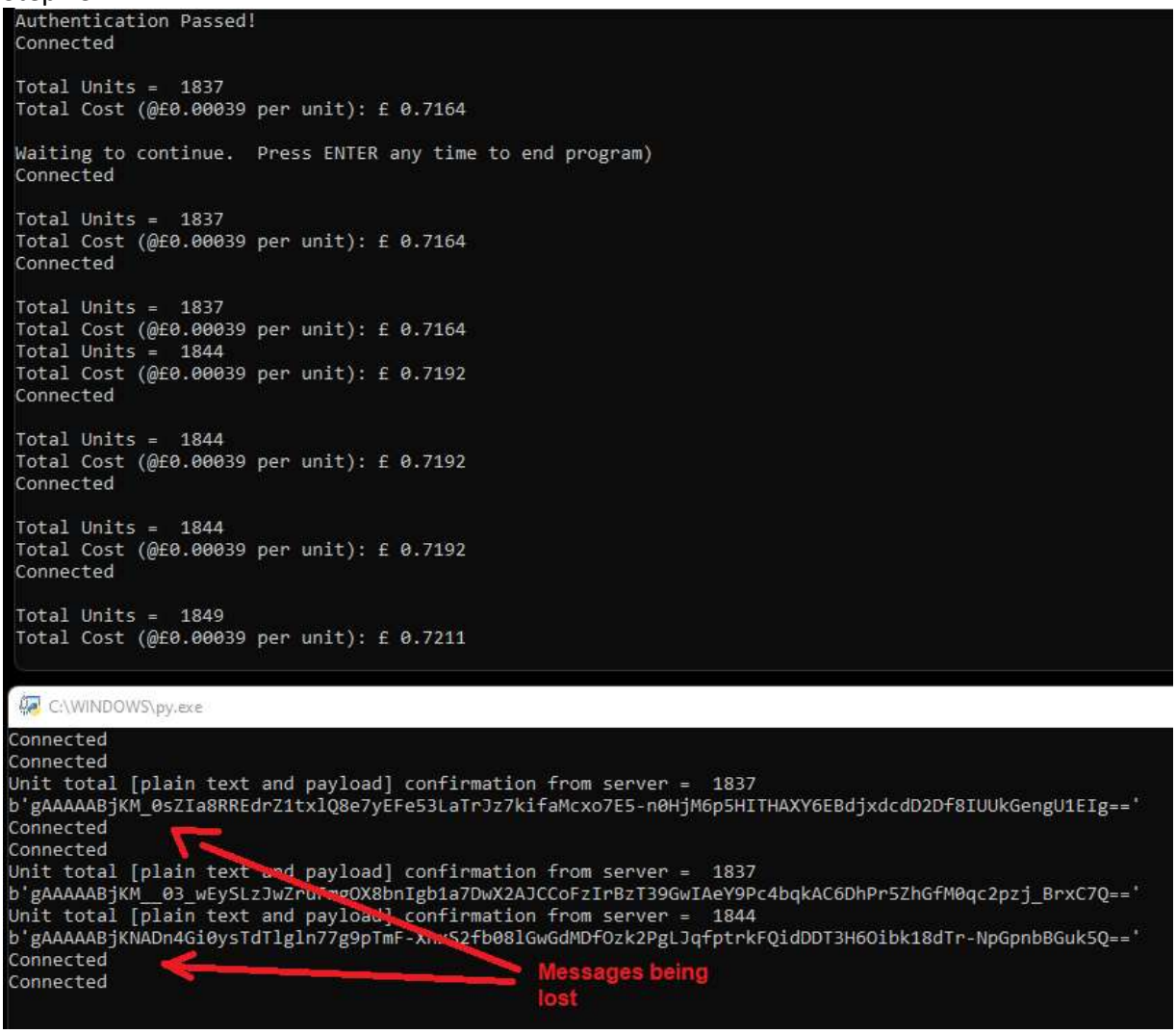
```
Connected



Received payload =  b'gAAAAABjKMYrADP8bGXH7IHNmm3MUhaQv2a6j_yMA5Vc_c87sMm0Zlj5c3IHe25kWTdth12eNFpBtUXl-by4mxHFdztyrpaEBA
=='
Total Units =  1740
Total Cost (@£0.00039 per unit): £ 0.6786
message retain flag= 1

Published 1740 to topic UNITS1222

Waiting to continue.  Press return to close):


Received payload =  b'gAAAAABjKMi1Kc3rbaU5-ihkaJxUxunmzZwM9eZM5j422mJ4TdR5Ig08H37BQI2aTscQeGVb1aj5K-4jZN286UhUcMwL8yE4-A
=='
Total Units =  1749
Total Cost (@£0.00039 per unit): £ 0.6821
message retain flag= 0

Published 1749 to topic UNITS1222


Received payload =  b'gAAAAABjKMi-fYZpol4hmlZjgbNALRori2m9zG0GTVTH2RsKTsABkfYY9lIpSWP6MKgcOUCD-Pu-wci3x29aRUOHGG5lthBG6A
=='
Total Units =  1753
Total Cost (@£0.00039 per unit): £ 0.6837
message retain flag= 0

Published 1753 to topic UNITS1222
```

Step #2 (Code)

```
# Set Constants for smart meter
QOSS = 1
BROKER = 'broker.emqx.io'
TOPIC1 = "UNITS1221"
TOPIC2 = "UNITS1222"
PORT = 1883
CIPHER_KEY = b'7OJZaJg4c5F7RIOhrSXNjq0Y0iGp1QtBy2gyVMSdHHY='
CIPHER = Fernet(CIPHER_KEY)
```

Refactored code includes a second topic used to pass confirmation messages back to the smart meter from the server, creating a continuous loop. This eliminated the need for a variable with a start value to count from.

Step #3


Authentication Passed!
Connected
Total Units = 1837
Total Cost (@£0.00039 per unit): £ 0.7164
Waiting to continue. Press ENTER any time to end program)
Connected
Total Units = 1837
Total Cost (@£0.00039 per unit): £ 0.7164
Connected
Total Units = 1837
Total Cost (@£0.00039 per unit): £ 0.7164
Total Units = 1844
Total Cost (@£0.00039 per unit): £ 0.7192
Connected
Total Units = 1844
Total Cost (@£0.00039 per unit): £ 0.7192
Connected
Total Units = 1844
Total Cost (@£0.00039 per unit): £ 0.7192
Connected
Total Units = 1849
Total Cost (@£0.00039 per unit): £ 0.7211
C:\WINDOWS\py.exe
Connected
Connected
Unit total [plain text and payload] confirmation from server = 1837
b'gAAAAABjKM_0sZIa8RREdrZ1txlQ8e7yEFe53LaTrJz7kifaMcxo7E5-n0HjM6p5HITHAXY6EBdjxdcdD2Df8IUUkGengU1EIg=='
Connected
Connected
Unit total [plain text and payload] confirmation from server = 1837
b'gAAAAABjKM__03_wEySLzJwZrU
Unit total [plain text and payload] confirmation from server = 1844
b'gAAAAABjKNADn4Gi0ysTdTlgln77g9pTmF-x
Connected
Connected
Messages being lost

Step #4 (Final code)

```
Welcome to the SSA prototype:
 Enter password to connect to broker: Th1sisS3cure!
Authentication Passed!
Connected

Total Units =  1863
Total Cost (@£0.00039 per unit): £ 0.7266

Waiting to continue.  Press ENTER any time to end program)
Total Units =  1870
Total Cost (@£0.00039 per unit): £ 0.7293
Total Units =  1872
Total Cost (@£0.00039 per unit): £ 0.7301
Total Units =  1873
Total Cost (@£0.00039 per unit): £ 0.7305
Total Units =  1882
Total Cost (@£0.00039 per unit): £ 0.734
```

C:\WINDOWS\py.exe

```
Connected
Unit total [plain text and payload] confirmation from server =  1863
b'gAAAAABjKNO3MNIatcxKCRdSQCD32COfqpMuSutnpi5LdwSnq1cOAHUUEoF6FG3DbvOy9_wlH6jwukcVuGG03BxgoFX4B83-IQ=='
Unit total [plain text and payload] confirmation from server =  1870
b'gAAAAABjKNPAUUkciV3jjQ-3XFaCRbSWAy_w4mDdlQXhBzPttmYP7ctrdpOKuZqHthZ8793JIRGDSGoDYzTqhouO8Q1L36lAlQ=='
Unit total [plain text and payload] confirmation from server =  1872
b'gAAAAABjKNPIrKX9qii5vsCNkwuefdcjDWufi-prbx2ht0D7hZyMe_3TA9iigR9uhIz0gbw1QPQA-qGtLyPsVfz5P6iYmQ33Fg=='
Unit total [plain text and payload] confirmation from server =  1873
b'gAAAAABjKNPR9Op5AVM9fI_GIvDThlVdGE15BHfzeoGeQIPeigxxVLPlYvmXFQPvW1G-Rwygbc8L2h8NwuLlk07sjSfkZE0j6A=='
Unit total [plain text and payload] confirmation from server =  1882
b'gAAAAABjKNPay1chahTyAdPdobEWFoLVRNskKC1qwDBT80BQlmAIPioigowWfys5bonHwZscgra_rc4sAVsickda7_r2OUvhjQ=='
```

TEST SCENARIO 6: Testing code using Linters				**Test Case**: **Pass / Fail / Not Executed / Suspended**
Step #	**Step Details**	**Expected Results**	**Actual Results**	**Pass / Fail / Not Executed / Suspended**
1	pylint server.py	10.0	2.61	Fail
2	Pylint smart_meter.py	10.0	2.09	Fail
3	Flake8 server py	No findings	Several findings	Fail
4	Flake8 smart_meter.py	No findings	Several findings	Fail
5	Pylint server.py	10.0	9.2	Fail but improved code
6	Pylint smart_meter.py	10.0	9.23	Fail but improved code
7	Flake8 server.py	No findings	No findings	Pass
8	Flake8 smart_meter.py	No findings	No findings	Pass

Pylint server.py (step #1)

```
C:\Users\Richard\SmartHome>pylint server.py
************* Module server
server.py:35:31: C0303: Trailing whitespace (trailing-whitespace)
server.py:55:0: C0304: Final newline missing (missing-final-newline)
server.py:1:0: C0114: Missing module docstring (missing-module-docstring)
server.py:4:0: C0410: Multiple imports on one line (logging, sys) (multiple-imports)
server.py:6:43: C0103: Argument name "rc" doesn't conform to snake_case naming style (invalid-name)
server.py:6:0: C0116: Missing function or method docstring (missing-function-docstring)
server.py:6:18: W0621: Redefining name 'client' from outer scope (line 45) (redefined-outer-name)
server.py:7:4: C0103: Variable name "m" doesn't conform to snake_case naming style (invalid-name)
server.py:6:26: W0613: Unused argument 'userdata' (unused-argument)
server.py:6:36: W0613: Unused argument 'flags' (unused-argument)
server.py:10:40: C0103: Argument name "rc" doesn't conform to snake_case naming style (invalid-name)
server.py:10:0: C0116: Missing function or method docstring (missing-function-docstring)
server.py:10:15: W0621: Redefining name 'client' from outer scope (line 45) (redefined-outer-name)
server.py:10:15: W0613: Unused argument 'client' (unused-argument)
server.py:10:23: W0613: Unused argument 'userdata' (unused-argument)
server.py:10:33: W0613: Unused argument 'flags' (unused-argument)
server.py:16:0: C0116: Missing function or method docstring (missing-function-docstring)
server.py:16:15: W0621: Redefining name 'client' from outer scope (line 45) (redefined-outer-name)
server.py:16:23: W0613: Unused argument 'userdata' (unused-argument)
server.py:26:0: C0116: Missing function or method docstring (missing-function-docstring)
server.py:26:8: W0621: Redefining name 'client' from outer scope (line 45) (redefined-outer-name)
server.py:34:0: C0116: Missing function or method docstring (missing-function-docstring)
server.py:34:8: W0621: Redefining name 'client' from outer scope (line 45) (redefined-outer-name)
server.py:37:0: C0103: Constant name "qoss" doesn't conform to UPPER_CASE naming style (invalid-name)
server.py:38:0: C0103: Constant name "broker" doesn't conform to UPPER_CASE naming style (invalid-name)
server.py:39:0: C0103: Constant name "topic1" doesn't conform to UPPER_CASE naming style (invalid-name)
server.py:40:0: C0103: Constant name "topic2" doesn't conform to UPPER_CASE naming style (invalid-name)
server.py:41:0: C0103: Constant name "port" doesn't conform to UPPER_CASE naming style (invalid-name)
server.py:42:0: C0103: Constant name "cipher_key" doesn't conform to UPPER_CASE naming style (invalid-name)
server.py:4:0: W0611: Unused import logging (unused-import)
server.py:4:0: W0611: Unused import sys (unused-import)
server.py:2:0: C0411: standard import "import time" should be placed before "import paho.mqtt.client as mqtt" (wrong-import-order)
server.py:4:0: C0411: standard import "import logging, sys" should be placed before "import paho.mqtt.client as mqtt" (wrong-import-order)
server.py:4:0: C0411: standard import "import logging, sys" should be placed before "import paho.mqtt.client as mqtt" (wrong-import-order)

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Your code has been rated at 2.61/10
```

Pylint smart_meter.py (Step #2)

```
C:\Users\Richard\SmartHome>pylint smart_meter.py
************* Module smart_meter
smart_meter.py:52:0: C0304: Final newline missing (missing-final-newline)
smart_meter.py:1:0: C0114: Missing module docstring (missing-module-docstring)
smart_meter.py:7:40: C0103: Argument name "rc" doesn't conform to snake_case naming style (invalid-name)
smart_meter.py:7:0: C0116: Missing function or method docstring (missing-function-docstring)
smart_meter.py:7:15: W0621: Redefining name 'client' from outer scope (line 43) (redefined-outer-name)
smart_meter.py:7:15: W0613: Unused argument 'client' (unused-argument)
smart_meter.py:7:23: W0613: Unused argument 'userdata' (unused-argument)
smart_meter.py:7:33: W0613: Unused argument 'flags' (unused-argument)
smart_meter.py:13:0: C0116: Missing function or method docstring (missing-function-docstring)
smart_meter.py:13:15: W0621: Redefining name 'client' from outer scope (line 43) (redefined-outer-name)
smart_meter.py:16:4: W0621: Redefining name 'msg' from outer scope (line 40) (redefined-outer-name)
smart_meter.py:18:4: W0621: Redefining name 'msgflag' from outer scope (line 41) (redefined-outer-name)
smart_meter.py:13:23: W0613: Unused argument 'userdata' (unused-argument)
smart_meter.py:18:4: W0612: Unused variable 'msgflag' (unused-variable)
smart_meter.py:21:0: C0116: Missing function or method docstring (missing-function-docstring)
smart_meter.py:21:8: W0621: Redefining name 'client' from outer scope (line 43) (redefined-outer-name)
smart_meter.py:24:0: C0116: Missing function or method docstring (missing-function-docstring)
smart_meter.py:24:8: W0621: Redefining name 'client' from outer scope (line 43) (redefined-outer-name)
smart_meter.py:24:21: W0621: Redefining name 'msg' from outer scope (line 40) (redefined-outer-name)
smart_meter.py:24:15: W0613: Unused argument 'topic' (unused-argument)
smart_meter.py:24:25: W0613: Unused argument 'qos' (unused-argument)
smart_meter.py:32:0: C0103: Constant name "qoss" doesn't conform to UPPER_CASE naming style (invalid-name)
smart_meter.py:33:0: C0103: Constant name "broker" doesn't conform to UPPER_CASE naming style (invalid-name)
smart_meter.py:34:0: C0103: Constant name "topic1" doesn't conform to UPPER_CASE naming style (invalid-name)
smart_meter.py:35:0: C0103: Constant name "topic2" doesn't conform to UPPER_CASE naming style (invalid-name)
smart_meter.py:36:0: C0103: Constant name "port" doesn't conform to UPPER_CASE naming style (invalid-name)
smart_meter.py:37:0: C0103: Constant name "cipher_key" doesn't conform to UPPER_CASE naming style (invalid-name)
smart_meter.py:40:0: C0103: Constant name "msg" doesn't conform to UPPER_CASE naming style (invalid-name)
smart_meter.py:41:0: C0103: Constant name "msgflag" doesn't conform to UPPER_CASE naming style (invalid-name)
smart_meter.py:2:0: W0611: Unused uniform imported from random (unused-import)
smart_meter.py:5:0: W0611: Unused import logging (unused-import)
smart_meter.py:2:0: C0411: standard import "from random import randrange, uniform" should be placed before "import paho.mqtt.client as mqtt" (wrong-import-order)
smart_meter.py:3:0: C0411: standard import "import time" should be placed before "import paho.mqtt.client as mqtt" (wrong-import-order)
smart_meter.py:5:0: C0411: standard import "import logging" should be placed before "import paho.mqtt.client as mqtt" (wrong-import-order)

-----------------------------------
Your code has been rated at 2.09/10
```

Flake8 server.py (Step #3)

```
C:\Users\Richard\SmartHome>flake8 server.py
server.py:2:34: E262 inline comment should start with '# '
server.py:5:1: E302 expected 2 blank lines, found 1
server.py:7:11: E225 missing whitespace around operator
server.py:12:1: E302 expected 2 blank lines, found 1
server.py:13:80: E501 line too long (179 > 79 characters)
server.py:16:8: E225 missing whitespace around operator
server.py:17:27: E231 missing whitespace after ','
server.py:19:47: E231 missing whitespace after ','
server.py:20:5: E265 block comment should start with '# '
server.py:21:15: E231 missing whitespace after ','
server.py:21:22: E231 missing whitespace after ','
server.py:21:26: E231 missing whitespace after ','
server.py:23:1: E302 expected 2 blank lines, found 1
server.py:23:15: E231 missing whitespace after ','
server.py:23:21: E231 missing whitespace after ','
server.py:23:25: E231 missing whitespace after ','
server.py:28:25: E231 missing whitespace after ','
server.py:28:37: E231 missing whitespace after ','
server.py:32:1: E302 expected 2 blank lines, found 1
server.py:32:15: E231 missing whitespace after ','
server.py:32:21: E231 missing whitespace after ','
server.py:34:27: E231 missing whitespace after ','
server.py:36:1: E305 expected 2 blank lines after class or function definition, found 1
server.py:36:5: E225 missing whitespace around operator
server.py:37:7: E225 missing whitespace around operator
server.py:38:7: E225 missing whitespace around operator
server.py:39:7: E225 missing whitespace around operator
server.py:40:5: E225 missing whitespace around operator
server.py:45:22: E231 missing whitespace after ','
server.py:45:34: E262 inline comment should start with '# '
server.py:47:18: E225 missing whitespace around operator
server.py:47:37: E262 inline comment should start with '# '
server.py:48:11: E231 missing whitespace after ','
server.py:48:18: E231 missing whitespace after ','
server.py:52:4: E225 missing whitespace around operator

C:\Users\Richard\SmartHome>
```

Flake8 smart_meter.py (Step #4)

```
C:\Users\Richard\SmartHome>flake8 smart_meter.py
smart_meter.py:2:1: F401 'random.uniform' imported but unused
smart_meter.py:5:1: F401 'logging' imported but unused
smart_meter.py:7:1: E302 expected 2 blank lines, found 1
smart_meter.py:8:10: E225 missing whitespace around operator
smart_meter.py:13:1: E302 expected 2 blank lines, found 1
smart_meter.py:16:8: E225 missing whitespace around operator
smart_meter.py:17:50: E231 missing whitespace after ','
smart_meter.py:17:80: E501 line too long (89 > 79 characters)
smart_meter.py:18:5: F841 local variable 'msgflag' is assigned to but never used
smart_meter.py:19:15: E231 missing whitespace after ','
smart_meter.py:19:22: E231 missing whitespace after ','
smart_meter.py:19:26: E231 missing whitespace after ','
smart_meter.py:21:1: E302 expected 2 blank lines, found 1
smart_meter.py:21:15: E231 missing whitespace after ','
smart_meter.py:21:21: E231 missing whitespace after ','
smart_meter.py:22:27: E231 missing whitespace after ','
smart_meter.py:24:1: E302 expected 2 blank lines, found 1
smart_meter.py:24:15: E231 missing whitespace after ','
smart_meter.py:24:21: E231 missing whitespace after ','
smart_meter.py:24:25: E231 missing whitespace after ','
smart_meter.py:32:1: E305 expected 2 blank lines after class or function definition, found 1
smart_meter.py:33:7: E225 missing whitespace around operator
smart_meter.py:34:7: E225 missing whitespace around operator
smart_meter.py:35:7: E225 missing whitespace around operator
smart_meter.py:44:22: E231 missing whitespace after ','
smart_meter.py:46:18: E225 missing whitespace around operator
smart_meter.py:47:11: E231 missing whitespace after ','
smart_meter.py:47:18: E231 missing whitespace after ','
smart_meter.py:52:23: W292 no newline at end of file

C:\Users\Richard\SmartHome>
```

Retest after implementing recommended improvements (Step #5, 6, 7, and 8)

```
C:\Users\Richard\SmartHome>pylint server.py
************* Module server
server.py:14:13: R1732: Consider using 'with' for resource-allocating operations (consider-using-with)
server.py:29:23: W0613: Unused argument 'userdata' (unused-argument)
server.py:29:33: W0613: Unused argument 'flags' (unused-argument)
server.py:39:23: W0613: Unused argument 'userdata' (unused-argument)

-------------------------------------------------------------------
Your code has been rated at 9.20/10 (previous run: 9.20/10, +0.00)


C:\Users\Richard\SmartHome>pylint smart_meter.py
************* Module smart_meter
smart_meter.py:10:23: W0613: Unused argument 'userdata' (unused-argument)
smart_meter.py:10:33: W0613: Unused argument 'flags' (unused-argument)
smart_meter.py:20:23: W0613: Unused argument 'userdata' (unused-argument)

-------------------------------------------------------------------
Your code has been rated at 9.23/10 (previous run: 9.23/10, +0.00)


C:\Users\Richard\SmartHome>flake8 server.py

C:\Users\Richard\SmartHome>flake8 smart_meter.py

C:\Users\Richard\SmartHome>
```