```
user@box:~$ sudo pip3 install -U psutil
[sudo] password for user:
/usr/local/lib/python3.8/dist-packages/pkg_resources/__init__.py:122: PkgResourcesDe
precationWarning: 0.23ubuntu1 is an invalid version and will not be supported in a f
uture release
  warnings.warn(
/usr/local/lib/python3.8/dist-packages/pkg_resources/__init__.py:122: PkgResourcesDe
precationWarning: 0.1.36ubuntu1 is an invalid version and will not be supported in a
 future release
  warnings.warn(
Collecting psutil
  Downloading psutil-5.9.0-cp38-cp38-manylinux_2_12_x86_64.manylinux2010_x86_64.many
linux_2_17_x86_64.manylinux2014_x86_64.whl (283 kB)
     |████████████████████████████████| 283 kB 9.4 MB/s
Installing collected packages: psutil
Successfully installed psutil-5.9.0
user@box:~$ cd demo
user@box:~/demo$ cp ~/iot/lesson7/thingspeak_cpu_loop.py .
user@box:~/demo$ cp ~/iot/lesson7/thingspeak_feed.py .
user@box:~/demo$ cat thingspeak_cpu_loop.py
import http.client, urllib.request, urllib.parse, urllib.error
from time import localtime, strftime
import psutil
import time
def doit():
        cpu_pc = psutil.cpu_percent()
        mem = psutil.virtual_memory()
        mem_avail_mb = mem.available/(1024*1024)
        params = urllib.parse.urlencode({'field1': cpu_pc, 'field2':
            mem_avail_mb,'key':'YOURKEYHERE'})
        headers = {"Content-type":
            "application/x-www-form-urlencoded","Accept": "text/plain"}
```

```
                conn = http.client.HTTPConnection("api.thingspeak.com:80")
            try:
                        conn.request("POST", "/update", params, headers)
                        response = conn.getresponse()
                        print(cpu_pc)
                        print(mem_avail_mb)
                        print(strftime("%a, %d %b %Y %H:%M:%S", localtime()))
                        print(response.status, response.reason)
                        data = response.read()
                        conn.close()
            except:
                        print("connection failed")
#sleep for 60 seconds (message update interval limit of 15 seconds)
if __name__ == "__main__":
            while True:
                        doit()
                        time.sleep(60)
user@box:~/demo$ cat thingspeak_feed.py
import http.client, urllib.request, urllib.parse, urllib.error
from time import localtime, strftime
import psutil
import time
"""
2020-11-26: Pridhvi Myneni added lines 13-18, 25, and 43-54
1. gitignore (https://git-scm.com/docs/gitignore) now prevents students from pushing
 up credentials.
2. This program now attempts to cache the API key, but always prompts the user for t
heir preference prior to saving credentials locally.
3. Pickle data type used to store credentials. Pickle is a binary storage version of
 JSON. Please note not-human-readable does not mean secure.
4. Removed key storage in source, which is generally a bad practice, as it leads to
version control systems having your key.
```

```
5. Key for storage in a dictionary. This could be expanded in the future if other in
formation needs to be similarly stored.
"""
from pickle import dump as pickle_dump
from pickle import load as pickle_load
from os.path import exists as file_exists
from os.path import isfile as is_file
PICKLE_FILE_NAME = "API_KEY.pickle"
API_KEY_INDEX = "API_KEY"
def doit():
        cpu_pc = psutil.cpu_percent()
        mem = psutil.virtual_memory()
        mem_avail_mb = mem.available/(1024*1024)
        params = urllib.parse.urlencode({'field1': cpu_pc, 'field2':
#              mem_avail_mb,'key':'YOURKEYHERE'})
            mem_avail_mb,'key':KEY})
        headers = {"Content-type":
               "application/x-www-form-urlencoded","Accept": "text/plain"}
        conn = http.client.HTTPConnection("api.thingspeak.com:80")
        try:
               conn.request("POST", "/update", params, headers)
               response = conn.getresponse()
               print(cpu_pc)
               print(mem_avail_mb)
               print(strftime("%a, %d %b %Y %H:%M:%S", localtime()))
               print(response.status, response.reason)
               data = response.read()
               conn.close()
        except:
               print("connection failed")
#sleep for 60 seconds (message update interval limit of 15 seconds)
if __name__ == "__main__":
```

```
user@box:~/demo$ python3 thingspeak_feed.py
An API key savefile was not found. Enter Write API Key >>> RUTVNBEAFVE5EUWU
Should we save this key for future use? [y/N] >>> y
0.6
1325.3828125
Tue, 22 Mar 2022 19:19:12
200 OK
```

```
user@box:~/demo$ sudo pip3 install -U gspread oauth2client
[sudo] password for user:
/usr/local/lib/python3.8/dist-packages/pkg_resources/__init__.py:122: PkgResourcesDeprecationWarning: 0.23ubuntu1 is an
 invalid version and will not be supported in a future release
  warnings.warn(
/usr/local/lib/python3.8/dist-packages/pkg_resources/__init__.py:122: PkgResourcesDeprecationWarning: 0.1.36ubuntu1 is
an invalid version and will not be supported in a future release
  warnings.warn(
Collecting gspread
  Downloading gspread-5.2.0-py3-none-any.whl (32 kB)
Collecting oauth2client
  Downloading oauth2client-4.1.3-py2.py3-none-any.whl (98 kB)
     |████████████████████████████████| 98 kB 8.3 MB/s
Collecting google-auth-oauthlib>=0.4.1
  Downloading google_auth_oauthlib-0.5.1-py2.py3-none-any.whl (19 kB)
Collecting google-auth>=1.12.0
  Downloading google_auth-2.6.2-py2.py3-none-any.whl (156 kB)
     |████████████████████████████████| 156 kB 43.1 MB/s
Requirement already satisfied, skipping upgrade: httplib2>=0.9.1 in /usr/lib/python3/dist-packages (from oauth2client)
(0.14.0)
Collecting pyasn1>=0.1.7
  Downloading pyasn1-0.4.8-py2.py3-none-any.whl (77 kB)
     |████████████████████████████████| 77 kB 9.3 MB/s
Collecting pyasn1-modules>=0.0.5
  Downloading pyasn1_modules-0.2.8-py2.py3-none-any.whl (155 kB)
     |████████████████████████████████| 155 kB 12.3 MB/s
Collecting rsa>=3.1.4
  Downloading rsa-4.8-py3-none-any.whl (39 kB)
Requirement already satisfied, skipping upgrade: six>=1.6.1 in /usr/lib/python3/dist-packages (from oauth2client) (1.14
.0)
Collecting requests-oauthlib>=0.7.0
  Downloading requests_oauthlib-1.3.1-py2.py3-none-any.whl (23 kB)
```

```
user@box:~/demo$ cp ~/iot/lesson7/rpi_spreadsheet.py .
user@box:~/demo$ mv ~/Downloads/rpidata-*.json ~/demo
mv: cannot stat '/home/user/Downloads/rpidata-*.json': No such file or directory
user@box:~/demo$ mv ~/Downloads/rpidata-*.json ~/demo
mv: cannot stat '/home/user/Downloads/rpidata-*.json': No such file or directory
user@box:~/demo$ mv ~/Downloads/*.json ~/demo
user@box:~/demo$ ls
API_KEY.pickle                      pubraspi.py   rpi_spreadsheet.py  system_info.py          thingspeak_feed.py
nodal-reserve-345023-552915316964.json  __pycache__  subraspi.py          thingspeak_cpu_loop.py
user@box:~/demo$ nano rpi_spreadsheet.py
```

```
user@box:~/demo$ python3 rpi_spreadsheet.py
Free RAM: 0 (1983)
Number of processes: 184
Up time:  4:21
Number of connections: 3
Temperature in C: 0
IP-address: 10.0.2.15
/bin/sh: 1: /opt/vc/bin/vcgencmd: not found
CPU speed in MHz:
Logging sensor measurements to rpidata every 10 seconds.
Press Ctrl-C to quit.
2022-03-22 19:45:27.965498
CPU Usage:    7.5 %
Temperature: 0.0 C
Wrote a row to rpidata
2022-03-22 19:45:38.349056
CPU Usage:    28.8 %
Temperature: 0.0 C
Wrote a row to rpidata
2022-03-22 19:45:48.678582
CPU Usage:    5.3 %
Temperature: 0.0 C
Wrote a row to rpidata
2022-03-22 19:45:59.022055
CPU Usage:    20.7 %
Temperature: 0.0 C
Wrote a row to rpidata
2022-03-22 19:46:09.551793
CPU Usage:    13.9 %
Temperature: 0.0 C
Wrote a row to rpidata
2022-03-22 19:46:19.902192
```

| Date / Time | CPU Usage % | Temperature C |
| --- | --- | --- |
| 2022-03-22 19:45:27.965498 | 7.5 | 0 |
| 2022-03-22 19:45:38.349056 | 28.8 | 0 |
| 2022-03-22 19:45:48.678582 | 5.3 | 0 |
| 2022-03-22 19:45:59.022055 | 20.7 | 0 |
| 2022-03-22 19:46:09.551793 | 13.9 | 0 |
| 2022-03-22 19:46:19.902192 | 13.3 | 0 |
| 2022-03-22 19:46:30.270358 | 8.5 | 0 |
| 2022-03-22 19:46:40.633096 | 8.3 | 0 |
| 2022-03-22 19:46:50.993764 | 11.7 | 0 |
| 2022-03-22 19:47:01.354180 | 4.9 | 0 |
| 2022-03-22 19:47:11.563490 | 1.7 | 0 |
| 2022-03-22 19:47:21.915570 | 1.9 | 0 |
| 2022-03-22 19:47:32.325333 | 1.1 | 0 |
| 2022-03-22 19:47:42.558129 | 1.6 | 0 |
| 2022-03-22 19:47:52.911261 | 3 | 0 |
| 2022-03-22 19:48:03.257785 | 3.3 | 0 |
| 2022-03-22 19:48:13.647424 | 3.5 | 0 |
| 2022-03-22 19:48:24.069985 | 3.6 | 0 |
| 2022-03-22 19:48:34.415179 | 1.4 | 0 |