

Lab 10A: Blockchain

Hash function with randomization

```
pi@Zhaoning: ~/iot/lesson10
File Edit Tabs Help
pi@Zhaoning:~/iot/lesson10$ cd ~/iot/lesson10
pi@Zhaoning:~/iot/lesson10$ cat hash_value.py
# hash(object) returns the hash value of the object (if it has one)
# Hash values are integers
# They are used to quickly compare dictionary keys during a dictionary lookup
# Numeric values that compare equal have the same hash value even if they are of different types, as is the case for 1 and 1.0
# For objects with custom __hash__() methods, note that hash() truncates the return value based on the bit width of the host machine

# hash for integer unchanged
print('The hash for 1 is:', hash(1))

# hash for decimal
print('The hash for 1.0 is:', hash(1.0))
print('The hash for 3.14 is:', hash(3.14))

# hash for string
print('The hash for Python is:', hash('Python'))

# hash for a tuple of vowels
vowels = ('a', 'e', 'i', 'o', 'u')
print('The hash for a tuple of vowels is:', hash(vowels))

# hash for a custom object
class Person:
    def __init__(self, age, name):
        self.age = age
        self.name = name
    def __eq__(self, other):
        return self.age == other.age and self.name == other.name
    def __hash__(self):
        return hash((self.age, self.name))
person = Person(23, 'Ada')
print('The hash for an object of person is:', hash(person))
pi@Zhaoning:~/iot/lesson10$ python3 hash_value.py
The hash for 1 is: 1
The hash for 1.0 is: 1
The hash for 3.14 is: 1846836513
The hash for Python is: 701838455
The hash for a tuple of vowels is: 1777737929
The hash for an object of person is: 209628372
pi@Zhaoning:~/iot/lesson10$ python3 hash_value.py
The hash for 1 is: 1
The hash for 1.0 is: 1
The hash for 3.14 is: 1846836513
The hash for Python is: 831970553
The hash for a tuple of vowels is: 198920277
The hash for an object of person is: -535305441
pi@Zhaoning:~/iot/lesson10$
```

SHA-2 Secure Hash Algorithm

```
pi@Zhaoning:~/iot/lesson10$ python3
Python 3.7.3 (default, Jul 25 2020, 13:03:44)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license()" for more information.
>>> import hashlib
>>> m=hashlib.sha256(b"hello, world")
>>> m.hexdigest()
'09ca7e4eaa6e8ae9c7d261167129184883644d07dfba7cbfbc4c8a2e08360d5b'
>>> m.digest_size
32
>>> m.block_size
64
>>> exit()
```

Build the tiniest blockchain in less than 50 lines of Python

by [Gerald Nash](#)

```
pi@Zhaoning: ~  
File Edit Tabs Help  
previous_block = blockchain[0]  
  
# How many blocks should we add to the chain  
# after the genesis block  
num_of_blocks_to_add = 20  
  
# Add blocks to the chain  
for i in range(0, num_of_blocks_to_add):  
    block_to_add = next_block(previous_block)  
    blockchain.append(block_to_add)  
    previous_block = block_to_add  
    # Tell everyone about it!  
    print("Block #{} has been added to the blockchain!".format(block_to_add.index))  
    print("Hash: {}".format(block_to_add.hash))  
pi@Zhaoning:~/iot/lesson10 $ python3 snakecoin.py  
Block #1 has been added to the blockchain!  
Hash: 263b571bf9ec212c1773441614765a1c57878342e98b7cd4bf745c1b1868809  
  
Block #2 has been added to the blockchain!  
Hash: aadb33d431093130cb455b34d00bdf5fa9d1b665706628fabbeed843d977c697  
  
Block #3 has been added to the blockchain!  
Hash: 2ae40d911c6bac97d98bbd6284c59e9f820c97748e28fd07c46fc9fcab0223fb  
  
Block #4 has been added to the blockchain!  
Hash: a5ee9b9d3604b4f87da9663d09c0ae2a32756d8da44dff003254a92e65447fba  
  
Block #5 has been added to the blockchain!  
Hash: 649a4d8c6af48c5c614150ee7f2452f07ce8eae05e97312111aac1ca8e72020a  
  
Block #6 has been added to the blockchain!  
Hash: d11e496963d81fbb2a888d5776a3ceb44a1b09b15dcf4cd24fac30a312c9aa3  
  
Block #7 has been added to the blockchain!  
Hash: e5ded01d72bc9c811631a8de0e007e77f254d4d5436ee35830dfea757d40b052  
  
Block #8 has been added to the blockchain!  
Hash: 7992242fd94d93f06b01dacb72db91256585ae683daf7100165b0db7141bdeb2  
  
Block #9 has been added to the blockchain!  
Hash: 400d2a28a6660a0e6f26c090d46d7fdd293401db4da0801953eb73cb84701c54  
  
Block #10 has been added to the blockchain!  
Hash: e521d4e44bc672e09e1c3ef8eb369d6c3f7f31b307b63bf0b51704c6af20cc4  
  
Block #11 has been added to the blockchain!  
Hash: 8bb307709f7f3c716f3a47e86b146b4a9c7e0519e9b1c0e1942c62eb05fd9dc5  
  
Block #12 has been added to the blockchain!  
Hash: 100d6929b5bfb730d198d7ed90c6cb2ecceaf19d772ce7312d9ed20869955a40  
  
Block #13 has been added to the blockchain!  
Hash: 1fbb6f95cb41f83b40705081ae3d9ebabe4775869a7468f0c528b18c8fc767e4  
  
Block #14 has been added to the blockchain!  
Hash: 1ec83dd4be0625c32356d721aa03c754ec123c7dfc5ed53e00ea93f0fa826d47  
  
Block #15 has been added to the blockchain!  
Hash: 0a3e2e317c5cdcd30aa3ce423c5e2a1337e5f027a19d09ad2d3e5ebc13ff6247  
  
Block #16 has been added to the blockchain!  
Hash: 7f5c1b8805a1603e98d2e754a1bcb568083d89d2b2eea3eb46ede3caa6ebdf7f  
  
Block #17 has been added to the blockchain!  
Hash: de77f2319607c20e757aaf558d6e785298fcb508828a644a0f2eedb81e62387  
  
Block #18 has been added to the blockchain!  
Hash: d547404a93533f007e775af23d0db69597cfba14ea5561d94d04e02e85b61185  
  
Block #19 has been added to the blockchain!  
Hash: 240c49e924fd2b83a9ae04766c816cf4635bc0f4ba968bf146f50b006e022f41  
  
Block #20 has been added to the blockchain!  
Hash: 7bc887671a1b4dfb28370e5b4f4da849feeac4a50cad4739cae8f83e6708278  
  
pi@Zhaoning:~/iot/lesson10 $ cd  
pi@Zhaoning:~ $
```

Python blockchain app by [Satwik Kansal](#)

Terminal 1: Run `node_server.py`

Terminal 2: Run run_app.py

```
pi@Zhaooning: ~/python_blockchain_app
File Edit Tabs Help

pi@Zhaooning:~$ git clone https://github.com/satwikansal/python_blockchain_app.git
Cloning into 'python_blockchain_app'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Compressing objects: 100% (3/3), done.
remote: Total 143 (delta 0), reused 1 (delta 0), pack-reused 140
Receiving objects: 100% (143/143), 221.74 KiB | 1.22 MiB/s, done.
Resolving deltas: 100% (67/67), done.
pi@Zhaooning:~$ export FLASK_APP=node_server.py
pi@Zhaooning:~$ cd ~/python_blockchain_app
pi@Zhaooning:~/python_blockchain_app$ flask run --port 8000
* Serving Flask app "node_server"
* Running on http://127.0.0.1:8000/ (Press CTRL+C to quit)
```

```
pi@Zhaooning:~/python_blockchain_app
File Edit Tabs Help

pi@Zhaooning:~$ vncserver
VNC(R) Server 6.7.2 (42622) ARMv6 (May 13 2020 19:34:20)
Copyright (C) 2002-2020 RealVNC Ltd.
RealVNC and VNC are trademarks of RealVNC Ltd and are protected by trademark
registrations and/or pending trademark applications in the European Union,
United States of America and other jurisdictions.
Protected by UK patent 2461970; US patent 6760936; EU patent 2852951.
See https://www.realvnc.com for information on VNC.
For third party acknowledgements see:
https://www.realvnc.com/docs/4/foxx.html
OS: Raspbian GNU/Linux 10, Linux 5.4.72, armv7l

Generating private key...
On some distributions (in particular Red Hat), you may get a better experience
by running vncserver-virtual in conjunction with the system Xorg server, rather
than the old version built-in to Xvnc. More desktop environments and
applications will likely be compatible. For more information on this alternative
implementation, please see: https://www.realvnc.com/doclink/kb-546

Running applications in /etc/vnc/xstartup

VNC Server catchphrase: "Total response history. Percent radius letter."
signature: ef-2a-34-35-7e-4a-dd-91

Log file is /home/pi/.vnc/Zhaooning1.log
New desktop is Zhaooning:1 (192.168.1.169)
pi@Zhaooning:~$ cd ~/python_blockchain_app
pi@Zhaooning:~/python_blockchain_app$ python3 run_app.py
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
* Restarting with stat
* Debugger is active!
* Debugger PIN: 136-128-120
```

Lab 10B: IOTA

[PyOTA](#) (IOTA Python Client Library) and [IRI](#) (IOTA Reference Implementation)

```

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pipZhaoning ~
$ sudo pip3 install pyota[curl]
Looking in indexes: https://pypi.org/simple, https://www.piwheels.org/simple
Collecting pyota[curl]
  Downloading https://files.pythonhosted.org/packages/77/3a/b3c56dc3957bde6fd258e1cef35ceb76cd5463a99032ef36370996596/PYOTA-2.0.2-py2.py3-none-any.whl (1138k)
    100% |#####| 1258k 790k/s
Requirement already satisfied: requests[security]>=2.4.1 in /usr/local/lib/python3.7/dist-packages (from pyota[curl]) (2.24.0)
Collecting pyth3
  Downloading https://files.pythonhosted.org/packages/bc/3a/25a68077d6ebfd1d6ad9687816c35ae691016e6735c31d4739f725f/pyth3_filters-2.0.2-py3-none-any.whl
Collecting pyth3 [from pyota[curl]]
  Downloading https://www.piwheels.org/simple/pyth3/pyth3a-1.0.2-cp37-cp37a-linux_armv7l.whl (464k)
    100% |#####| 74k 30k/s
Requirement already satisfied: six in /usr/local/lib/python3.7/dist-packages (from pyth3[curl]) (1.11.0)
Collecting pyota-curl; extra == "curl" (from pyota[curl])
  Downloading https://www.piwheels.org/simple/pyota-curl/PYOTA-curl-1.0.2-cp37-cp37a-linux_armv7l.whl
Requirement already satisfied: certifi>=2007.4.17 in /usr/lib/python3/dist-packages (from requests[security]>=2.4.1-pyota[curl]) (2018.8.24)
Requirement already satisfied: chardet<4, >=3.0.2 in /usr/local/lib/python3/dist-packages (from requests[security]>=2.4.1-pyota[curl]) (3.0.4)
Requirement already satisfied: idna<3, >=2.0 in /usr/lib/python3/dist-packages (from requests[security]>=2.4.1-pyota[curl]) (2.8.1)
Requirement already satisfied: urllib3<1.25, >=1.21.1 in /usr/lib/python3/dist-packages (from requests[security]>=2.4.1-pyota[curl]) (1.24.1)
Requirement already satisfied: smtplib<5, >=2.5 in /usr/lib/python3/dist-packages (from requests[security]>=2.4.1-pyota[curl]) (2.6)
Requirement already satisfied: pyopenssl<19.0.0, >=14; extra == "security" in /usr/local/lib/python3.7/dist-packages (from requests[security]>=2.4.1-pyota[curl]) (17.0.6)
Requirement already satisfied: cryptography>=2.4; extra == "security" in /usr/local/lib/python3.7/dist-packages (from requests[security]>=2.4.1-pyota[curl]) (3.2.1)
Collecting regex>=2018.8.17 (from phx-filters; python version >= "3.5")-pyota[curl]
  Downloading https://www.piwheels.org/simple/regex/regex-2020.11.13-cp37-cp37a-linux_armv7l.whl (6278k)
    100% |#####| 8248k 942k/s
Requirement already satisfied: phx-class-registry (from phx-filters; python version >= "3.5")-pyota[curl]
  Downloading https://files.pythonhosted.org/packages/32/70/666ac3cf268489c3cab08757b36341d0d9b4bd9ca15421f056a7704377/phx_class_registry-3.0.5-py3-none-any.whl
Requirement already satisfied: python-datapi in /usr/local/lib/python3.7/dist-packages (from phx-filters; python version >= "3.5")-pyota[curl] (2.8.1)
Requirement already satisfied: pytz in /usr/local/lib/python3.7/dist-packages (from phx-filters; python version >= "3.5")-pyota[curl] (2020.1)
Requirement already satisfied: effn1.11.3, >=1.8 in /usr/local/lib/python3.7/dist-packages (from cryptography>=2.4; extra == "security"-requests[security]>=2.4.1-pyota[curl]) (1.14.3)
Requirement already satisfied: pygamm in /usr/local/lib/python3.7/dist-packages (from effn1.11.3, >=1.8; cryptography>=2.4; extra == "security"-requests[security]>=2.4.1-pyota[curl]) (2.20)
Installing collected packages: regex, phx-class-registry, phx-filters, pyth3a, pyota-curl, pyota
Successfully installed phx-class-registry-3.0.5 phx-filters-2.0.2 pyota-2.1.0 pyota-curl-1.0.9 pyth3a-1.0.2 regex-2020.11.13

pipZhaoning ~$ cd ~/iot/leson01
from iot import Iota

# Create a new instance of the IOTA API object
# Specify which node to connect to
url = total(adapter = "https://nodes.devnet.iota.org:443")

# Call the 'get_node_info()' method for information about the node and the Tangle
response = api.get_node_info()

print(response)

pipZhaoning ~$ iot/leson01 $ python3 iri_node_info.py
{"latestMilestone": "TransactionHash6B73A9E8M0U0AVG9HQAFCQKUC2TQC8H0ZAKATUJGV5VNZ8UJ3CPXKUFZEDG0UQW0B8H7K0A999", "latestSolidSubtangleMilestone": "TransactionHash6B73A9E8M0U0AVG9HQAFCQKUC2TQC8H0ZAKATUJGV5VNZ8UJ3CPXKUFZEDG0UQW0B8H7K0A999", "latestSolidSubtangleMilestone": "TransactionHash6B73A9E8M0U0AVG9HQAFCQKUC2TQC8H0ZAKATUJGV5VNZ8UJ3CPXKUFZEDG0UQW0B8H7K0A999", "duration": 0, "features": {"NewHeight": "VerifiableDeduplicationFrom", "Sleepable": "True", "Sleepable": "True", "LastSnapshotMilestoneIndex": 205970, "LatestMilestoneIndex": 205970, "LatestSolidSubtangleMilestoneIndex": 205974, "MilestoneStartIndex": 1910454, "Neighbors": 1, "Time": 160593010000, "Tips": 3, "TransactionsToRequest": 0}

pipZhaoning ~$

```

Download and build the C library for BCM2835

```
pi@Zhaoning: ~  
File Edit Tabs Help  
make[2]: Leaving directory '/home/pi/bcm2835-1.60/src'  
Making all in doc  
make[2]: Entering directory '/home/pi/bcm2835-1.60/doc'  
make[2]: Nothing to be done for 'all'.  
make[2]: Leaving directory '/home/pi/bcm2835-1.60/doc'  
make[2]: Entering directory '/home/pi/bcm2835-1.60'  
make[2]: Leaving directory '/home/pi/bcm2835-1.60'  
make[1]: Leaving directory '/home/pi/bcm2835-1.60'  
pi@Zhaoning:~/bcm2835-1.60 $ sudo make check  
Making check in src  
make[1]: Entering directory '/home/pi/bcm2835-1.60/src'  
make test  
make[2]: Entering directory '/home/pi/bcm2835-1.60/src'  
gcc -DHAVE_CONFIG_H -I. -I.. -g -O2 -MT test.o -MD -MP -MF .deps/test.Tpo -c -o test.o test.c  
mv -f .deps/test.Tpo .deps/test.Po  
gcc -g -O2 -o test test.o ./libbcm2835.a -lrt  
make[2]: Leaving directory '/home/pi/bcm2835-1.60/src'  
make check-TESTS  
make[2]: Entering directory '/home/pi/bcm2835-1.60/src'  
make[3]: Entering directory '/home/pi/bcm2835-1.60/src'  
PASS: test  
=====
```

```
Testsuite summary for bcm2835 1.60  
=====
```

```
# TOTAL: 1  
# PASS: 1  
# SKIP: 0  
# XFAIL: 0  
# FAIL: 0  
# XPASS: 0  
# ERROR: 0  
=====
```

```
make[3]: Leaving directory '/home/pi/bcm2835-1.60/src'  
make[2]: Leaving directory '/home/pi/bcm2835-1.60/src'  
make[1]: Leaving directory '/home/pi/bcm2835-1.60/src'  
Making check in doc  
make[1]: Entering directory '/home/pi/bcm2835-1.60/doc'  
make[1]: Nothing to be done for 'check'.  
make[1]: Leaving directory '/home/pi/bcm2835-1.60/doc'  
make[1]: Entering directory '/home/pi/bcm2835-1.60'  
make[1]: Leaving directory '/home/pi/bcm2835-1.60'  
pi@Zhaoning:~/bcm2835-1.60 $ sudo make install  
Making install in src  
make[1]: Entering directory '/home/pi/bcm2835-1.60/src'  
make[2]: Entering directory '/home/pi/bcm2835-1.60/src'  
/bin/mkdir -p '/usr/local/lib'  
/usr/bin/install -c -m 644 libbcm2835.a '/usr/local/lib'  
( cd '/usr/local/lib' && ranlib libbcm2835.a )  
/bin/mkdir -p '/usr/local/include'  
/usr/bin/install -c -m 644 bcm2835.h '/usr/local/include'  
make[2]: Leaving directory '/home/pi/bcm2835-1.60/src'  
make[1]: Leaving directory '/home/pi/bcm2835-1.60/src'  
Making install in doc  
make[1]: Entering directory '/home/pi/bcm2835-1.60/doc'  
make[2]: Entering directory '/home/pi/bcm2835-1.60/doc'  
make[2]: Nothing to be done for 'install-exec-am'.  
make[2]: Nothing to be done for 'install-data-am'.  
make[2]: Leaving directory '/home/pi/bcm2835-1.60/doc'  
make[1]: Leaving directory '/home/pi/bcm2835-1.60/doc'  
make[1]: Entering directory '/home/pi/bcm2835-1.60'  
make[2]: Entering directory '/home/pi/bcm2835-1.60'  
make[2]: Nothing to be done for 'install-exec-am'.  
make[2]: Nothing to be done for 'install-data-am'.  
make[2]: Leaving directory '/home/pi/bcm2835-1.60'  
make[1]: Leaving directory '/home/pi/bcm2835-1.60'  
pi@Zhaoning:~/bcm2835-1.60 $ cd  
pi@Zhaoning:~ $
```

Clone the code repository

```
File Edit Tabs Help
pi@Zhaoning: ~/dht11-rasp3

/usr/include/nodejs/deps/v8/include/v8config.h:324:3: note: in definition of macro 'V8_DEPRECATED'
    declarator __attribute__((deprecated(message)))
    ^~~~~~
../node-dht-sensor.cpp:189:38: warning: 'uint32_t v8::Value::Uint32Value() const' is deprecated: Use maybe version [-Wdeprecated-declarations]
    _gpio_pin = args[1]->Uint32Value();
                               ^
In file included from /usr/include/nodejs/deps/v8/include/v8.h:26,
                 from /usr/include/nodejs/src/node.h:63,
                 from ../node-dht-sensor.cpp:1:
/usr/include/nodejs/deps/v8/include/v8.h:2477:47: note: declared here
V8_DEPRECATED("Use maybe version", uint32_t Uint32Value() const);
                                              ^
/usr/include/nodejs/deps/v8/include/v8config.h:324:3: note: in definition of macro 'V8_DEPRECATED'
    declarator __attribute__((deprecated(message)))
    ^~~~~~
In file included from ../node-dht-sensor.cpp:1:
../node-dht-sensor.cpp: At global scope:
/usr/include/nodejs/src/node.h:573:43: warning: cast between incompatible function types from 'void (*)(v8::Handle<v8::Object>)' {aka 'void (*)(v8::Local<v8::Object>)' } to 'node::addon_register_func' {aka 'void (*)(v8::Local<v8::Object>, v8::Local<v8::Value>, void*)' } [-Wcast-function-type]
(node::addon_register_func) (regfunc),
                                     ^
/usr/include/nodejs/src/node.h:607:3: note: in expansion of macro 'NODE_MODULE_X'
NODE_MODULE_X(modname, regfunc, NULL, 0) // NOLINT (readability/null_usage)
^
../node-dht-sensor.cpp:280:1: note: in expansion of macro 'NODE_MODULE'
NODE_MODULE(node_dht_sensor, Init);
^
In file included from /usr/include/nodejs/src/node.h:63,
                 from ../node-dht-sensor.cpp:1:
/usr/include/nodejs/deps/v8/include/v8.h: In instantiation of 'void v8::PersistentBase<T>::SetWeak(P*, typename v8::WeakCallbackInfo<P>::Callback, v8::WeakCallbackType) [with P = node::ObjectWrap; T = v8::Object; typename v8::WeakCallbackInfo<P>::Callback = void (*)(const v8::WeakCallbackInfo<node::ObjectWrap>*)]':
/usr/include/nodejs/src/node_object_wrap.h:84:78: required from here
/usr/include/nodejs/deps/v8/include/v8.h:9502:16: warning: cast between incompatible function types from 'v8::WeakCallbackInfo<node::ObjectWrap>::Callback' {aka 'void (*)(const v8::WeakCallbackInfo<node::ObjectWrap>*)' } to 'Callback' {aka 'void (*)(const v8::WeakCallbackInfo<void>*)' } [-Wcast-function-type]
    reinterpret_cast<Callback>(callback), type);
    ^
/usr/include/nodejs/deps/v8/include/v8.h: In instantiation of 'void v8::PersistentBase<T>::SetWeak(P*, typename v8::WeakCallbackInfo<P>::Callback, v8::WeakCallbackType) [with P = Nan::ObjectWrap; T = v8::Object; typename v8::WeakCallbackInfo<P>::Callback = void (*)(const v8::WeakCallbackInfo<Nan::ObjectWrap>*)]':
../nan/nan_object_wrap.h:66:61: required from here
/usr/include/nodejs/deps/v8/include/v8.h:9502:16: warning: cast between incompatible function types from 'v8::WeakCallbackInfo<Nan::ObjectWrap>::Callback' {aka 'void (*)(const v8::WeakCallbackInfo<Nan::ObjectWrap>*)' } to 'Callback' {aka 'void (*)(const v8::WeakCallbackInfo<void>*)' } [-Wcast-function-type]
CXX(target) Release/obj.target/node_dht_sensor/dht-sensor.o
SOLINK_MODULE(target) Release/obj.target/node_dht_sensor.node
COPY Release/node_dht_sensor.node
make: Leaving directory '/home/pi/dht11-rasp3/node_modules/node-dht-sensor/build'
npm WARN dht11-rasp3@1.0.0 No repository field.

added 9 packages from 22 contributors in 30.25s
pi@Zhaoning:~/dht11-rasp3 $
```

Terminal 1: Run mam_publish.js

Terminal 2 on the same or another Raspberry Pi: Run mam_receive.js

```
File Edit Tabs Help
pi@Zhaoning: ~/dht11-rasp3
pi@Zhaoning:~/dht11-rasp3$ node mam_publish.js
{
  data: {
    temperature: 28.5,
    humidity: 65,
    timestamp: '2023-10-10T10:10:10.101Z'
  },
  address: '192.168.1.101'
}

File Edit Tabs Help
pi@Zhaoning: ~/dht11-rasp3
pi@Zhaoning:~/dht11-rasp3$ node mam_receive.js
You have entered an invalid root: YOUR_ROOT
pi@Zhaoning:~/dht11-rasp3$
```


Change sensor type from DHT11 to DHT22 and GPIO pin from 4 to 24 (The sensor is required)

```
*sensor.js - Mousepad
File Edit Search View Document Help

1) You can change the default setting: TIMEINTERVAL
2) Do not forget to type: npm install
3) Start the app: node sensor.js
4) If you encounter problems reading the DHT11 sensor data and wants more logging:
   Type: npm uninstall node-dht-sensor
   Type: npm install node-dht-sensor --dht_verbose=true

   If you have fixed your problem:
   Type: npm uninstall node-dht-sensor
   Type: npm install node-dht-sensor --dht_verbose=false

More information:
https://www.mobilefish.com/developer/iota/iota\_quickguide\_raspi\_mam.html
*/
const sensor = require('node-dht-sensor');

const TIMEINTERVAL = 10; // seconds
const SENSORTYPE = 22; // 11=DHT11, 22=DHT22
const GPIOPIN = 24; // The Raspi gpio pin where data from the DHT11 is read

function readSensor(){
  sensor.read(SENSORTYPE, GPIOPIN, function(err, temperature, humidity) {
    if (!err) {
      console.log('temp: ' + temperature.toFixed(1) + 'C, ' + 'humidity: ' + humidity.toFixed(1) + '%');
    } else {
      console.log(err);
    }
  });
}

readSensor();

// Automatically update sensor value every N seconds
setInterval(readSensor, TIMEINTERVAL*1000);
```

```
*mam_sensor.js - Mousepad
File Edit Search View Document Help

/*
Author: Robert Lie (mobilefish.com)

The mam_sensor.js file publishes DHT11 sensor data (temperature and humidity) on the tangle using MAM.
This file only works on the Raspberry Pi.
The published data can be viewed using the mam_receive.js file or
https://www.mobilefish.com/services/cryptocurrency/mam.html (Select option: Data receiver)

Usage:
1) Connect DHT11 sensor to Raspberry Pi.
2) Do not forget to type: npm install
3) You can change the default settings: MODE, SIDEKEY, SECURITYLEVEL or TIMEINTERVAL
   If you do, make the same changes in mam_receive.js file.
4) Start the app: node mam_sensor.js

More information:
https://www.mobilefish.com/developer/iota/iota\_quickguide\_raspi\_mam.html
*/
const sensor = require('node-dht-sensor');
const Mam = require('./lib/mam.client.js');
const IOTA = require('iota.lib.js');
const moment = require('moment');

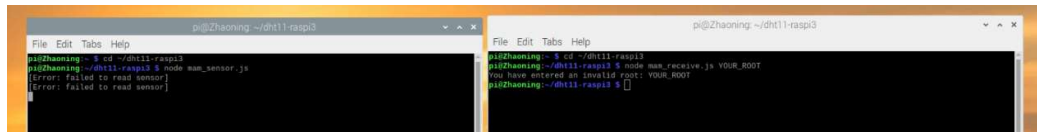
const iota = new IOTA({ provider: 'https://nodes.testnet.iota.org:443' });

const MODE = 'restricted'; // public, private or restricted
const SIDEKEY = 'mysecret'; // Enter only ASCII characters. Used only in restricted mode
const SECURITYLEVEL = 3; // 1, 2 or 3
const TIMEINTERVAL = 30; // seconds
const SENSORTYPE = 22; // 11=DHT11, 22=DHT22
const GPIOPIN = 24; // The Raspi gpio pin where data from the DHT11 is read

// Initialise MAM State
let mamState = Mam.init(iota, undefined, SECURITYLEVEL);
```

Terminal 1: Run mam_sensor.js

Terminal 2 on the same or another Raspberry Pi: Run mam_receive.js



The image shows two terminal windows side-by-side. The left window, titled 'pi@Zhaoning: ~/dht11-rasp3', shows the user running 'cd ~/dht11-rasp3' and then 'node mam_sensor.js'. This results in two lines of error output: 'Error: failed to read sensor' and 'Error: failed to read sensor'. The right window, also titled 'pi@Zhaoning: ~/dht11-rasp3', shows the user running 'cd ~/dht11-rasp3' and then 'node mam_receive.js YOUR_ROOT'. This results in two lines of output: 'You have entered an invalid root: YOUR_ROOT' and 'pi@Zhaoning:~/dht11-rasp3\$'.

```
pi@Zhaoning: ~/dht11-rasp3
File Edit Tabs Help
pi@Zhaoning:~$ cd ~/dht11-rasp3
pi@Zhaoning:~/dht11-rasp3$ node mam_sensor.js
Error: failed to read sensor
Error: failed to read sensor

pi@Zhaoning:~/dht11-rasp3
File Edit Tabs Help
pi@Zhaoning:~$ cd ~/dht11-rasp3
pi@Zhaoning:~/dht11-rasp3$ node mam_receive.js YOUR_ROOT
You have entered an invalid root: YOUR_ROOT
pi@Zhaoning:~/dht11-rasp3$
```