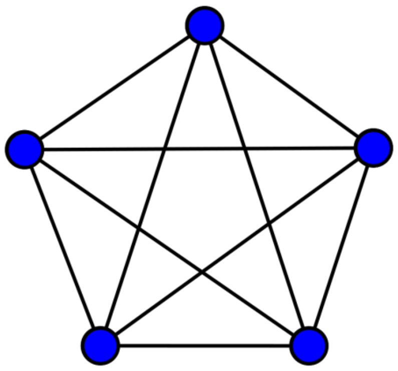
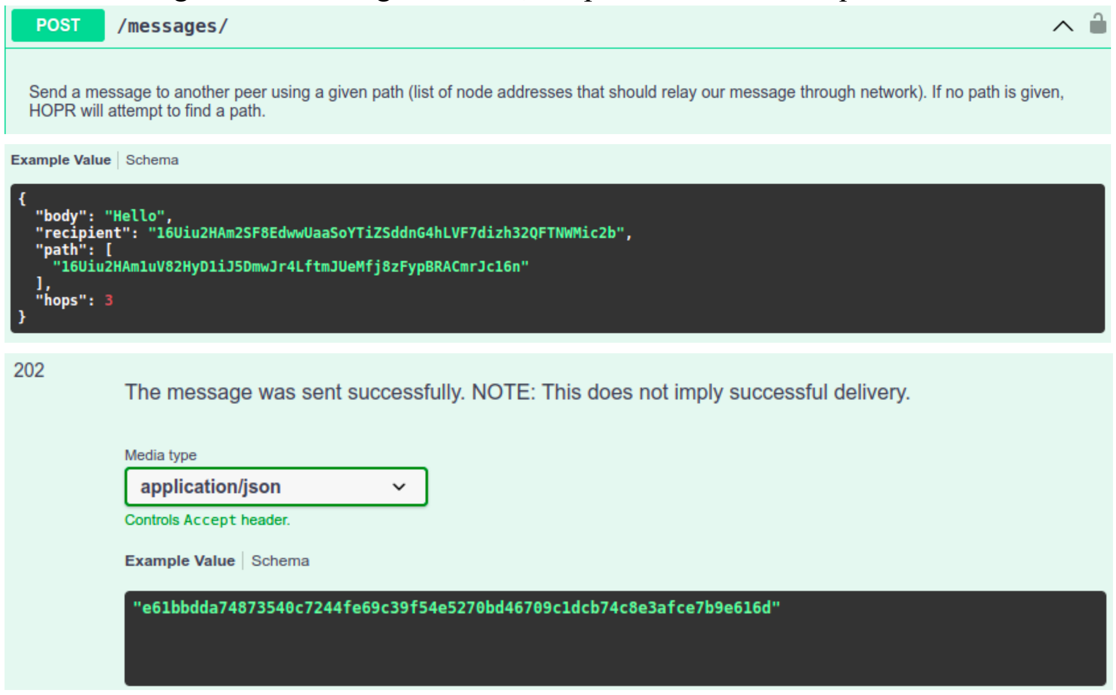
Test Plan - Messages

K5 Graph



All the HOPR graph nodes are interconnected to each other at all times, meaning that each HOPR node has a Websocket server running and other HOPR nodes connected to it act as Websocket clients. So for a k5 graph we will have 5 Websocket servers running and 5 Websocket clients connected to each, making up of 25 Websocket clients.
For interacting and controlling the nodes, simple HTTP REST requests are used.



`/messages/`

Send a message to another peer using a given path (list of node addresses that should relay our message through network). If no path is given, HOPR will attempt to find a path.

Example Value | Schema

```
{
  "body": "Hello",
  "recipient": "16Uiu2HAm2SF8EdwwUaaSoYTiZSddnG4hLVF7dizh32QFTNWMic2b",
  "path": [
    "16Uiu2HAm1uV82HyD1iJ5DmwJr4LftmJUeMfj8zFypBRACmrJc16n"
  ],
  "hops": 3
}
```

202

The message was sent successfully. NOTE: This does not imply successful delivery.

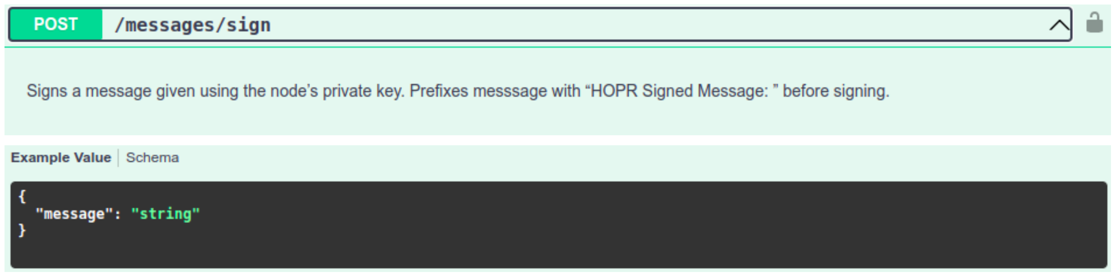
Media type

application/json

Controls Accept header.

Example Value | Schema

```
"e61bbdda74873540c7244fe69c39f54e5270bd46709c1dcb74c8e3afce7b9e616d"
```

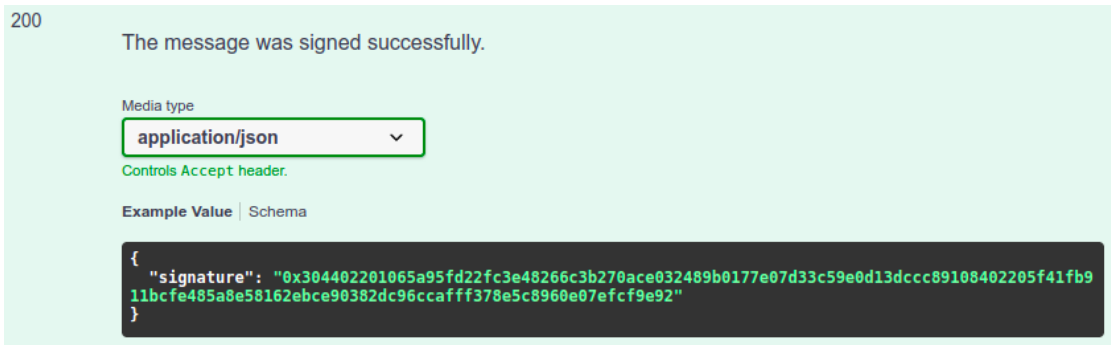


`/messages/sign`

Signs a message given using the node's private key. Prefixes messsage with "HOPR Signed Message: " before signing.

Example Value | Schema

```
{
  "message": "string"
}
```



200

The message was signed successfully.

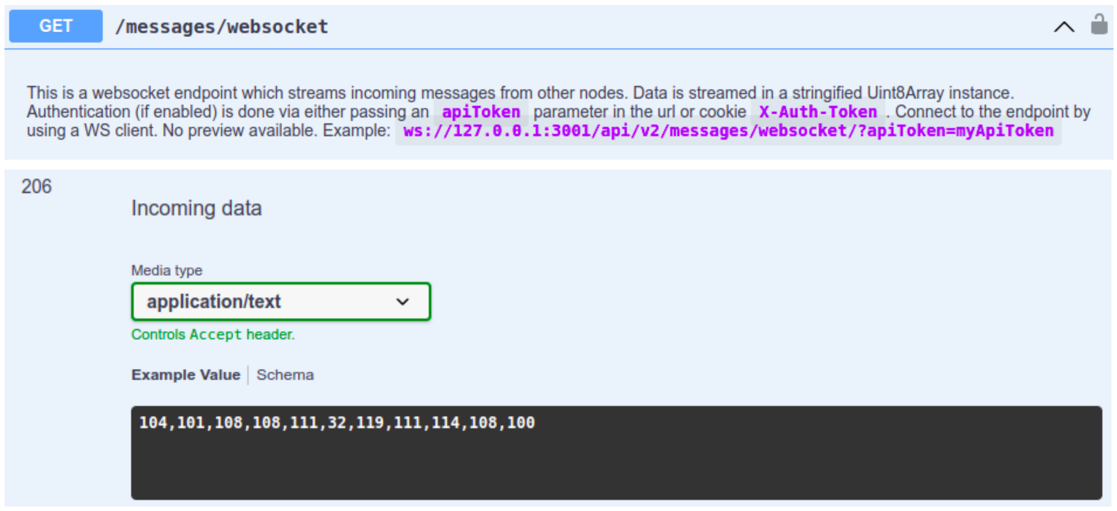
Media type

application/json

Controls Accept header.

Example Value | Schema

```
{
  "signature": "0x304402201065a95fd22fc3e48266c3b270ace032489b0177e07d33c59e0d13dccc89108402205f41fb9
11bcfe485a8e58162ebce90382dc96ccafff378e5c8960e07efcf9e92"
}
```



GET /messages/websocket

This is a websocket endpoint which streams incoming messages from other nodes. Data is streamed in a stringified Uint8Array instance. Authentication (if enabled) is done via either passing an `apiToken` parameter in the url or cookie `X-Auth-Token`. Connect to the endpoint by using a WS client. No preview available. Example: `ws://127.0.0.1:3001/api/v2/messages/websocket/?apiToken=myApiToken`

206

Incoming data

Media type

application/text

Controls Accept header.

Example Value | Schema

```
104,101,108,108,111,32,119,111,114,108,100
```

Functional Test Scenarios

1. Send message between 2 nodes with no hops

- Preconditions: Have a channel open between *node1* and *node2*

Step1: Send message from *node1* to *node2*

Step2: Check that the message is received on *node2*

- Check the stream of Uint8Array encoded numbers

Step3: Check that the message is not received by other nodes

Step4: Check that other nodes are not visited

Step5: ?Check that the balance is/not charged by the message?

2. Send message between 2 nodes with one defined hop peerId

- Preconditions: Have a channel open between *node1*, *node2*, and *node3*

Step1: Send message from *node1* to *node2* with *node3* as path

Step2: Check that the message arrives at *node2*

Step3: Check that *node3* was visited, and *node4* and *node5* are not visited

Step4: Check that the message is not received by other nodes

Step5: ?Check that the balance is/not charged by the message?

3. Send message between 2 nodes with 1 random hop and no defined path

Note: The random hops should be ignored in this case

- Preconditions: Have channels opened between *node1*, *node2*, *node4*, so that we can check that the random path chosen is through available *node4*. In the case there are channels open and funded between all k5 graph test setup nodes, then we have to check node 3, 4, and 5 just to see that the system has visited at least one node from those remaining 3 nodes.

Step1: Send message from *node1* to *node2* with 1 hop defined

Step2: Check that the message arrives at *node2*

Step3: Check that node4 was visited (or one of node 3, 4, or 5)

Step4: Check that the message is not received by other nodes
Step5: ?Check that the balance is/not charged by the message?

4. Send message between 2 nodes with one defined hop and 1 random hops

Note: The random hops should be ignored in this case
- Preconditions: Have channels opened between *node1*, *node2*, *node3* and at least one other node, just to see that the random hop does not go through other nodes.

Step1: Send message from *node1* to *node2* with *node3* as path and 1 hops
Step2: Check that the message arrives at *node2*
Step3: Check that 1 random hop is ignored and only *node3* is visited
Step4: Check that the message is not received by other nodes
Step5: ?Check that the balance is/not charged by the message?

Edge Cases

5. Send reply back from *node2* to *node1*

- Preconditions: Have a channel open between *node2* and *node1*

Step1: Send a test message from *node1* to *node2*
Step2: Send a test message back from *node2* to *node1*
Step3: Check that the test message arrives at node1
Step4: Check that other nodes don't receive the message
Step5: Check that other nodes are not visited

6. Send test message between 2 nodes with a fund-depleted hop in between

- Preconditions: make sure *node3* is out of funds

Step1: Send test message between *node1* and *node2* with *node3* as a defined path/hop
Step2: Check that message does not arrive at node2 (usually with a 5-10s timeout)
Step3: Perhaps check that node3 was visited (has to investigate what happens @node3 in this case and check against documentation)

Notes:
- For the provided test environment with 5 nodes, all the nodes are already funded but in a real word scenario the HOPR clients have to fund the nodes, so a few more scenarios could be built for those cases too.
- I have to still learn more about the system, and I'm sure I will be able to come up with more scenarios.

End-to-end Testing

Develop some end to end workflows to test some real-life use cases of the system.

1. Create some channels between certain nodes, fund them, send messages, etc

Fuzz Testing

1. Send 100 (or a certain fixed number) of messages between random nodes with random generated message (long and short) just to see what happens to the system

- Eventually, we can make a variation of this so that we will cover the following cases
  A. Direct messages
  B. Using defined hop address
  C. Using a certain number of random hops chosen by the system. in this case its a bit more challenging to check where the hops are routed through the system, but its possible with a controlled k5 graph in the test environment for example, and we can go around over all the nodes and check the visited timestamp, make a difference between them and see which ones are newer compared to the last visitation.