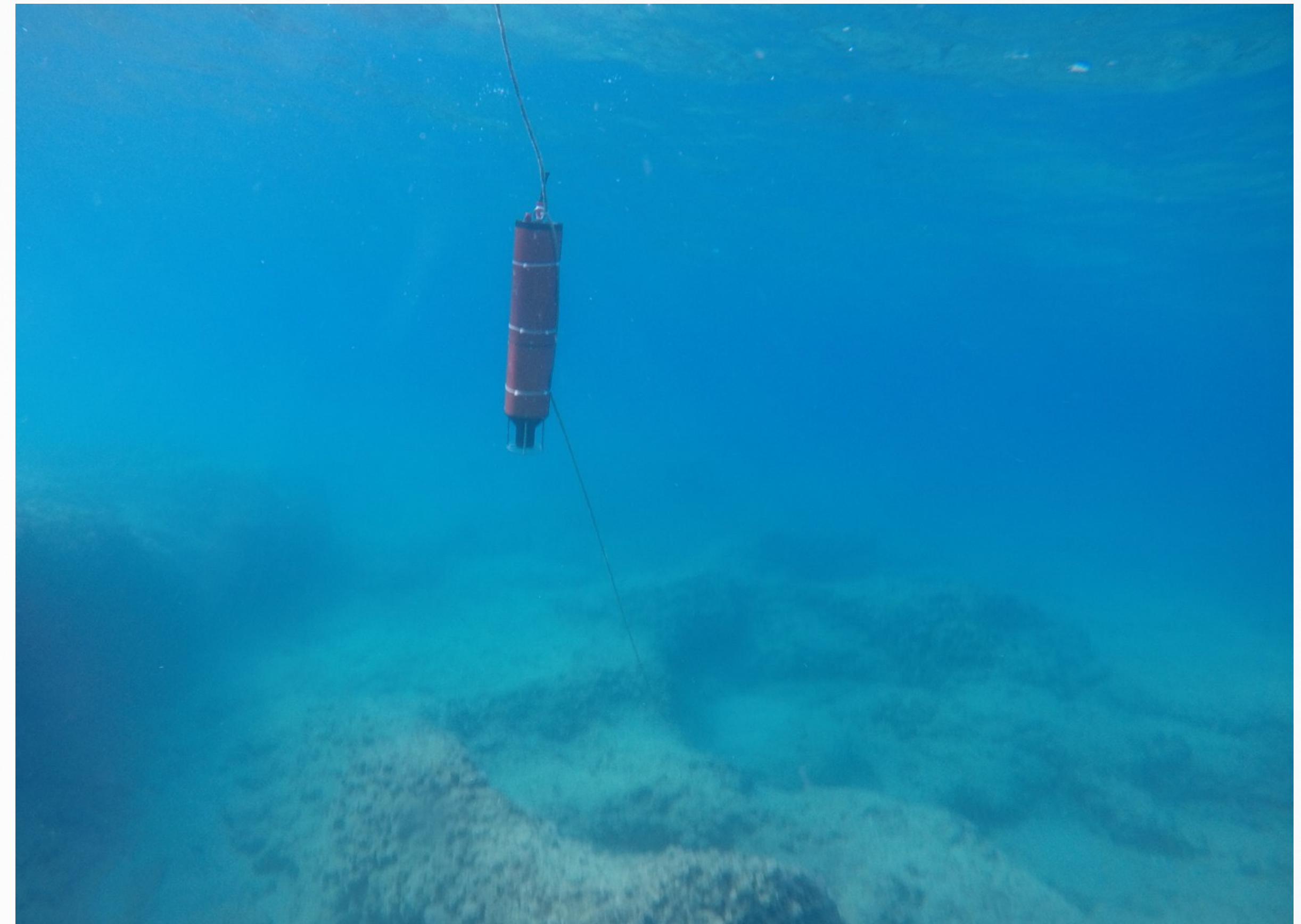


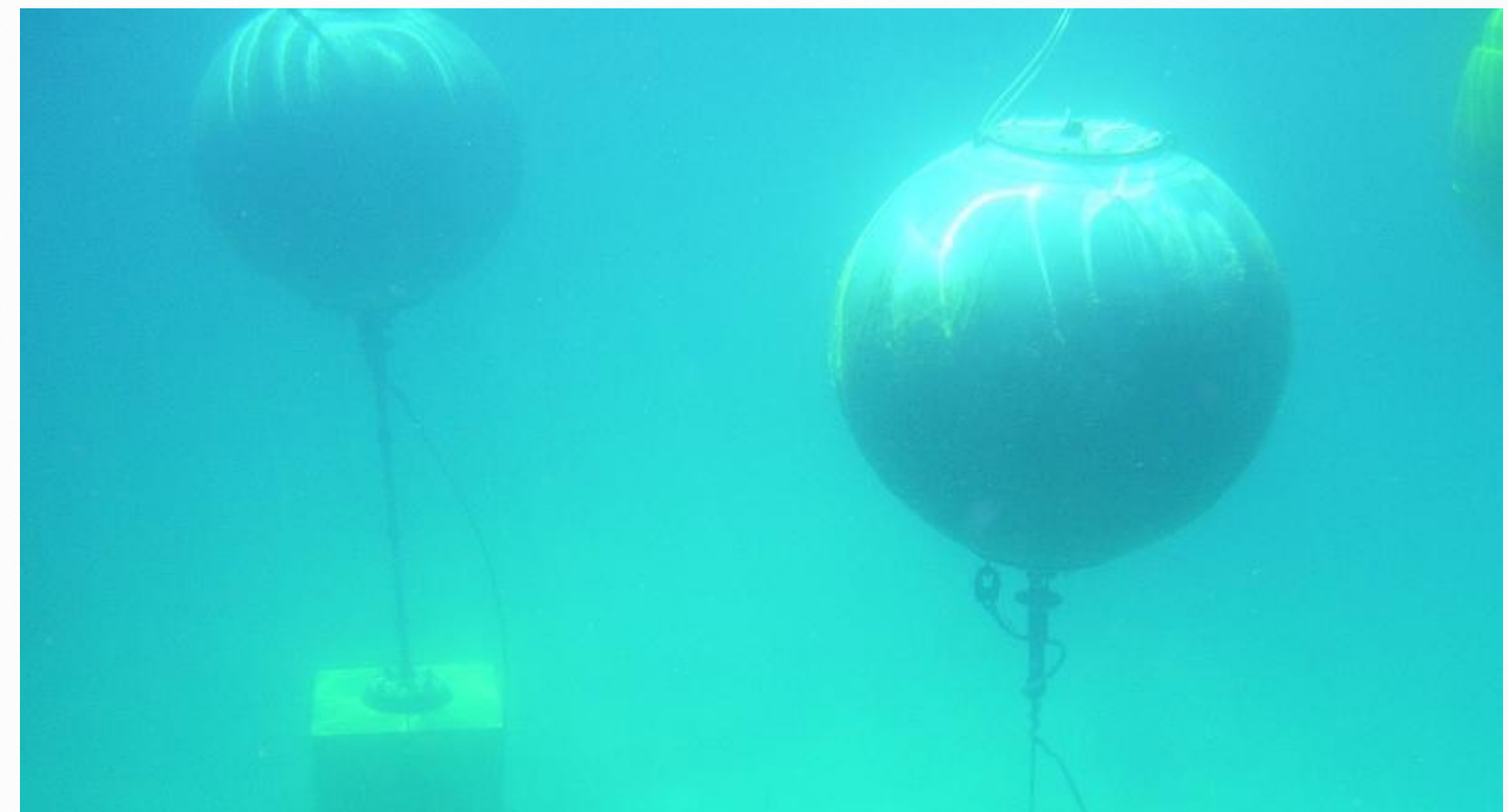
PART 4 - SENSORS AND THE INTERNET

- Sockets
- Tunnels
- Connection to Internet

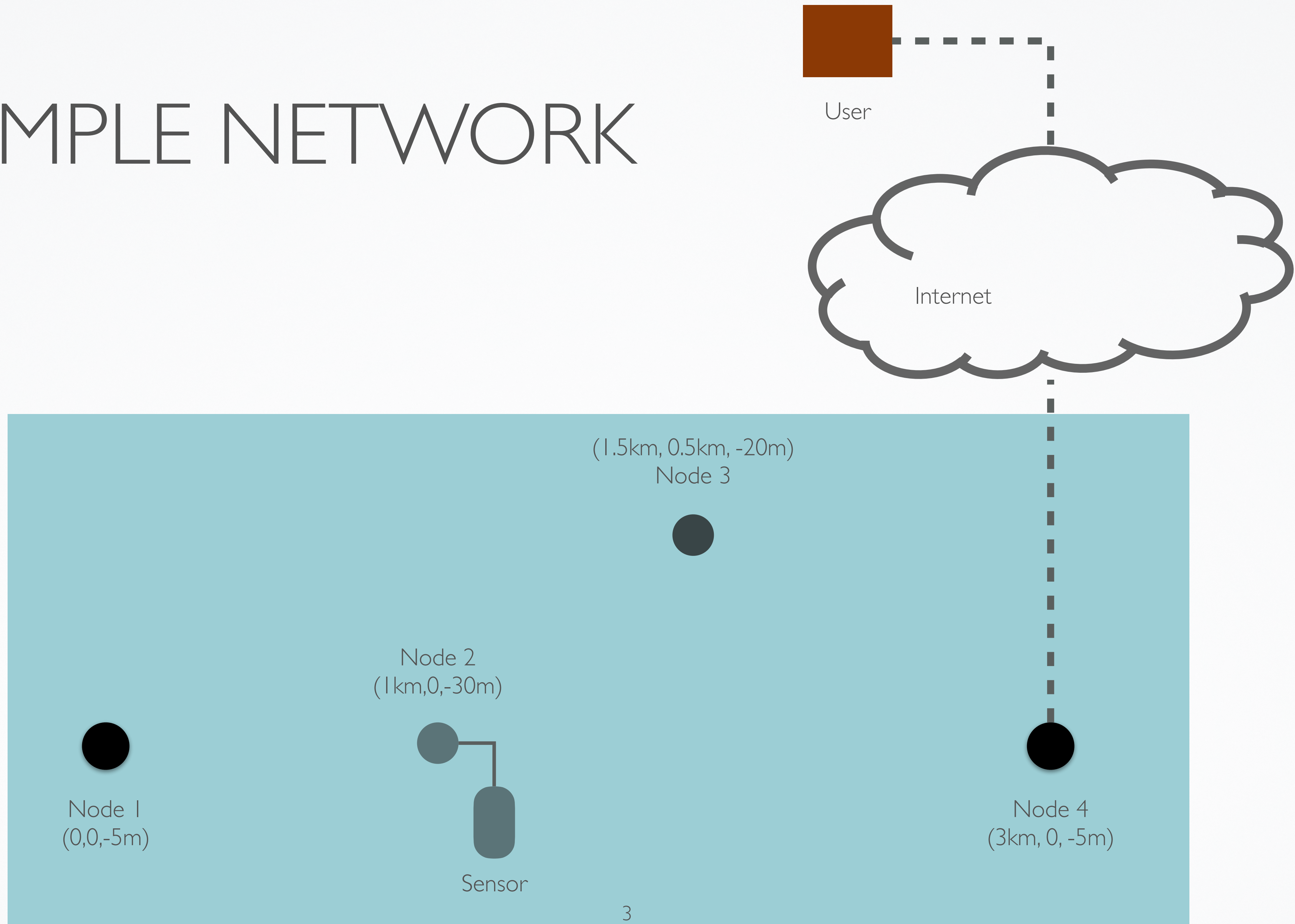


SENSORS AND DEVICES

- Underwater Sensors
- AUVs
- ROVs

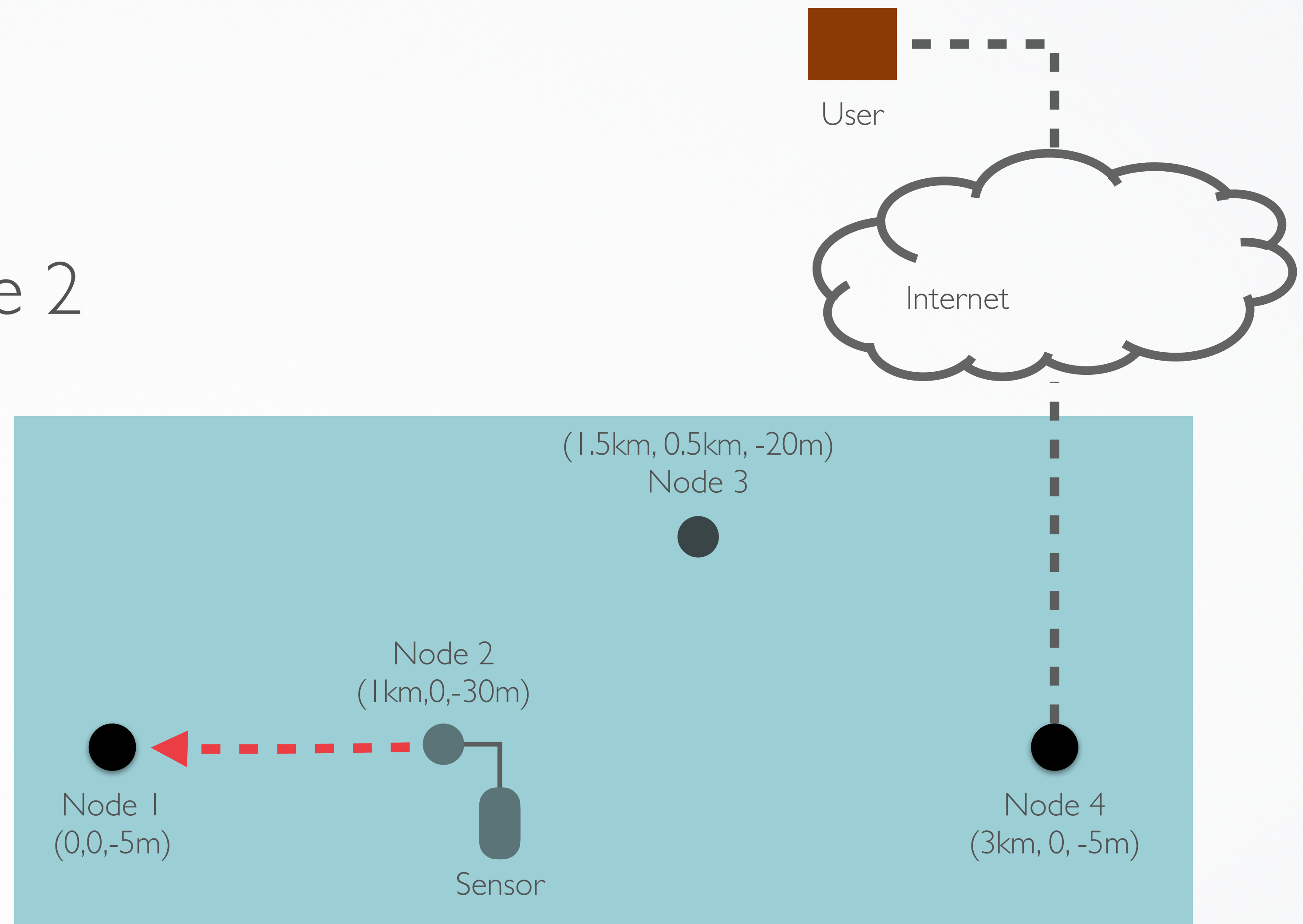


EXAMPLE NETWORK



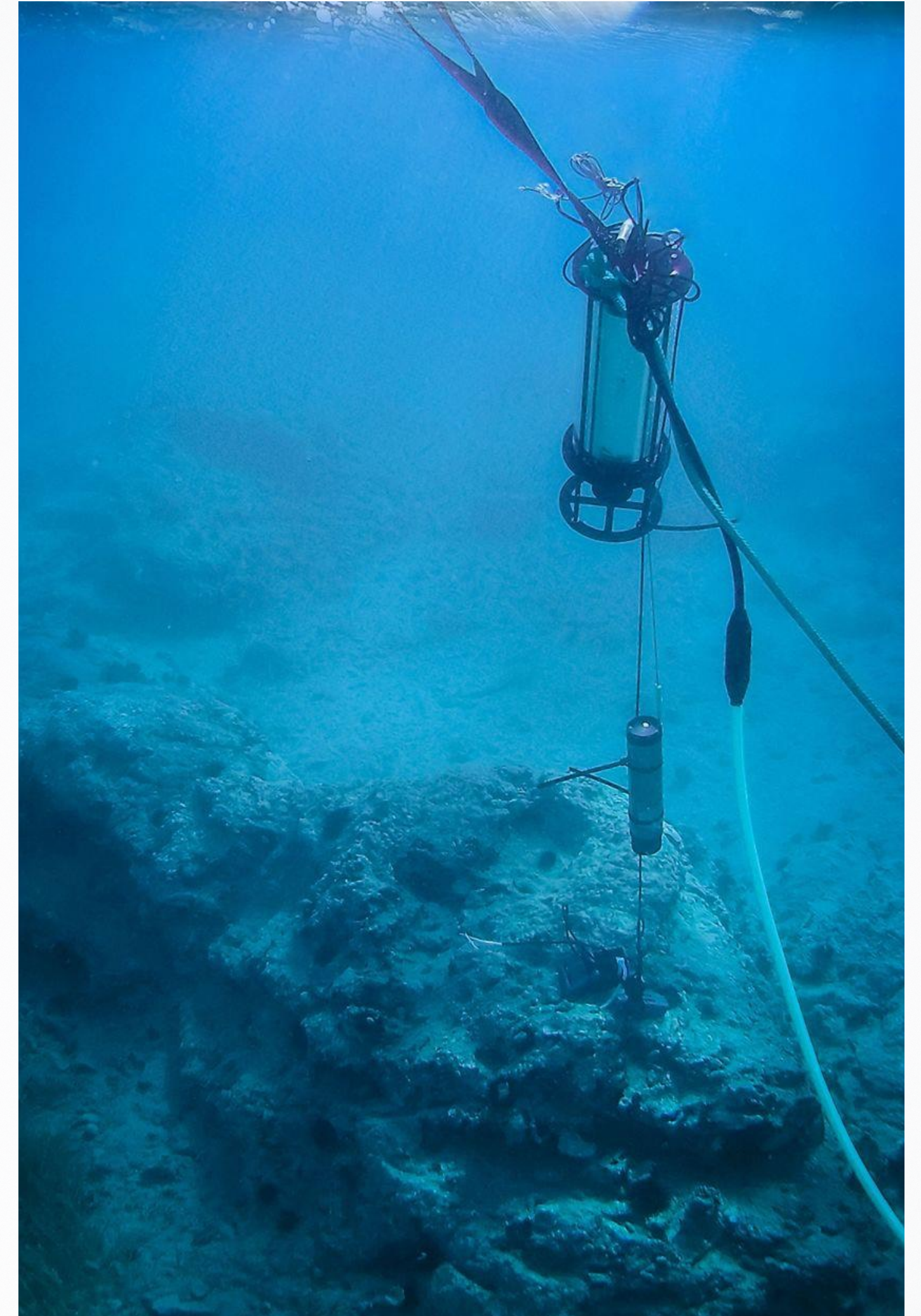
POINT-TO-POINT + ONE WAY DATA

- Sensor connected to Node 2
- Send data from Node 2
- Receive data on Node 1



EXAMPLE USE CASES

- Retrieve data from sea bottom mounted ADCP
- Retrieve data from strain gauge attached to an underwater structure



SOCKETS

- Commonly used in Terrestrial Networks
- Simple Abstraction over underlying Network layers
- Host : Port

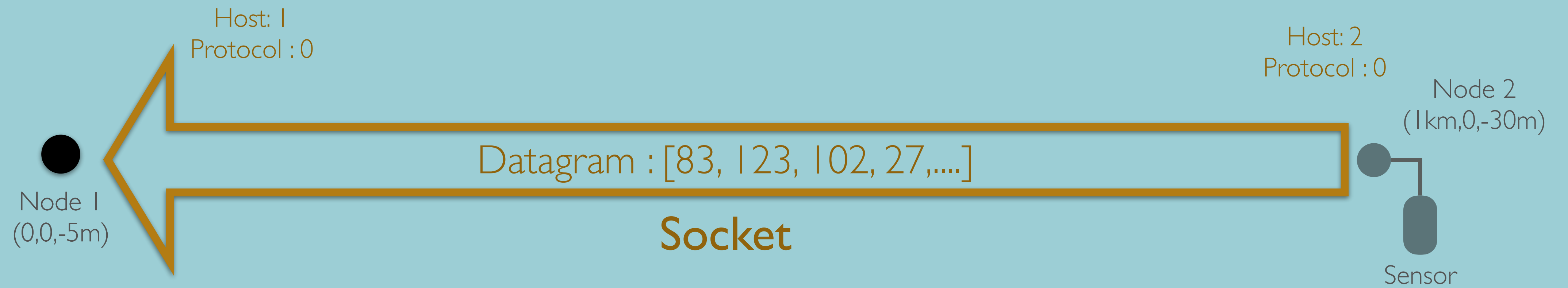


SOCKETS IN UNDERWATER NETWORKS

- UnetSocket API
- Host : Port \leftrightarrow Host : Protocol

```
def to = sock.host('B')           1
sock.connect(to, 0)               2
sock.send('hello!' as byte[])    3
sock.send('more data!' as byte[])
```


SOCKETS

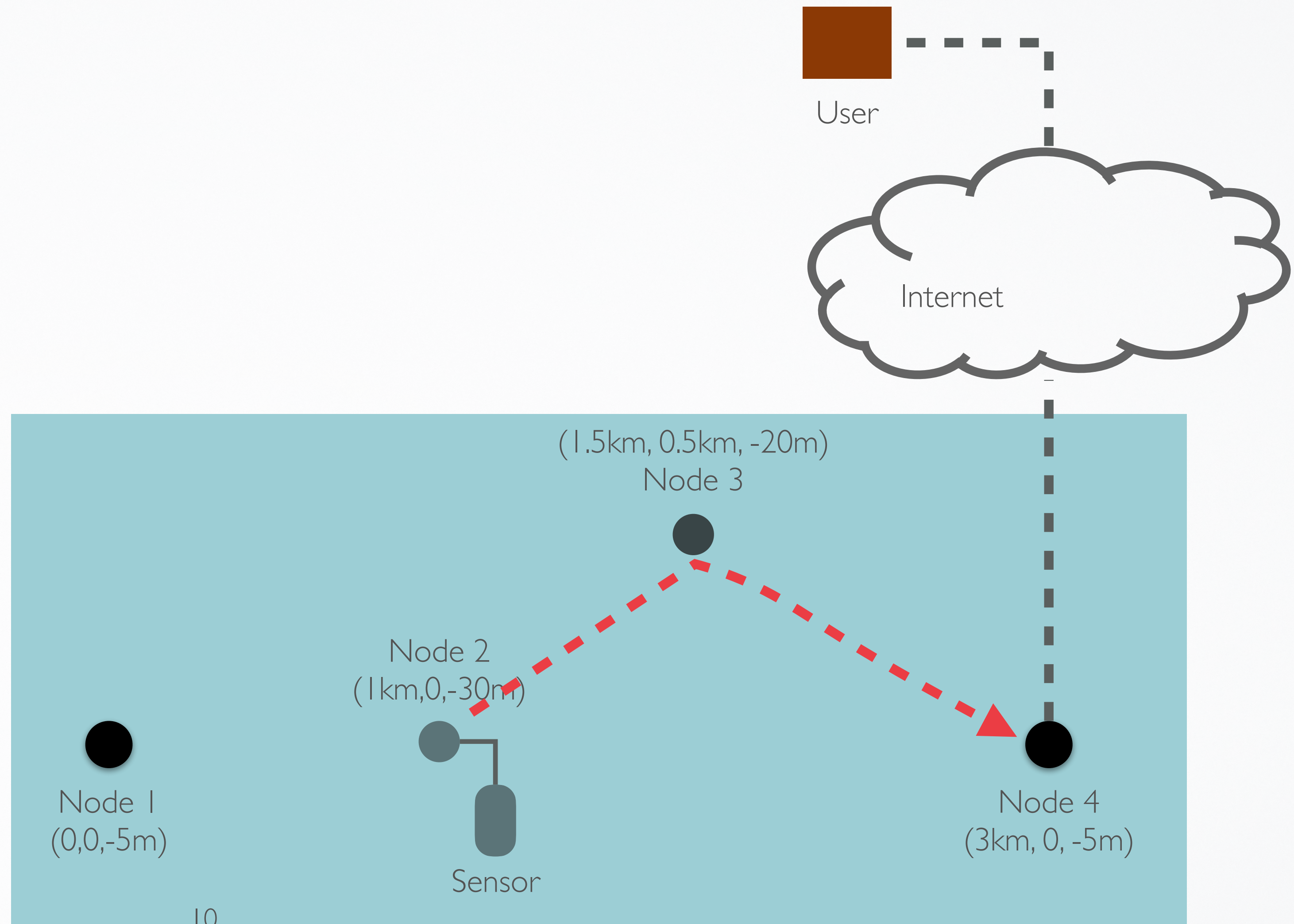




DEMO 4.1

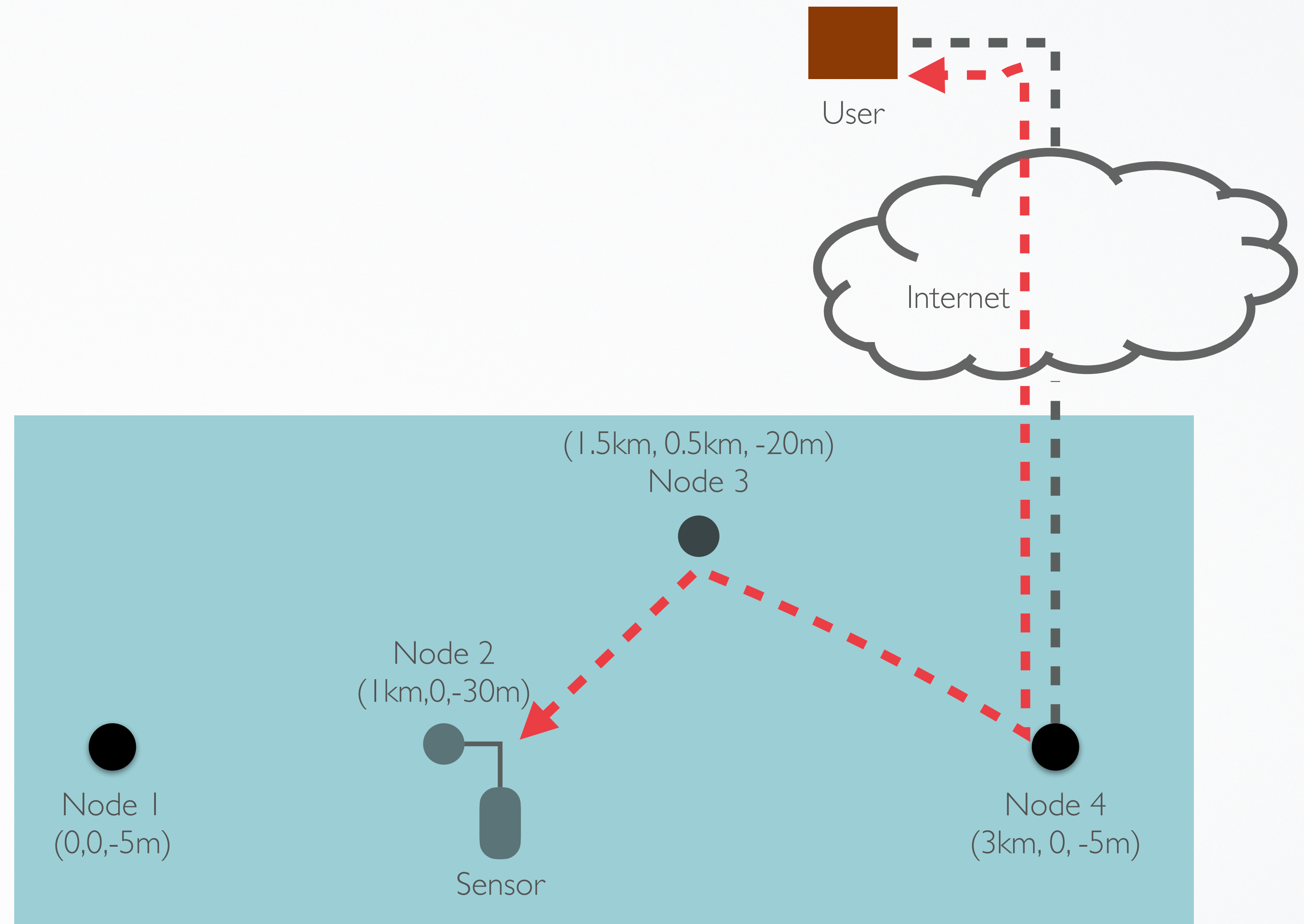
MULTI HOP + ONE WAY DATA

- Route through Node 3
- Add static routes or RDP
- Network Layer



TWO WAY DATA + INTERNET

- Two way data
- Multi-Hop
- Sensor's data protocol
- Receive data over the Internet



SENSORS

- "Speak" different protocols
- Streaming vs Packetised
- UDP ,TCP ,RS232
- Encapsulate sensor protocol in Unet protocol



TUNNELS

- Commonly used in Terrestrial Networks
- Encapsulates "user" protocol inside network's protocol
- Shell over TCP → SSH

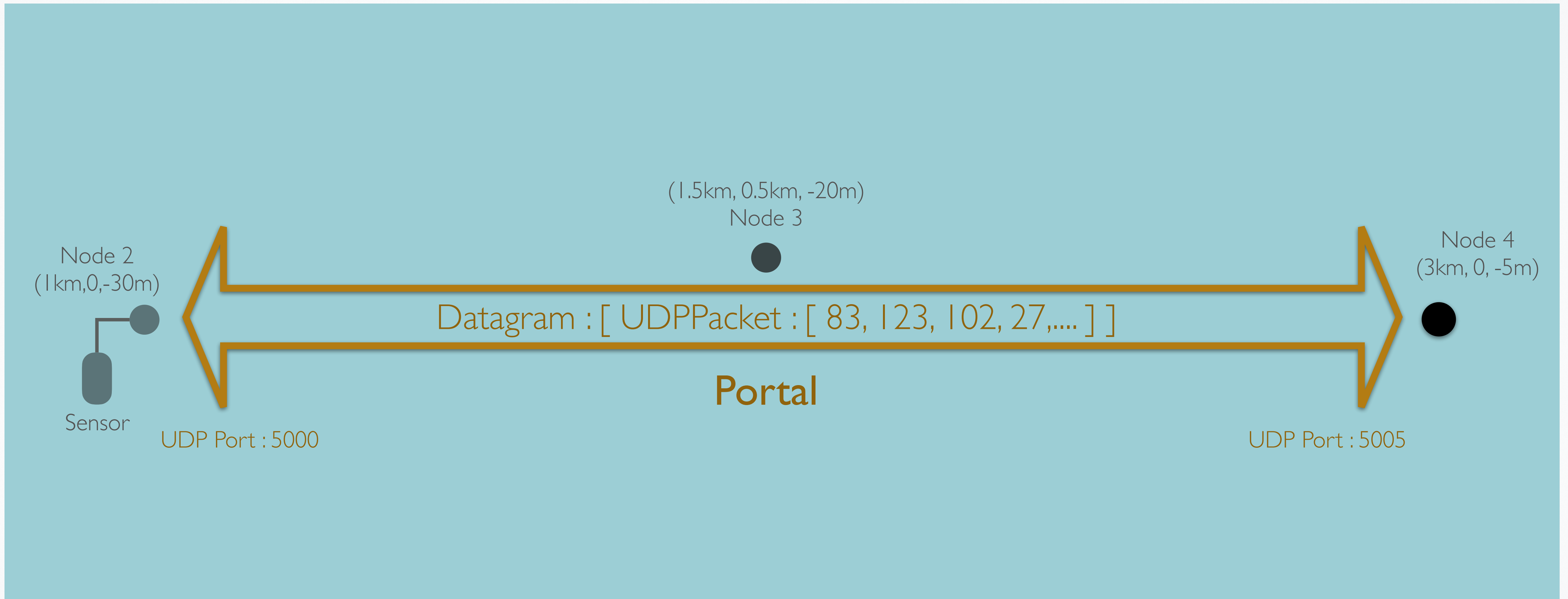


TUNNELS IN UNDERWATER NETWORKS

- UnetStack Portals
- TCP, RS232 → Portal
- UDP → UDPPortal

```
UNET  
> container.add 'portal', new org.ar1.unet.portal.UdpPortal(port:7000, peer:host('B'));  
> portal  
« UDP Portal »  
  
Transparent transport for UDP frames through a network.  
  
[org.ar1.unet.portal.UdpPortalParam]  
  clientIP = 255.255.255.255  
  clientPort = 7778  
  dsp = uwlink  
  peer = 31  
  port = 7000  
  priority = NORMAL  
  protocol = 0  
  reliability = false
```


PORTALS

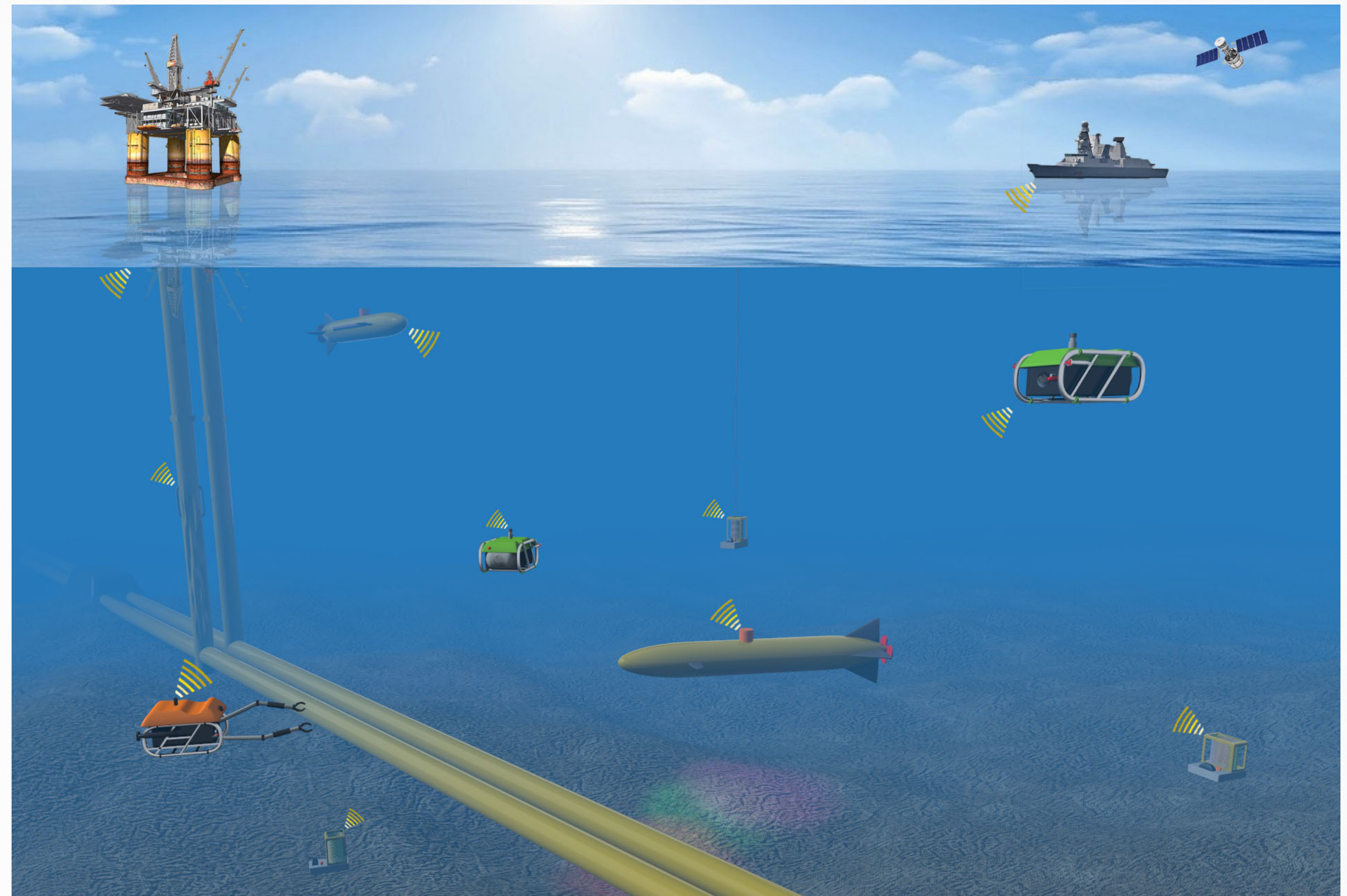




DEMO 4.2

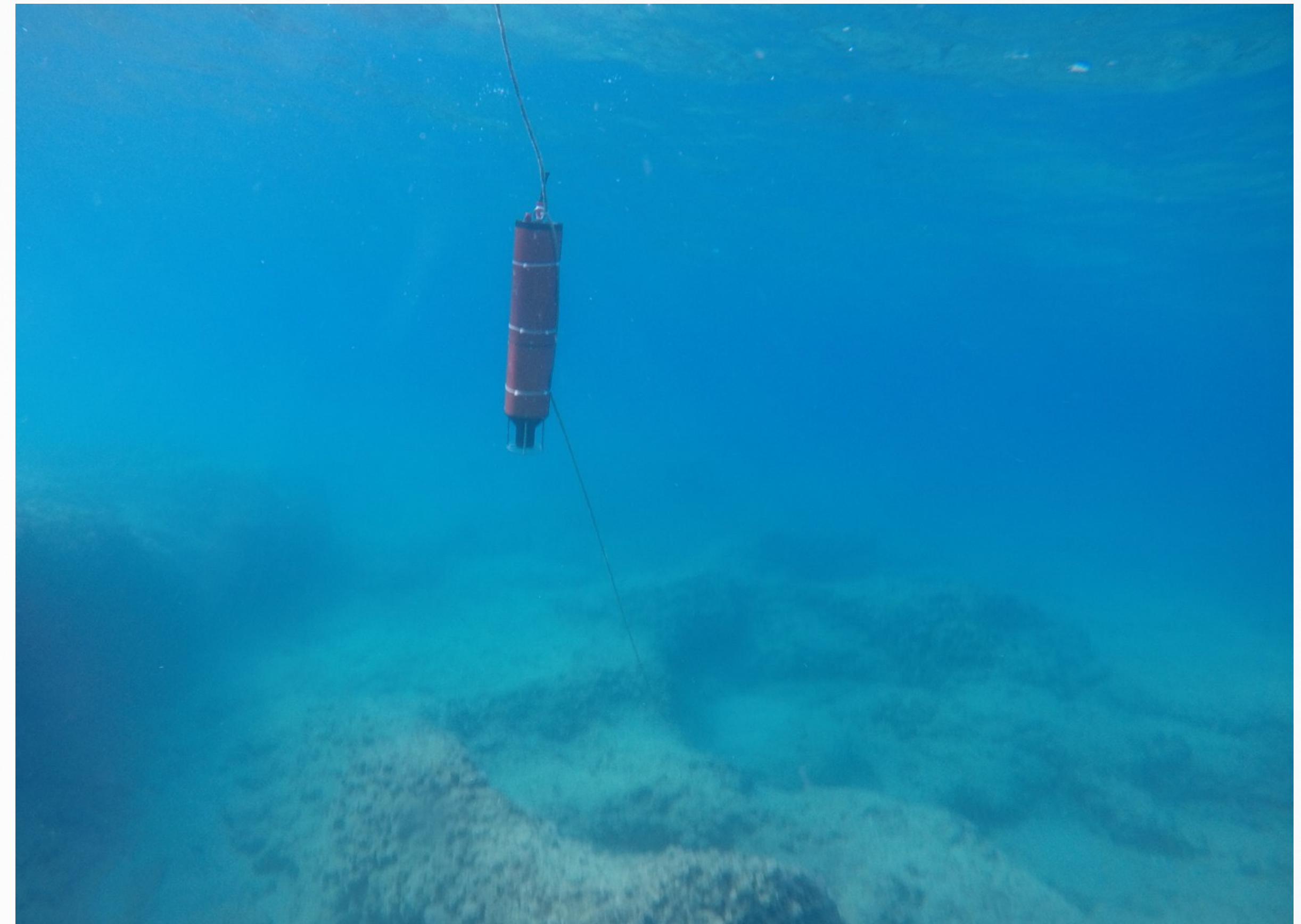
EXAMPLE USE CASES

- Remote Control an AUV
- Remotely change settings on a Sensor/Actuator
- Cloud based management of underwater Sensor Networks



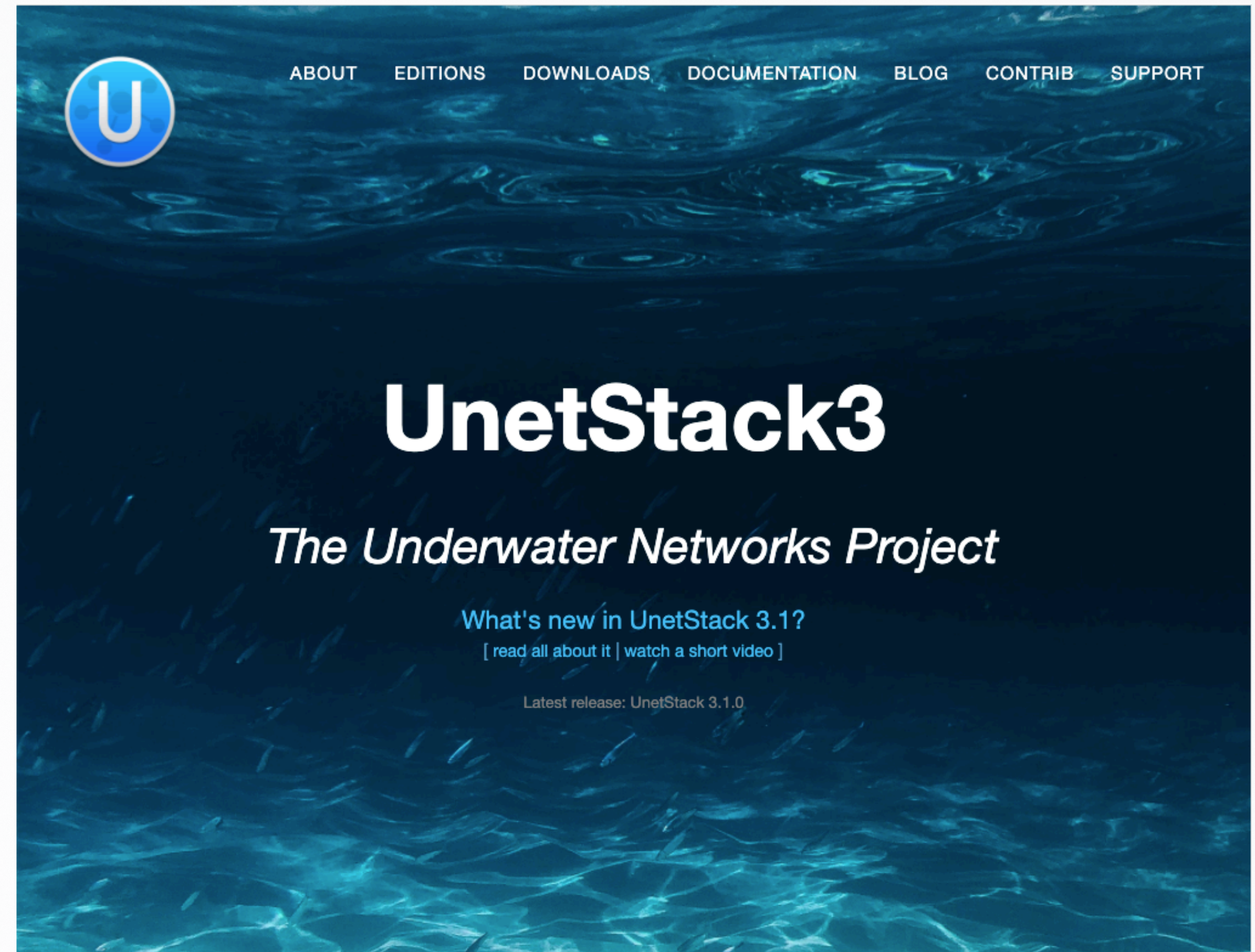
PART 4 - SENSORS AND THE INTERNET

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HANDS ON SESSION 4

- Try out Demo 4.1 and 4.2 using UnetStack
- Ask questions in the chat
- <http://subnero.com/oceans20>



NEXT...

- Part 5 : Localization

Visit <http://subnero.com/oceans20> for slides, code examples and other resources from this tutorial