

An Autonomous Blueprint: Create, Validate, Apply

Paul Harvey





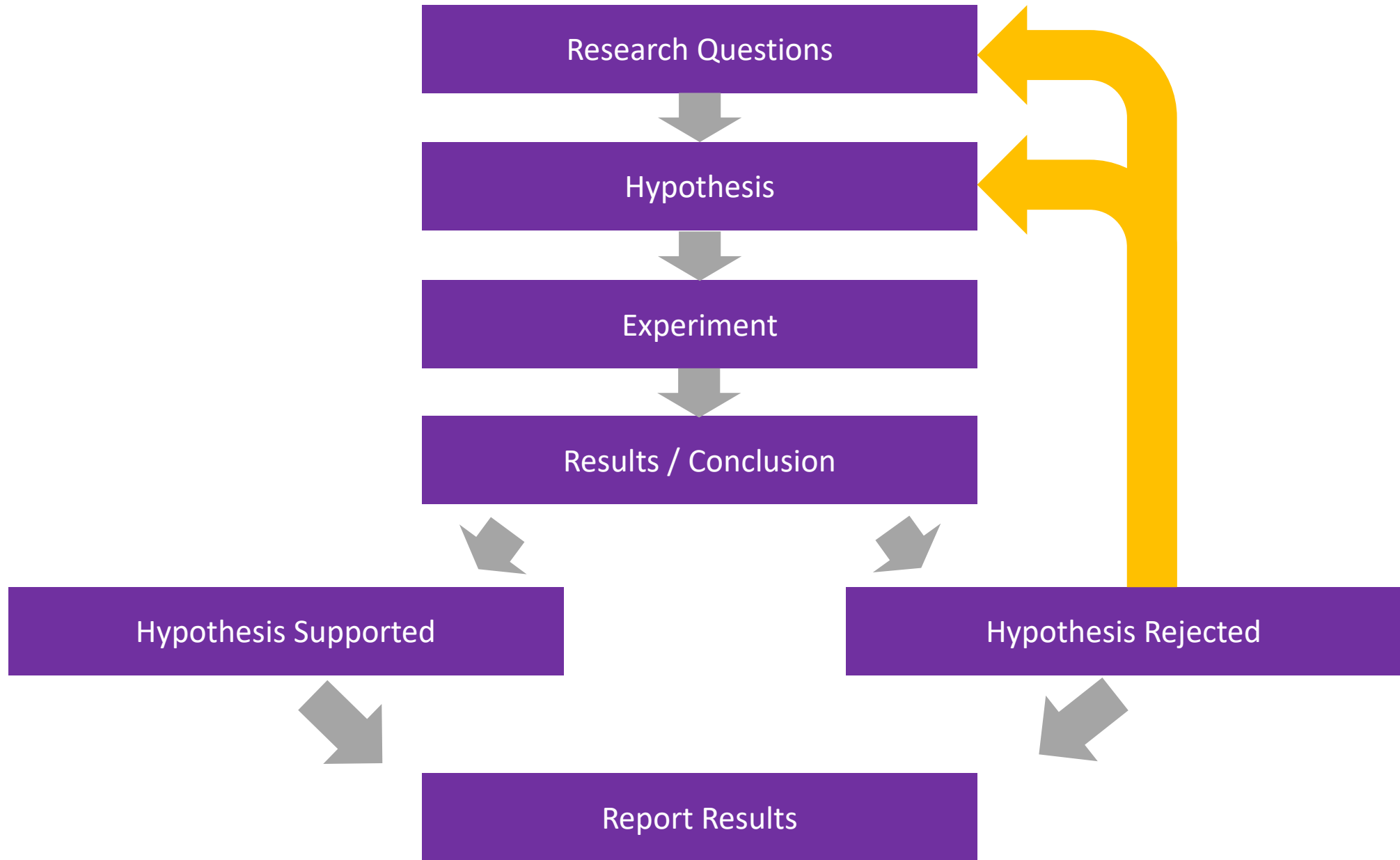
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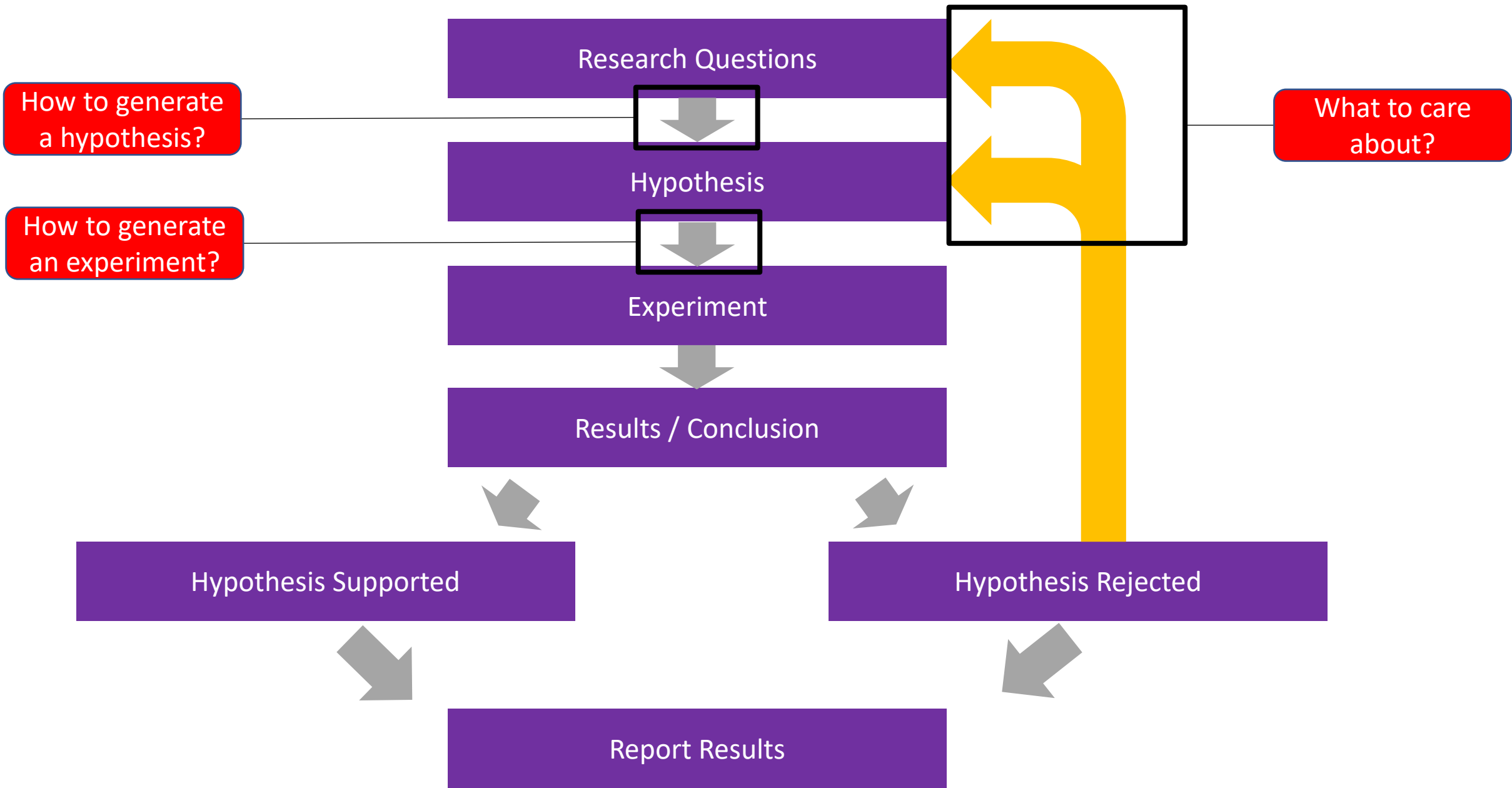


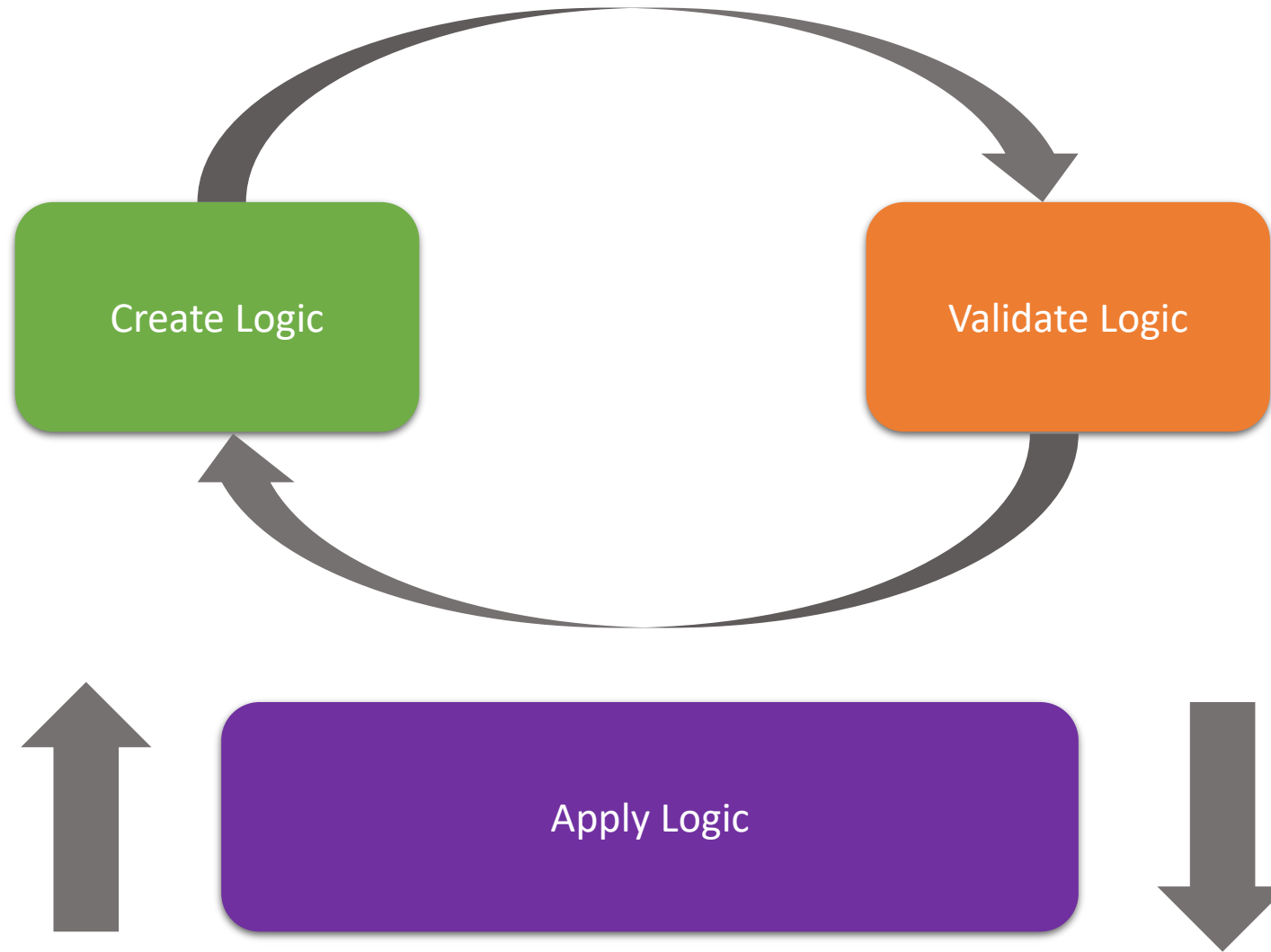
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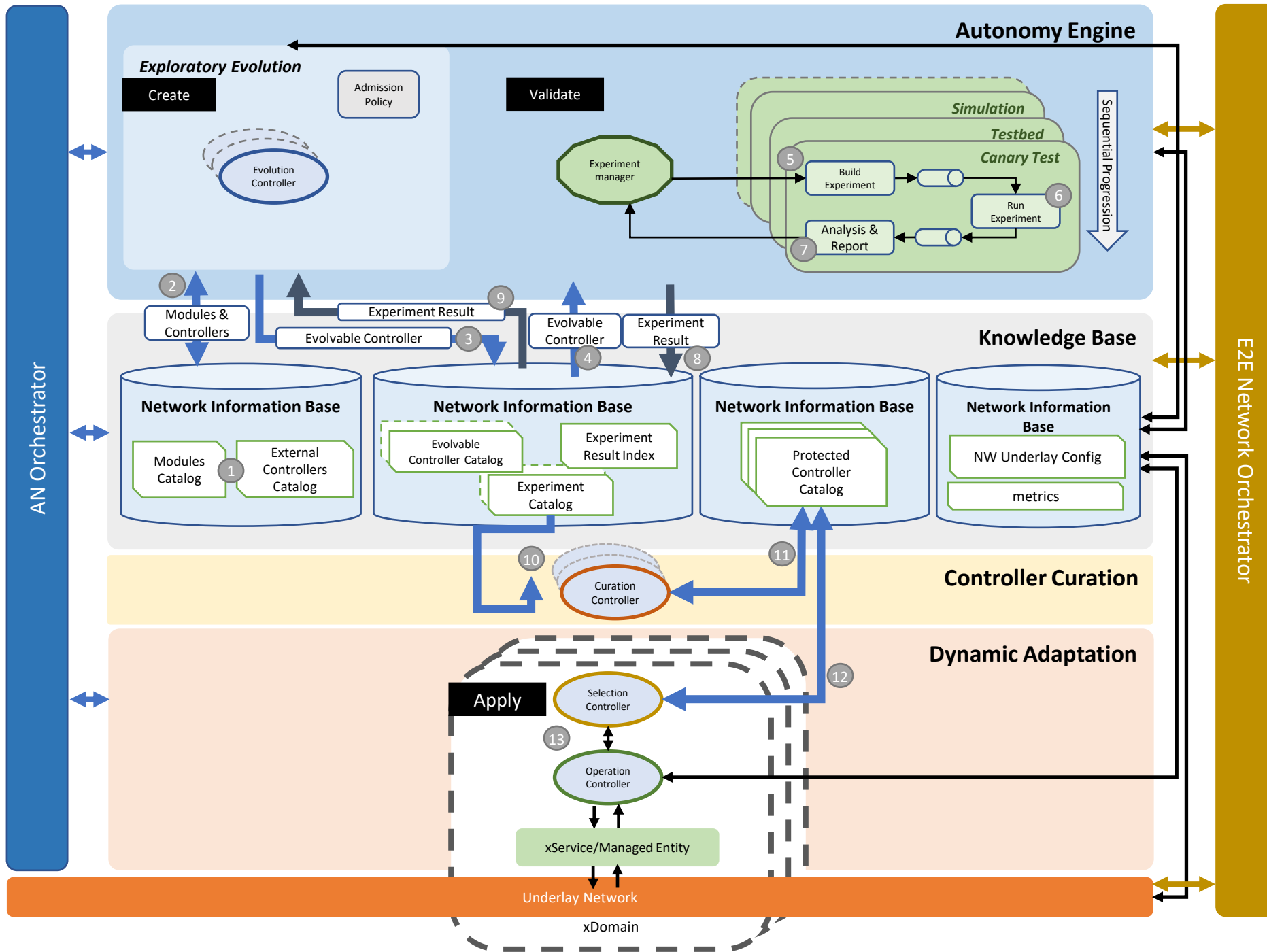


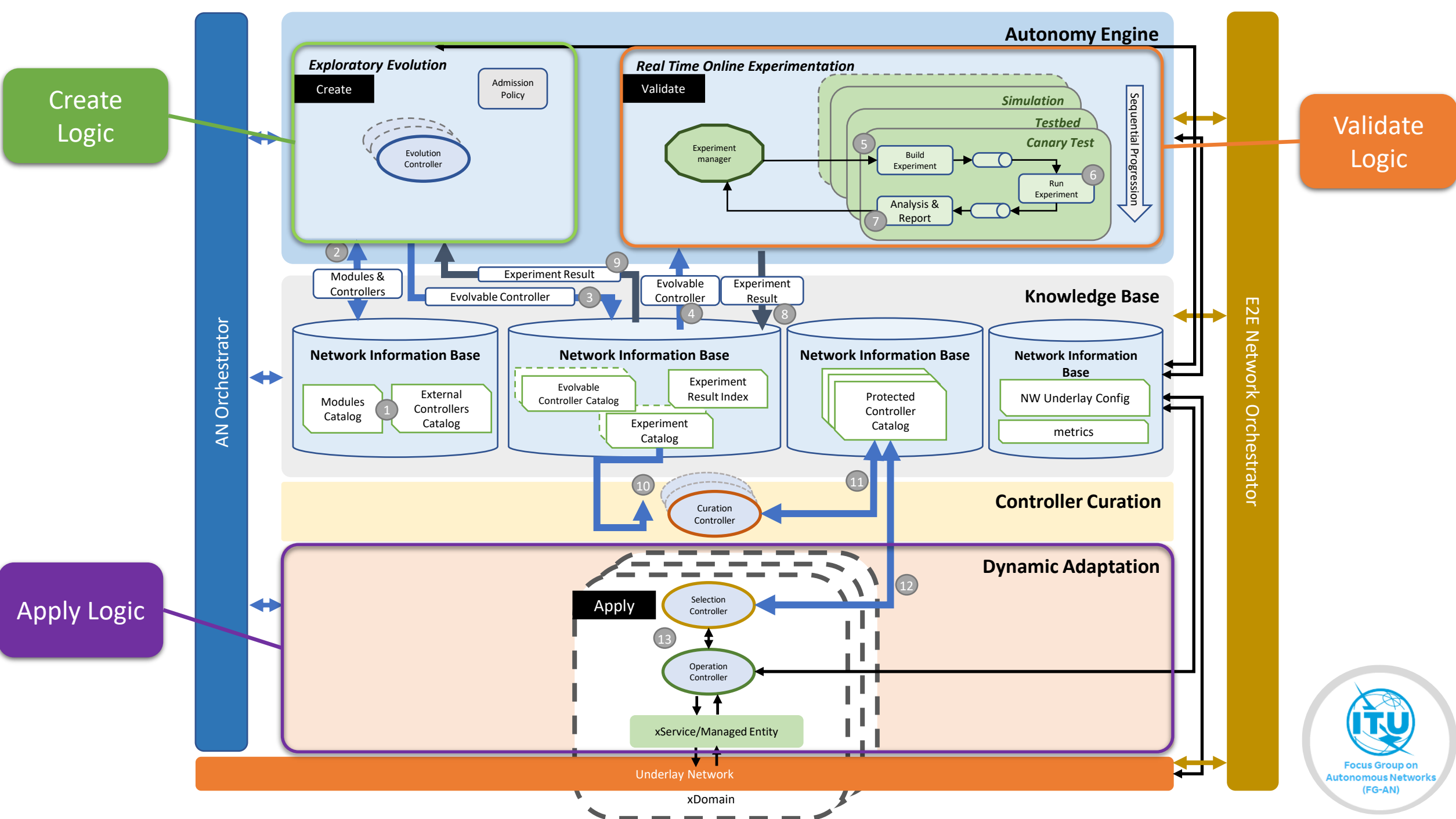
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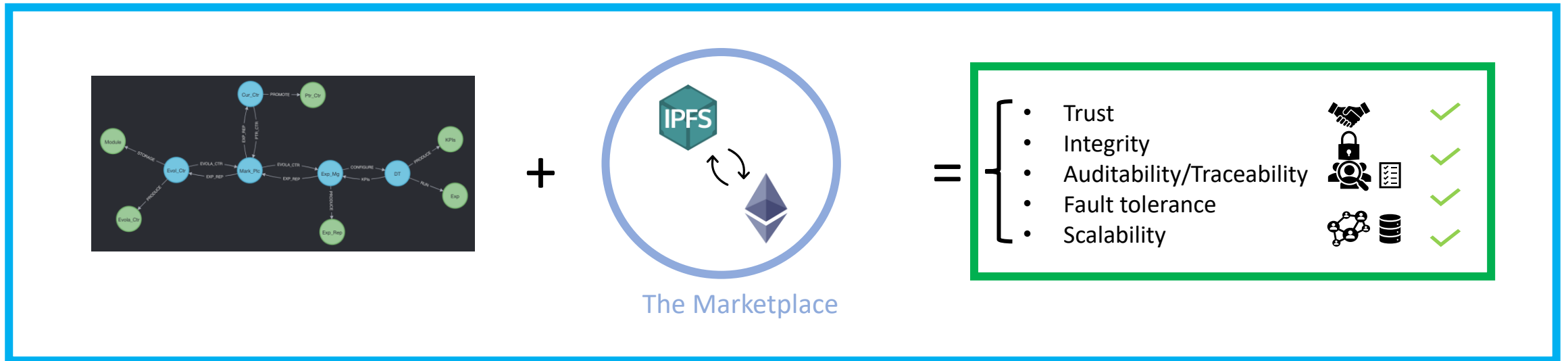




Blockchain



ALERT



- Decentralized Architecture for evolution of controllers in an Autonomous Network.

JAIME FÚSTER DE LA FUENTE



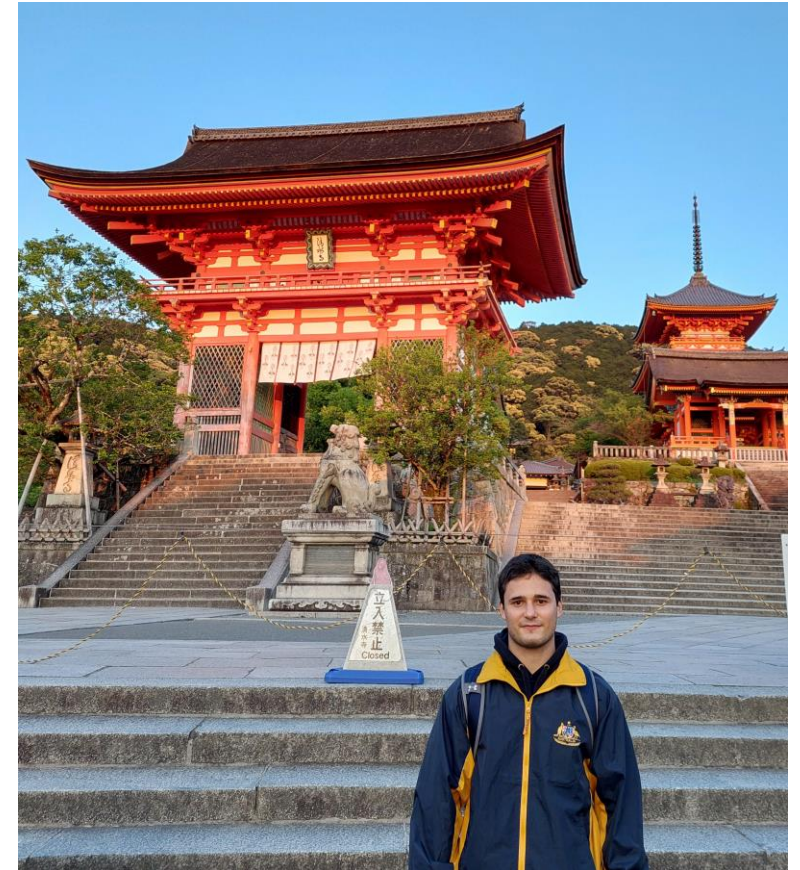
Rakuten
Mobile



EU-Japan Centre
for Industrial Cooperation

日欧産業協力センター

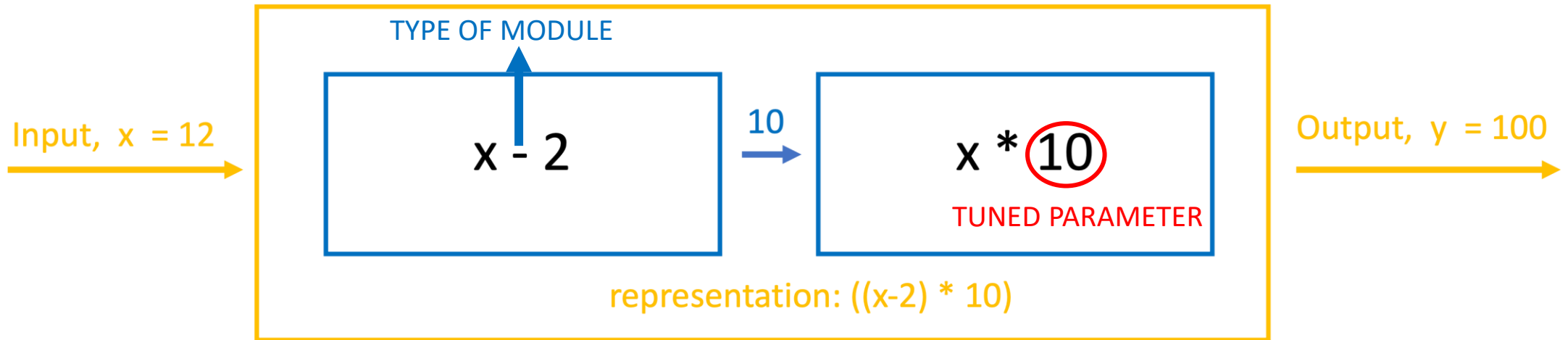
ÁLVARO PENDÁS RECONDO

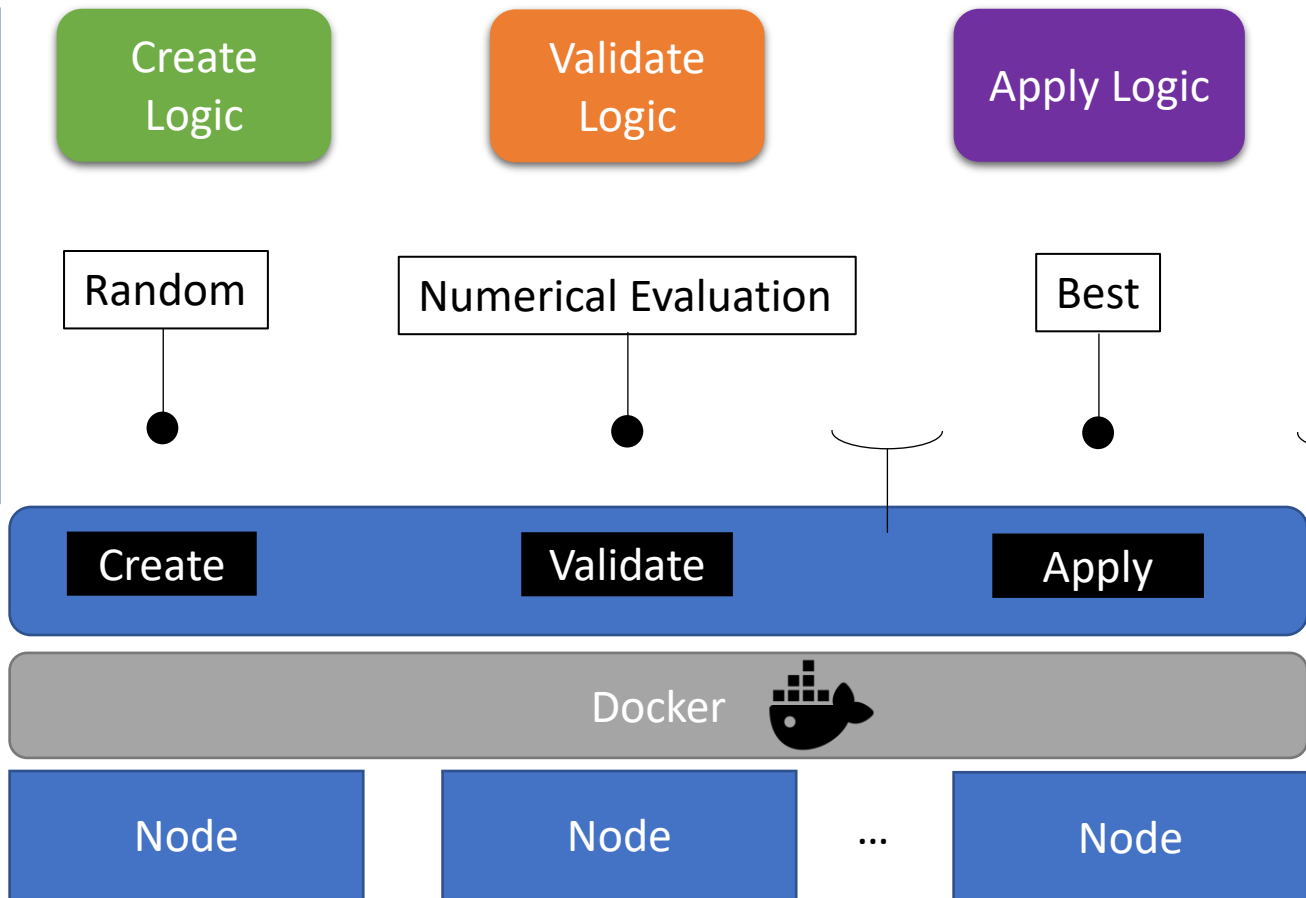
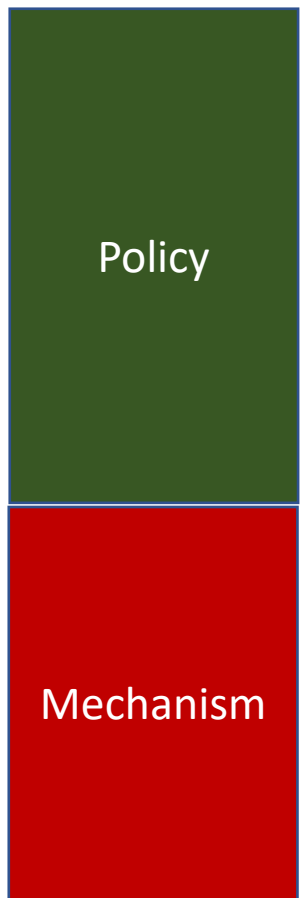
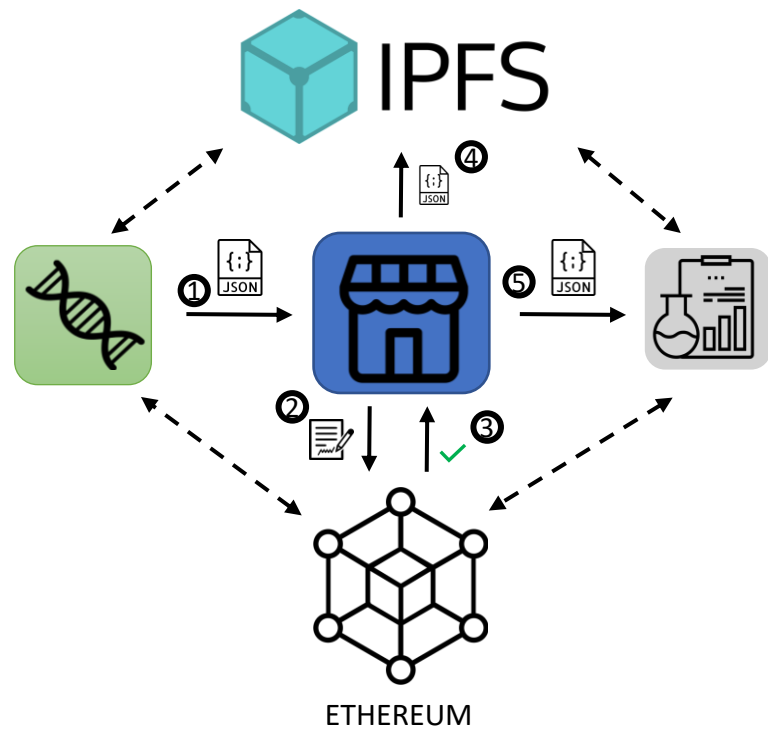




```
def f_mul(x, param):  
    return x * param
```

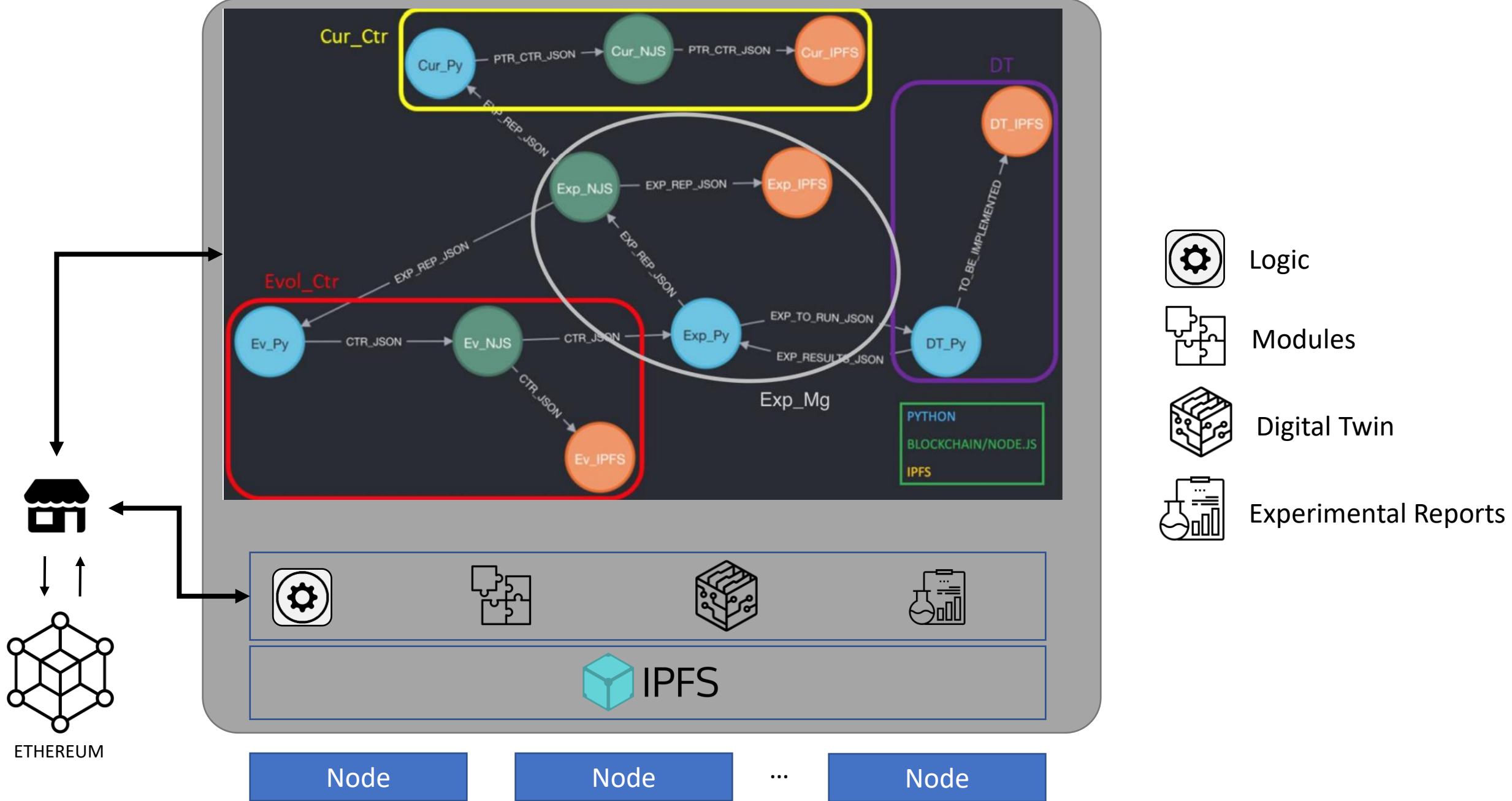
Controller
Id: 34







Inter-Telco Distributed Marketplace & Runtime



```

evol-ctr-py | {'file': '{"type": "controller", "id": 32, "modules": ["sum", "pow"], "parameters": [10, 10], "representation": "((x+10)^10)"'}
evol-ctr-py | {'cid': 'QmcRhK3o8tW7m6rQAxrargU6a8x7X9Smyxd7rDvV7xiyUR'}
evol-ctr-py | {'file': '{"type": "controller", "id": 33, "modules": ["sub", "mul"], "parameters": [2, 2], "representation": "((x-2)*2)"'}
evol-ctr-py | {'cid': 'QmY9KpCHhefRCCBQowpCqZoDacRBycyMQBLgrisS34FU8V'}
evol-ctr-py | {'file': '{"type": "controller", "id": 34, "modules": ["sub", "mul"], "parameters": [2, 10], "representation": "((x-2)*10)"'}
evol-ctr-py | {'cid': 'QmP5ffWUvKWUDpoMCSvdw6rwyf3r2CoZAgDJJtiY8h84B4'}
evol-ctr-py | {'file': '{"type": "controller", "id": 35, "modules": ["sub", "mul"], "parameters": [10, 2], "representation": "((x-10)*2)"'}
evol-ctr-py | {'cid': 'QmWw2qBK9TsRskivWXXKryG6caFq7fxS99trB5RJMKB5Dx'}
evol-ctr-py | {'file': '{"type": "controller", "id": 36, "modules": ["sub", "mul"], "parameters": [10, 10], "representation": "((x-10)*10)"'}

```

Figure 19: Log messages of the Ev_Py docker container.

0.0.0.0:8091/ipfs/QmP5ffWUvKWUDpoMCSvdw6rwyf3r2CoZAgDJJtiY8h84B4

JSON Raw Data Headers

Save Copy Collapse All Expand All Filter JSON

```

type: "controller"
id: 34
modules:
  0: "sub"
  1: "mul"
parameters:
  0: 2
  1: 10
representation: "((x-2)*10)"

```

Figure 20: Access to the JSON representation of a controller in the Marketplace via its CID. The Marketplace node that is being consulted is Exp_IPFS.

```

exp-mg-py | {'file': '{"results": {"average": 2421330825982.1294, "value": 576650390590.0}, "type": "exp_rep", "id": 32}'}
exp-mg-py | <Response [200]>
exp-mg-py | {'file': '{"results": {"average": 7.01592, "value": 29}, "type": "exp_rep", "id": 33}'}
exp-mg-py | <Response [200]>
exp-mg-py | {'file': '{"results": {"average": 35.0889, "value": 5}, "type": "exp_rep", "id": 34}'}
exp-mg-py | <Response [200]>
exp-mg-py | {'file': '{"results": {"average": -8.99704, "value": 45}, "type": "exp_rep", "id": 35}'}
exp-mg-py | <Response [200]>
exp-mg-py | {'file': '{"results": {"average": -45.0169, "value": 85}, "type": "exp_rep", "id": 36}'}
exp-mg-py | <Response [200]>

```

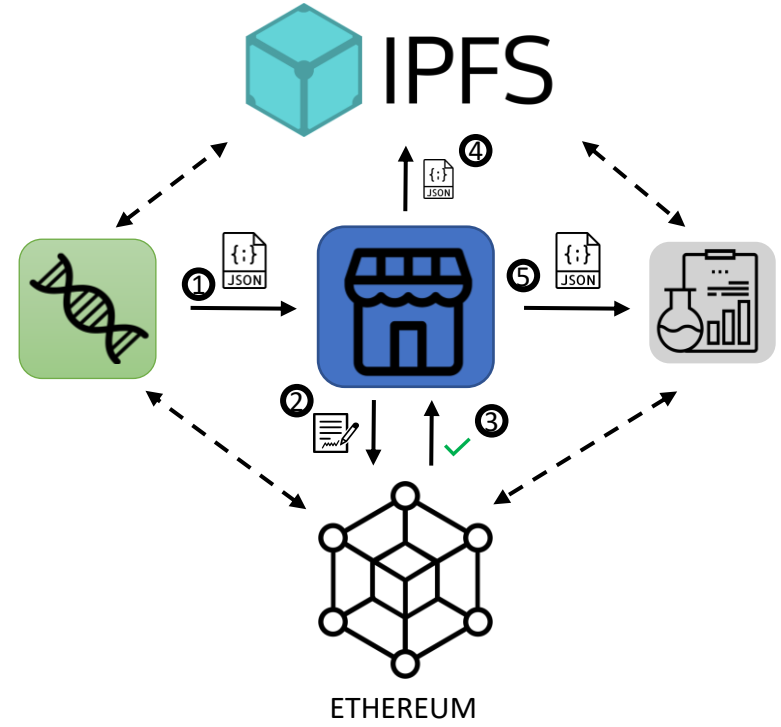
Figure 22: Log messages of the Exp_Mg docker container.

```

exp-mg-mkp | FILE WAS SENT SUCCESSFULLY
exp-mg-mkp | ===== NEW FILE RECEIVED =====
exp-mg-mkp | File type: exp_rep
exp-mg-mkp | Content: {"results": {"average": 35.0889, "value": 5}, "type": "exp_rep", "id": 34}
exp-mg-mkp | File CID computed: Qmdp5dQi2wHMnkS9SHxKPSKQz4W3RadcooEjufT7rPRpwD
exp-mg-mkp | File upload was successfully registered in the chain !
exp-mg-mkp | File successfully uploaded to IPFS !
exp-mg-mkp | File: {
exp-mg-mkp |   path: 'Qmdp5dQi2wHMnkS9SHxKPSKQz4W3RadcooEjufT7rPRpwD',
exp-mg-mkp |   cid: CID(Qmdp5dQi2wHMnkS9SHxKPSKQz4W3RadcooEjufT7rPRpwD),
exp-mg-mkp |   size: 82
exp-mg-mkp | }
exp-mg-mkp | {
exp-mg-mkp |   method: 'POST',
exp-mg-mkp |   uri: 'http://172.16.239.41:6003/exp_rep',
exp-mg-mkp |   body: { results: { average: 35.0889, value: 5 }, type: 'exp_rep', id: 34 },
exp-mg-mkp |   json: true
exp-mg-mkp | } {
exp-mg-mkp |   method: 'POST',
exp-mg-mkp |   uri: 'http://172.16.239.11:6004/exp_rep',
exp-mg-mkp |   body: { results: { average: 35.0889, value: 5 }, type: 'exp_rep', id: 34 },
exp-mg-mkp |   json: true
exp-mg-mkp | }

```

Figure 23: Log messages of the Exp_NJS docker container.



2nd International Workshop on Autonomous Network Management in 5G and Beyond Systems (ANMS 2023)

8 or 12 May, 2023, Miami, FL, USA

Collocated with IEEE/IFIP Network Operations and Management Symposium (NOMS2023)



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BUENA VISTA