



Neuropil – Cyber Security Mesh

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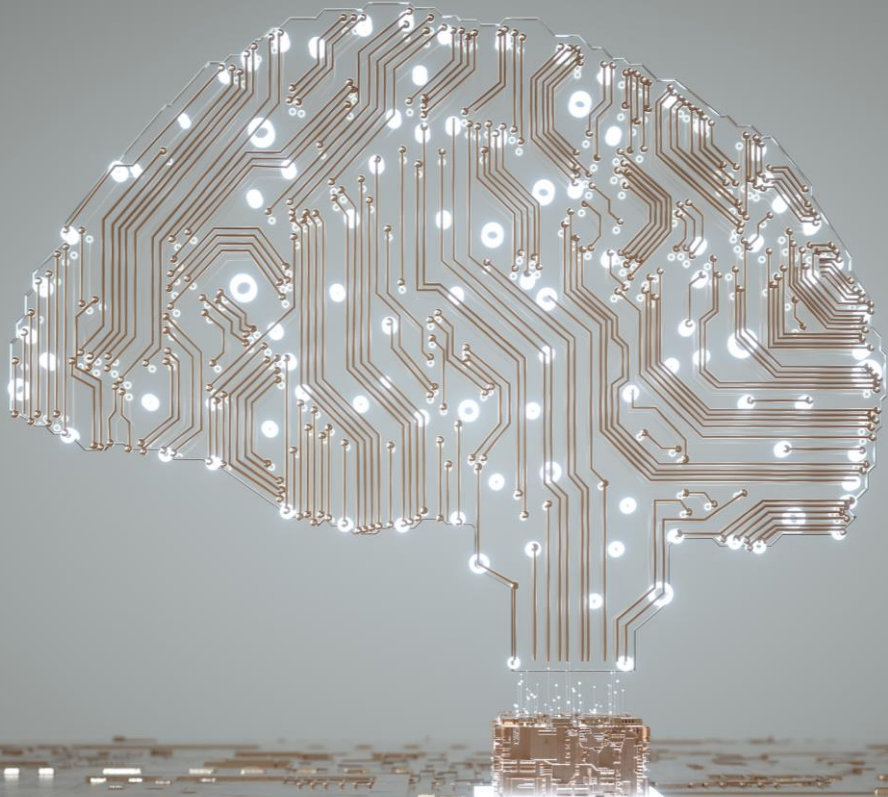
CEO of pi-lar

Fed 4 Fire Report Presentation

Köln, 27.01.2022



Cyber
Security
Mesh



Cyber Security Mesh Scaling

NEUROPIIL

Experiment Set Up



Neuropil application



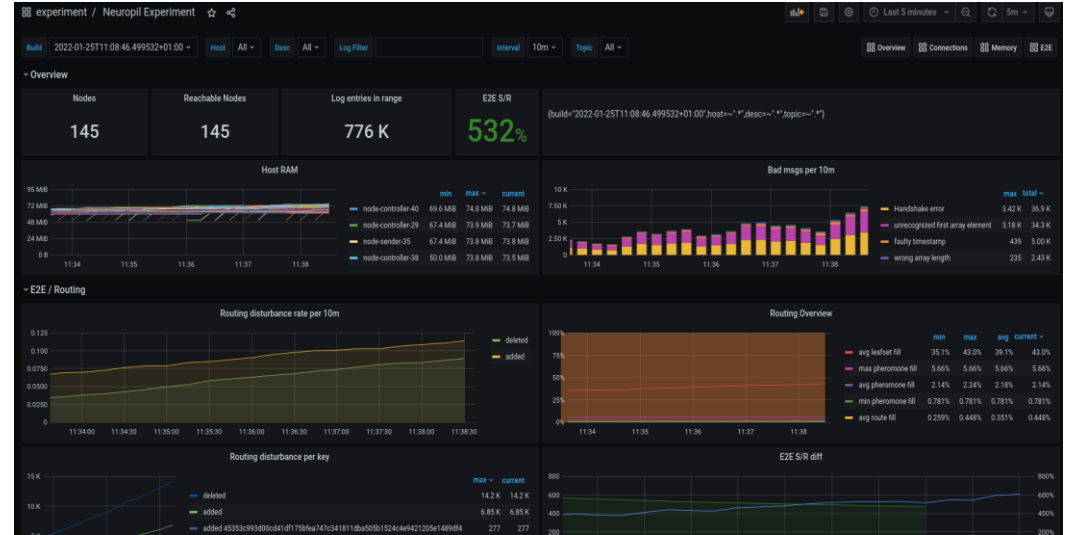
Log aggregation



Display Tool



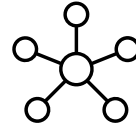
Orchestration Tool



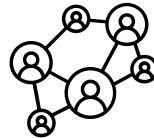
Concept & Objectives

Four Experiments

- Full Mesh
- Half Mesh
- Userspace Messages
 - Full Mesh
 - Half Mesh
- Failover Experiment
 - Full Mesh
 - Half Mesh



Full & Half Mesh test for protocol connectivity

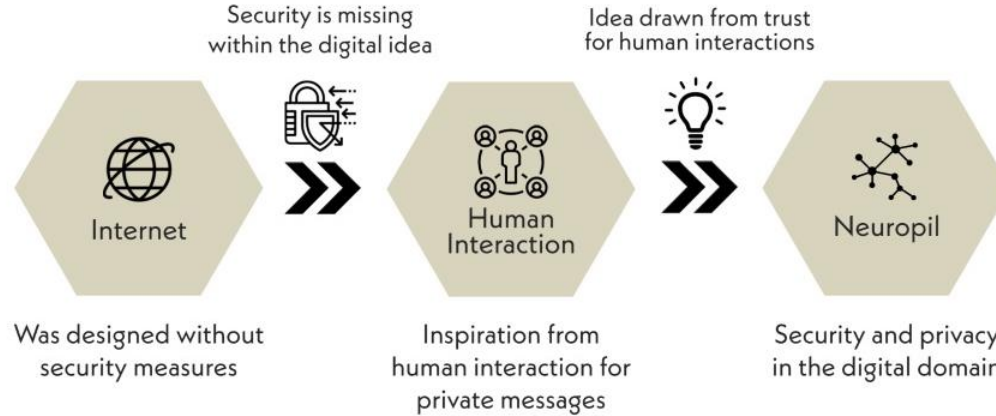


Userspace Messages test for real case purposes



Failover Experiment test for availability

Background & Motivation



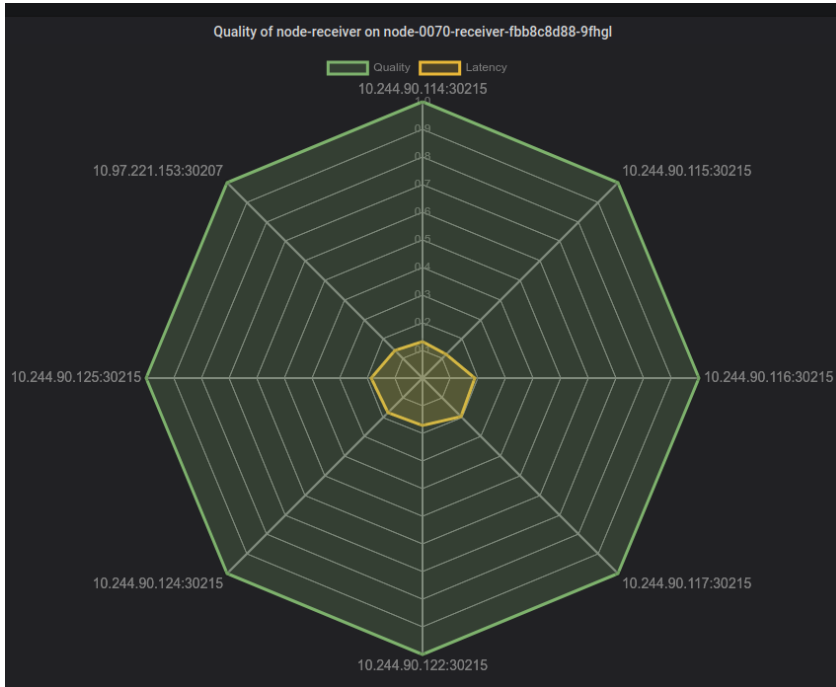


Project Results

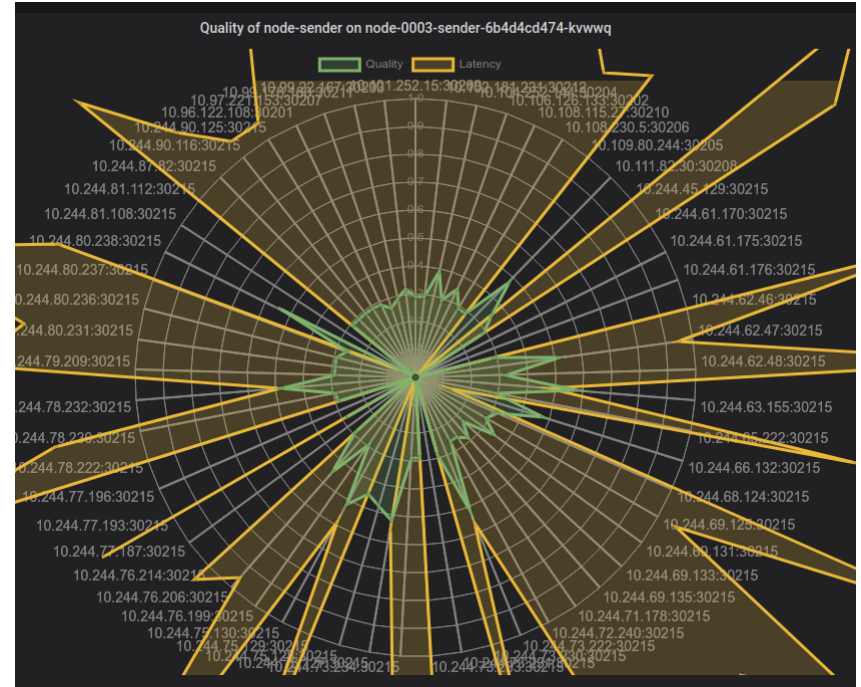
Connectivity Measurements



GOOD EXAMPLE



BAD EXAMPLE



Lessons learned

1. Software Bugs
2. Faulty Timestamps
3. Concurrency Issues
4. Scaling of implemented bloom filter
5. Message Overload
6. SDN based on user space authentication
7. Wrong / Incomplete metrics

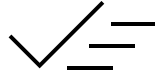


Business Impact

Impact on our business



More stable
Version of neuropil

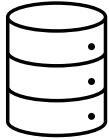


Proven accessible
scalability

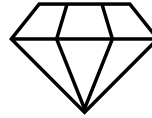


First enterprise ready
cyber security mesh

How did Fed4Fire help us



Access to highly distributed
datacenter (edgenet)



Time valued experiments
gratification



Social Media campaign for the
experiment

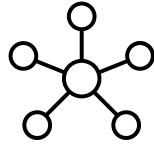


Worldwide connectivity, that
mimics our production set-up

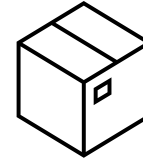


Connected us with a competent
and valued partner for our
concerns regarding kubernetes

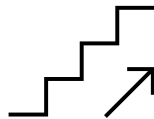
Value perceived



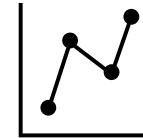
Moving from hundreds to thousands of nodes to millions



Container management and monitoring large scale clusters.



insights into our library and it's scale-up behaviour



underpin improvements with real data

Why did we come to Fed4Fire?



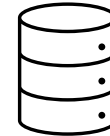
A partner who valued progression in cyber security



A reliable and accessible testnet environment



Worldwide connectivity / latencies



Access to the highly distributed datacenter



Feedback

Used resources & tools



Provided by Fed4Fire



Edgernet



Kubernetes



Docker

Contact:
Berat Senel

Delivered by pi-lar



Neuropil

Cyber
Security
Mesh



Python



LOKI

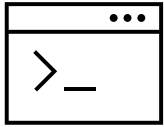


Grafana Labs

Added value of Fed4Fire

1. Unified tooling
2. Testing of scale up behaviour
3. Testing of various scenarios (chaos engineering)
4. Identification of software enhancements
5. Real world environment
6. Free Bandwidth

Kubernetes as single interaction system



One command to start 50 groups á one controller, one receiver and one sender neuropil node:

```
> ./do script kubernetes.py --main-controller 2 --group_count  
50 --wave 1 && kubectl apply -k "build/kubernetes/main-  
mesh" && kubectl apply -k "build/kubernetes/e2e-half-mesh"
```

Testing of scale-up behaviour



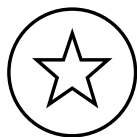
till now only a maximum of
200 neuropil-nodes possible
due to local CPU boundaries



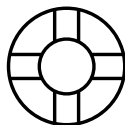
now over 2000 connected
neuropil nodes were
successfully tested



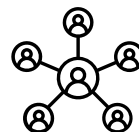
Testing of various scenarios (chaos engineering)



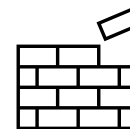
Star
Network



Ring
Network

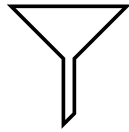


Mesh
Network



Network
Resilience

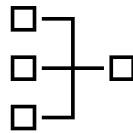
Identification of software enhancements



Bloom filter
implementation



Network stability with
client binding

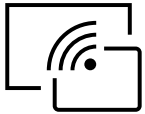


Message/system
overload management



Concurrency Issues

Real world environment



Real latencies



Real host issues

- no DNS available
- networking issues



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European Union



Co-funded by the
Swiss Confederation

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