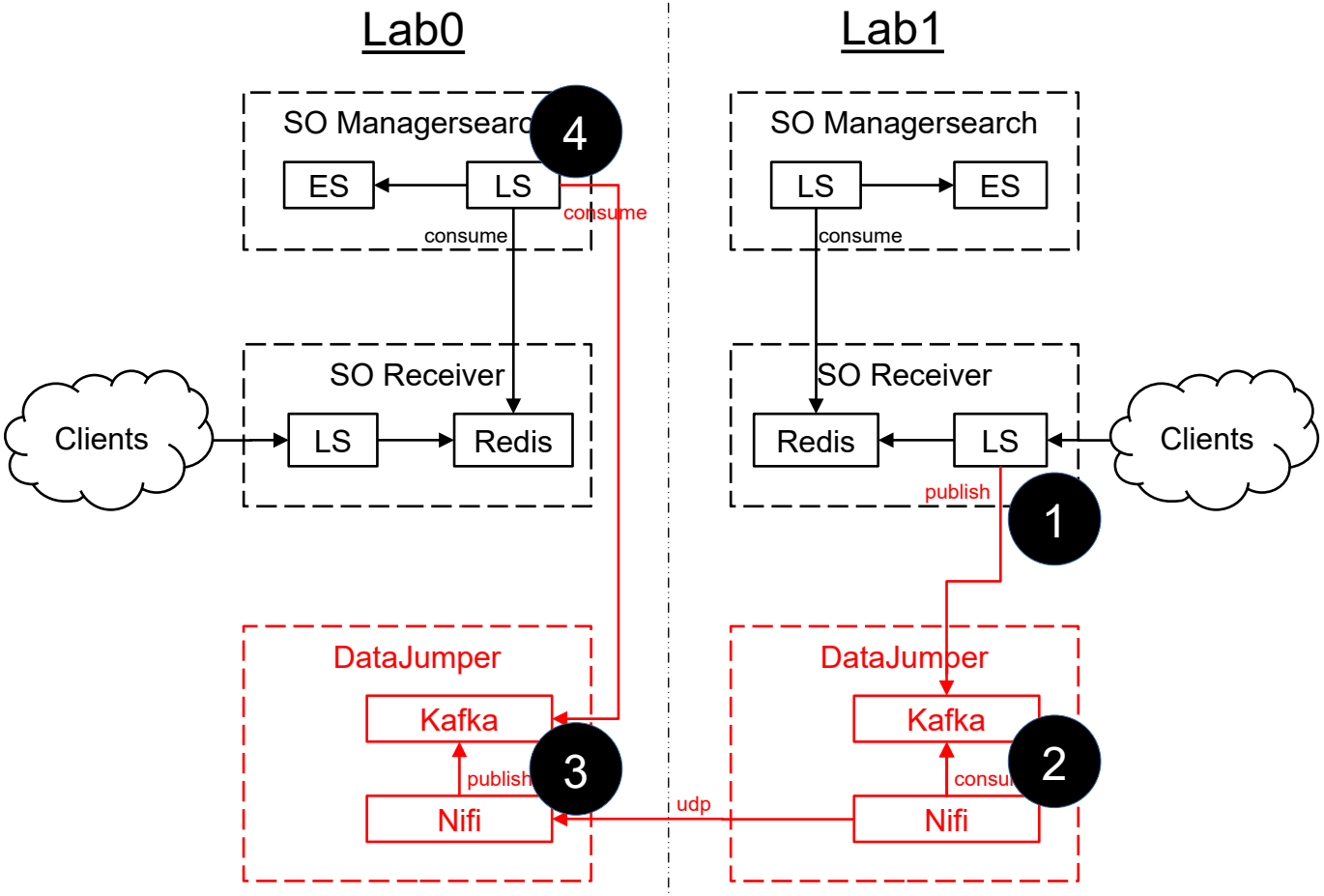
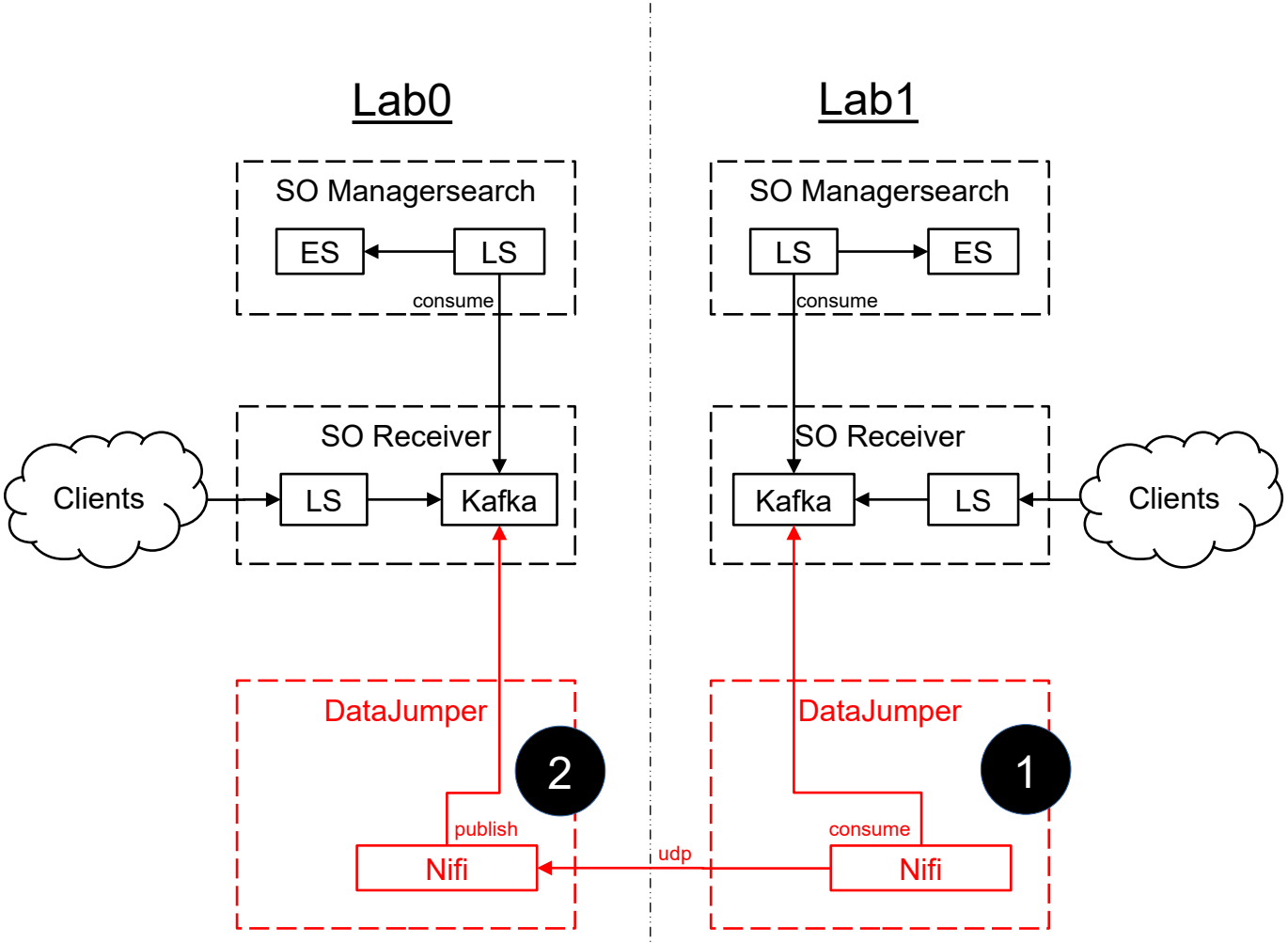
Aggregate multiple independent Security Onion envs.

A HOWTO in four steps



Aggregate multiple independent Security Onion envs.

Pro version (out of scope, probably only two steps)

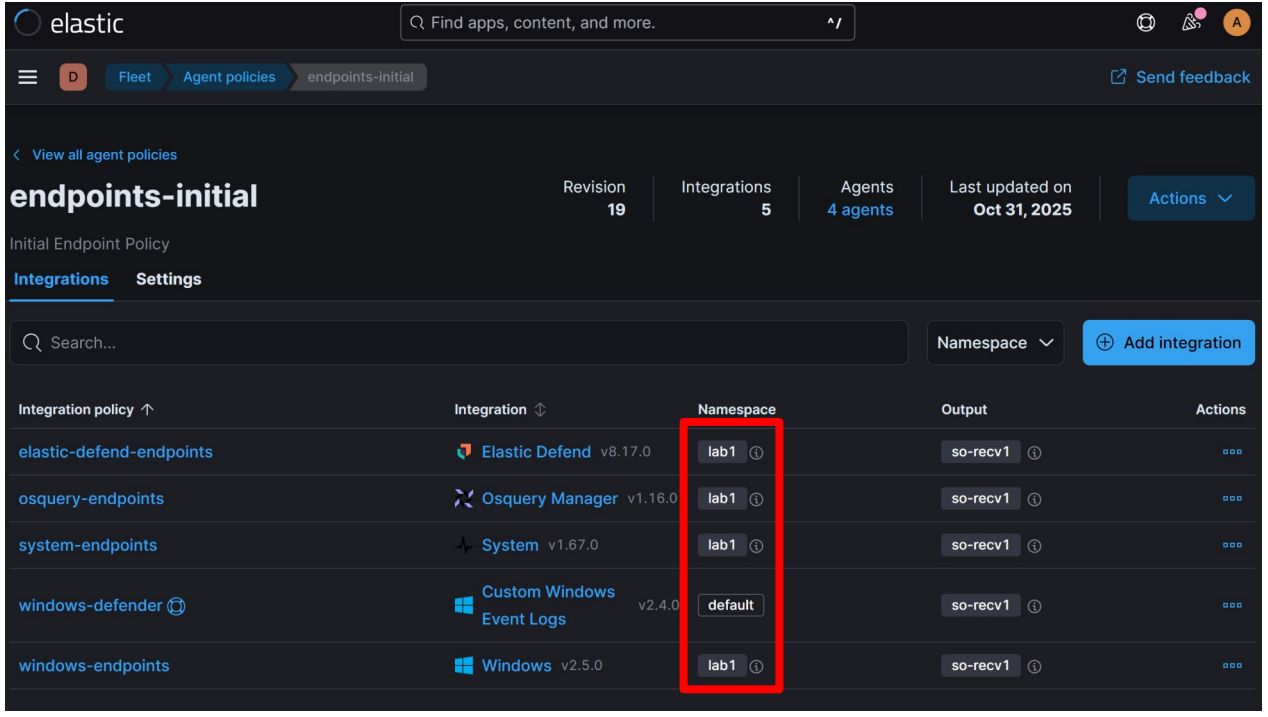


Lab1 configuration

Based on the Open Source
version of Security Onion

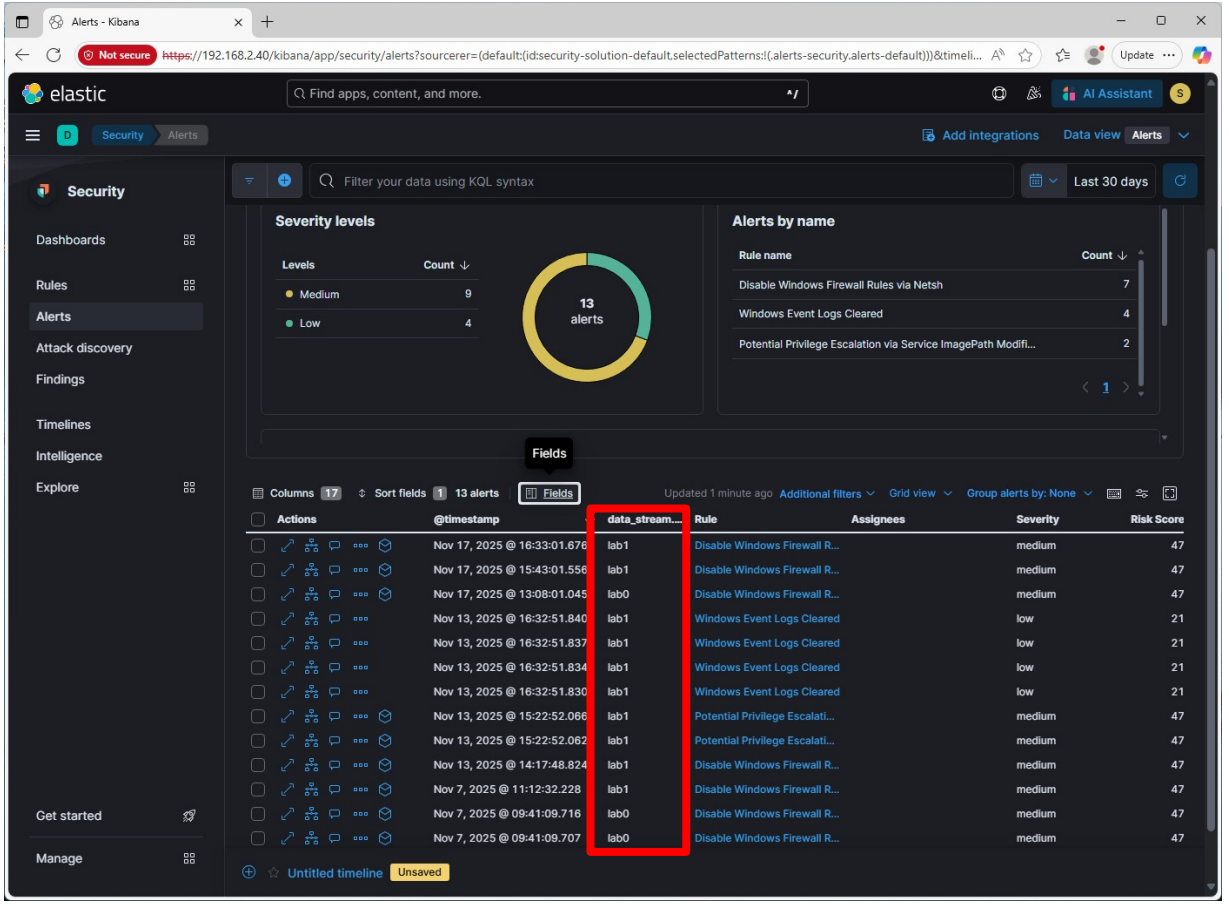
0. Elastic namespaces

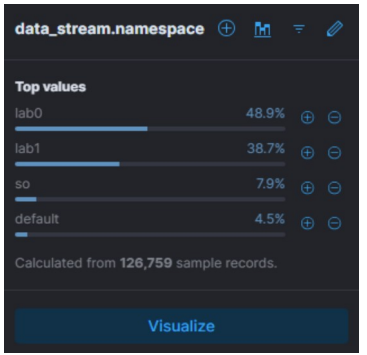
In Elastic Fleet, modify the value of the namespace field that each event will get, so we can distinguish between events from different environments. Because every event will have this value, we can realise environment specific alerts and alert suppression rules with a single ruleset.

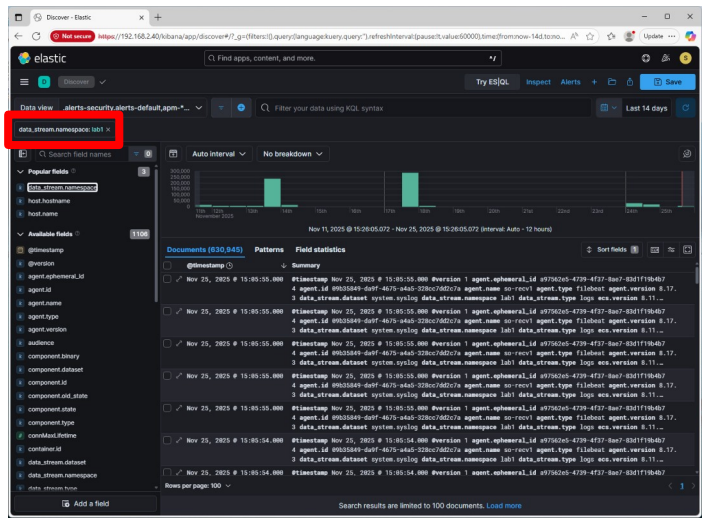


(Unfortunately it isn't configurable for every integration policy, like e.g. the windows-defender integration)

The end result will be alerts generated using a single ruleset in Lab0 for both Lab1 and Lab0 that still distinguish between environments.





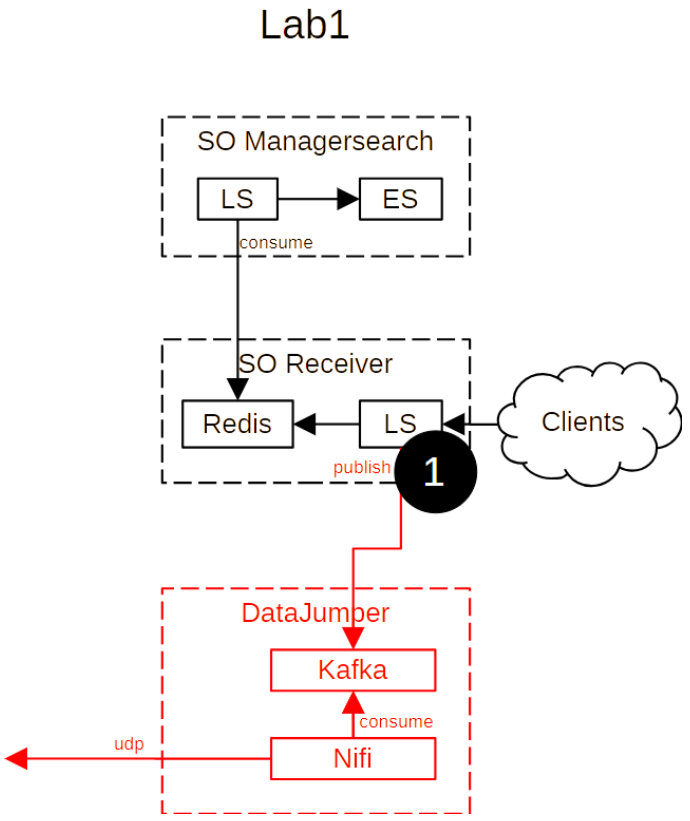


1. Kafka output

OVERVIEW

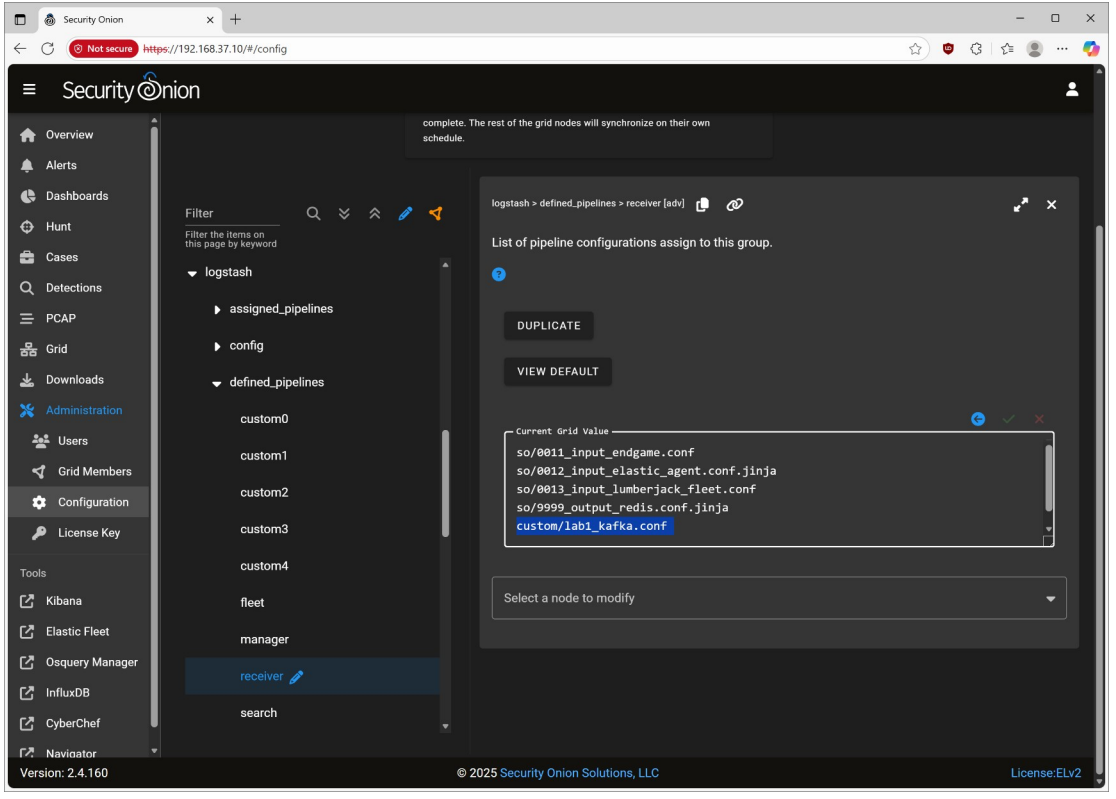
The Redis config in SO is set up for load balancing using a simple queue, not a pub/sub channel. That means that reading the same Redis queue will remove events and lead to dataloss. Instead, we add a custom Logstash pipeline to the Receiver. This does duplicate events, into our own Kafka Topic. SO support customizing Logstash pipelines for these SO roles:

- Receiver
- Manager
- Search
- Fleet



1. Kafka output

a) Security Onion Console



b) File on Manager

/opt/so/saltstack/local/salt/logstash/pipelines/config/custom/lab1_kafka.conf

```
output {
  kafka {
    codec => json
    bootstrap_servers => "192.168.37.129:9092"
    topic_id => "lab1"
  }
}
```

c) Sync Grid

d) Check on Receiver via SSH:

```
sudo salt-call pillar.get logstash:defined_pipelines
```

```
[admin@so-recv1 ~]$ sudo salt-call pillar.get logstash:defined_pipelines
local:
    ----------
    receiver:
        - so/0011_input_endgame.conf
        - so/0012_input_elastic_agent.conf.jinja
        - so/0013_input_lumberjack_fleet.conf
        - so/9999_output_redis.conf.jinja
        - custom/lab1_kafka.conf
[admin@so-recv1 ~]$
```

e) Don’t want to wait 15 minutes? Execute on the Receiver:

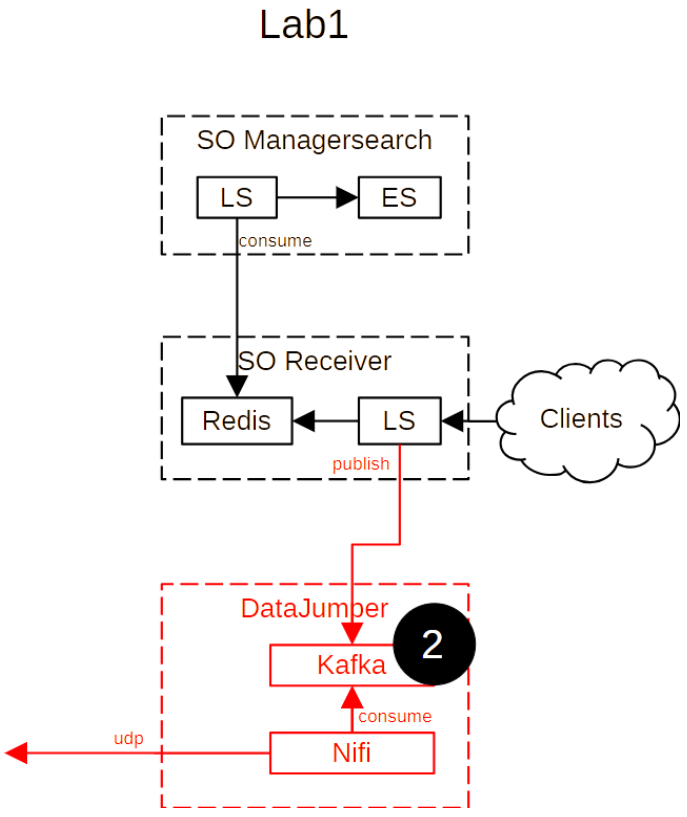
```
sudo salt-call state.highstate
```

2. Kafka and Nifi

OVERVIEW

The Logstash pipeline from the previous step duplicates events to a new Kafka Topic. To receive these events and transmit them to Lab0, we install a Linux system with:

1)Podman
2)Kafka container
3)Nifi container



2. Kafka and Nifi

a) On an internet connected Linux system:

```
podman pull apache/kafka:latest
podman pull apache/nifi:latest

podman save -o apache-kafka.tar apache/kafka:latest
podman save -o apache-nifi.tar apache/nifi:latest
```

b) Transfer the 2 tar files to Lab1

c) On the Lab1 Linux systeem:

```
podman load -i /tmp/apache-kafka.tar
podman load -i /tmp/apache-nifi.tar

podman images
```

2. Kafka and Nifi

d) Start Kafka container (no authentication, auto topic creation)

```
podman run --detach --name kafka --hostname kafka -p 9092:9092 \
-e KAFKA_NODE_ID=1 \
-e KAFKA_PROCESS_ROLES=broker,controller \
-e KAFKA_CONTROLLER_LISTENER_NAMES=CONTROLLER \
-e KAFKA_CONTROLLER_QUORUM_VOTERS=1@localhost:9093 \
-e KAFKA_LISTENERS=A://:9092,CONTROLLER://:9093 \
-e KAFKA_LISTENER_SECURITY_PROTOCOL_MAP=A:PLAINTEXT,CONTROLLER:PLAINTEXT \
-e KAFKA_ADVERTISED_LISTENERS=A://192.168.37.129:9092 \
-e KAFKA_INTER_BROKER_LISTENER_NAME=A \
-e KAFKA_OFFSETS_TOPIC_REPLICATION_FACTOR=1 \
-e KAFKA_TRANSACTION_STATE_LOG_REPLICATION_FACTOR=1 \
-e KAFKA_TRANSACTION_STATE_LOG_MIN_ISR=1 \
-e KAFKA_NUM_PARTITIONS=1 \
apache/kafka:latest
```

e) Check logs for successful start

```
podman logs -f kafka

[...knip...]
[2025-11-03 10:26:53,014] INFO Kafka version: 4.0.0 (org.apache.kafka.common.utils.AppInfoParser)
[2025-11-03 10:26:53,017] INFO Kafka commitId: 985bc99521dd22bb (org.apache.kafka.common.utils.AppInfoParser)
[2025-11-03 10:26:53,019] INFO Kafka startTimeMs: 1762165613014 (org.apache.kafka.common.utils.AppInfoParser)
[2025-11-03 10:26:53,023] INFO [KafkaRaftServer nodeId=1] Kafka Server started (kafka.server.KafkaRaftServer)
```

f) Open local firewall

```
firewall-cmd --add-port=9092/tcp --permanent
firewall-cmd --reload
```

2. Kafka and Nifi

g) Start Nifi container

```
podman run --name nifi --detach -p 8443:8443 \
-e SINGLE_USER_CREDENTIALS_USERNAME=admin \
-e SINGLE_USER_CREDENTIALS_PASSWORD=eenwachtwoordmetminimaal12karakters \
-e NIFI_WEB_HTTPS_PORT=8443 \
apache/nifi:latest
```

h) Check logs for successful start (can take a while)

```
podman logs -f nifi

[...knip...]
2025-11-06 10:54:08,040 INFO [main] org.eclipse.jetty.server.Server Started oejs.Server@13a268cd{STARTING}[12.0.27,sto=0] @230155ms
2025-11-06 10:54:08,060 INFO [main] org.apache.nifi.web.server.JettyServer Started Server on https://906f398d8249:8443/nifi
2025-11-06 10:54:08,212 INFO [main] o.a.n.runtime.StandardManagementServer Started Management Server on http://127.0.0.1:52020
2025-11-06 10:54:08,232 INFO [main] org.apache.nifi.runtime.Application Started Application in 226.876 seconds (226876498547 ns)
```

i) Open local firewall

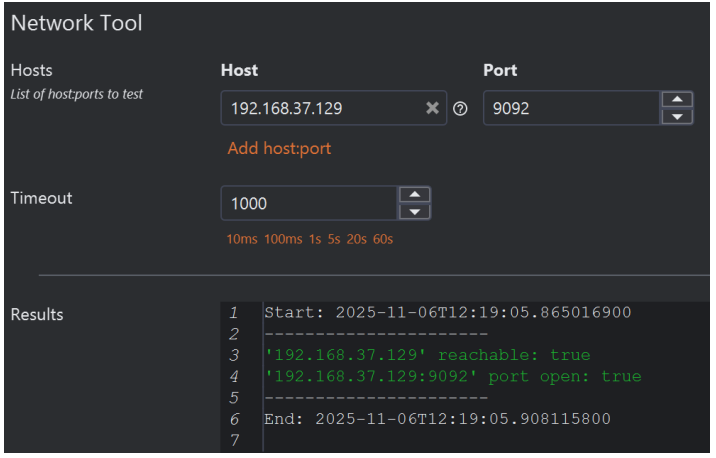
```
firewall-cmd --add-port=8443/tcp --permanent
firewall-cmd --reload
```

j) Add “906f398d8249” to the hosts file on your lab workstations (Otherwise you can’t configure Nifi pipelines)

2. Kafka and Nifi

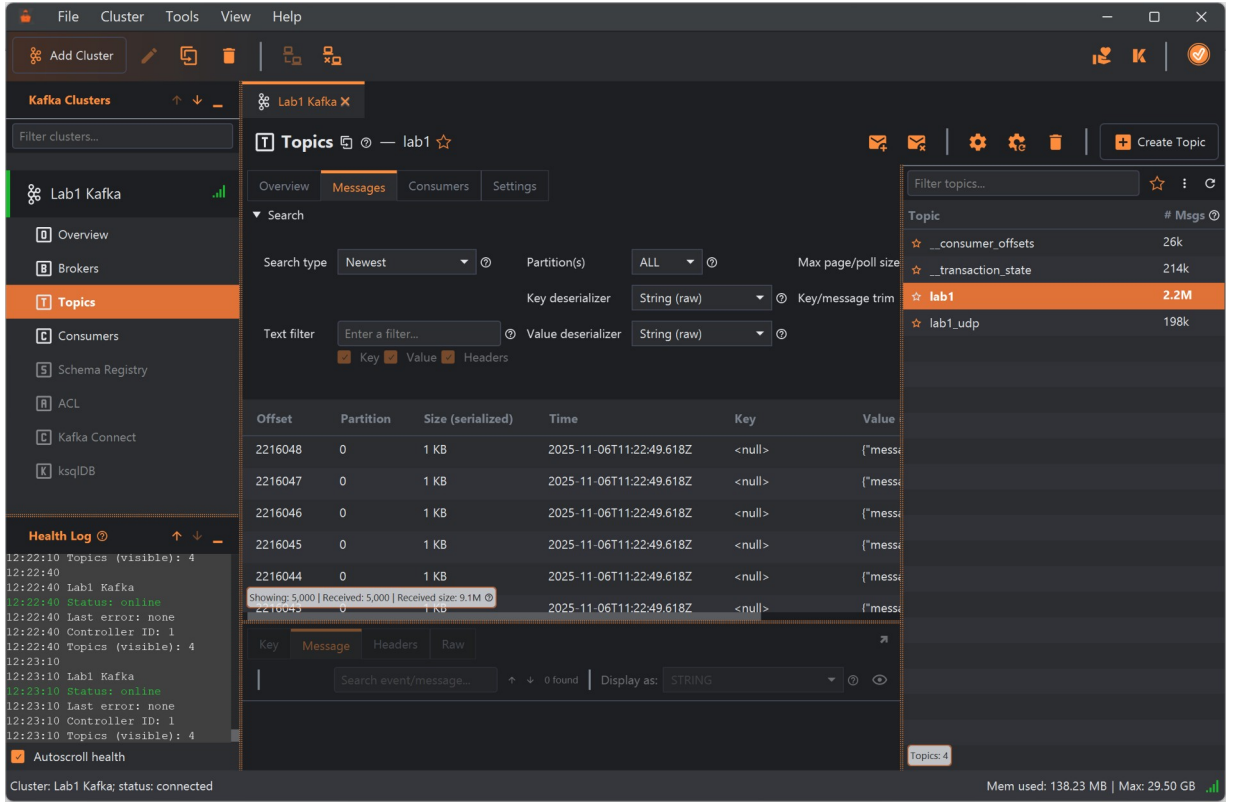
k) Install KafkIO (Linux, Windows, macOS) or some other Kafka GUI tool

l) Check connectivity
(Add Cluster → Check network reachability)



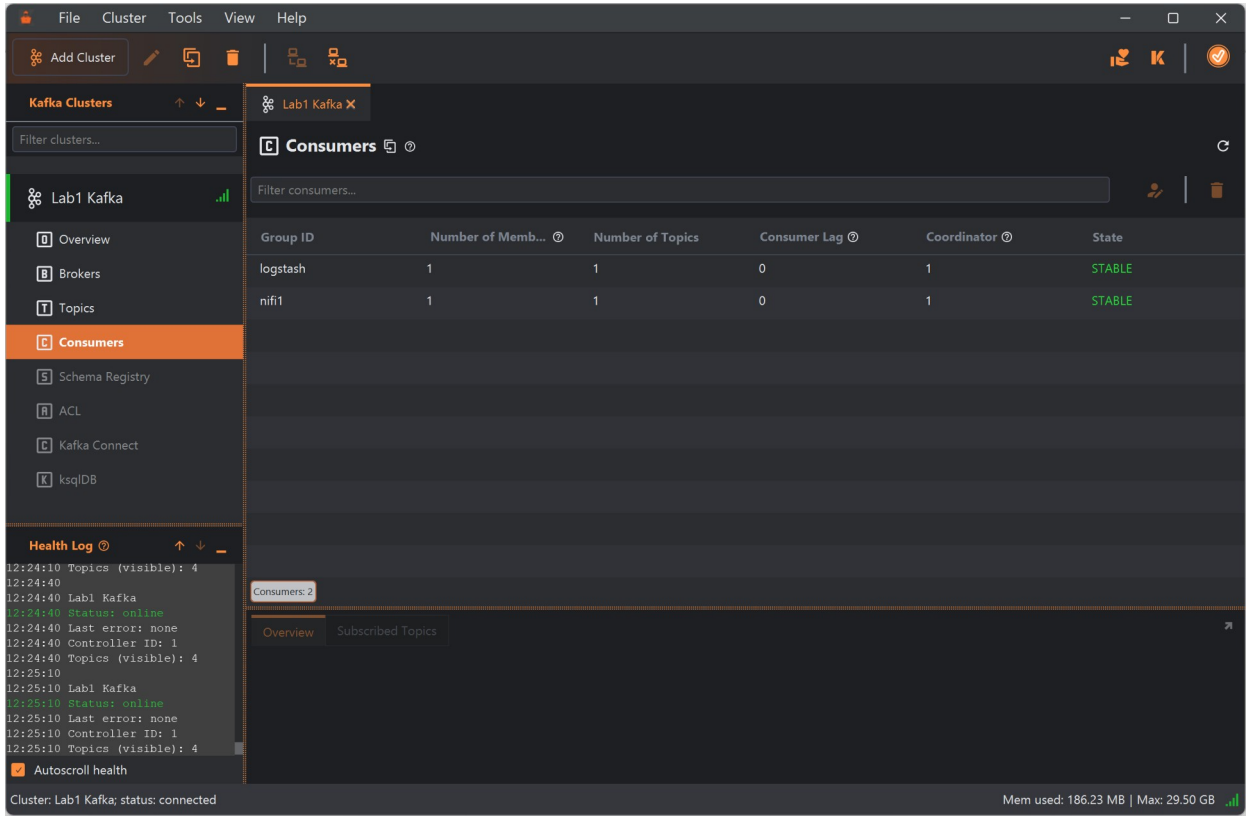
2. Kafka and Nifi

m) Are there messages in the lab1 topic?



2. Kafka and Nifi

n) Is logstash listed as a consumer Group ID?

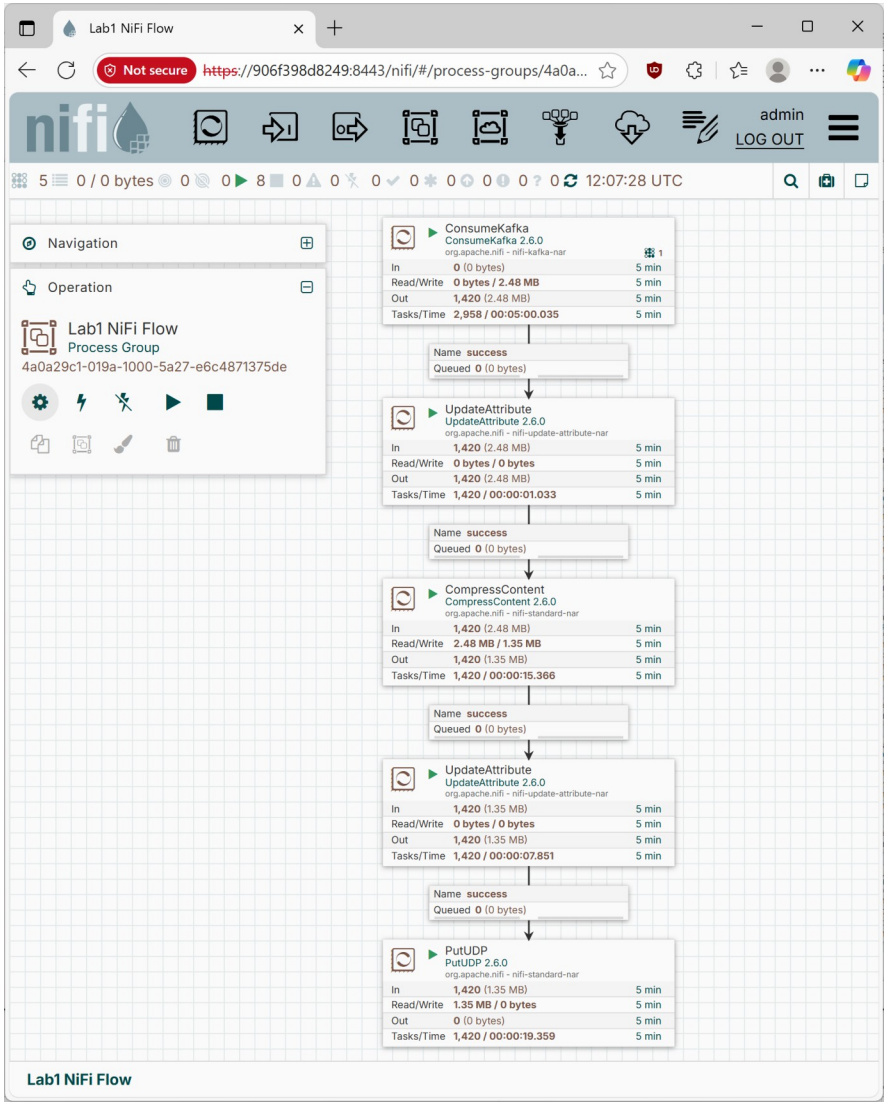


In the subsequent steps we will create an additional subscriber that uses a different group id to consume events from this topic.

2. Kafka and Nifi

o) Configurere dataflow in Nifi by adding, configurting and linking these processors:

1)ConsumeKafka
2)UpdateAttribute
3)CompressContent
4)UpdateAttribute
5)PutUDP



⇦ (Read lab1 topic)

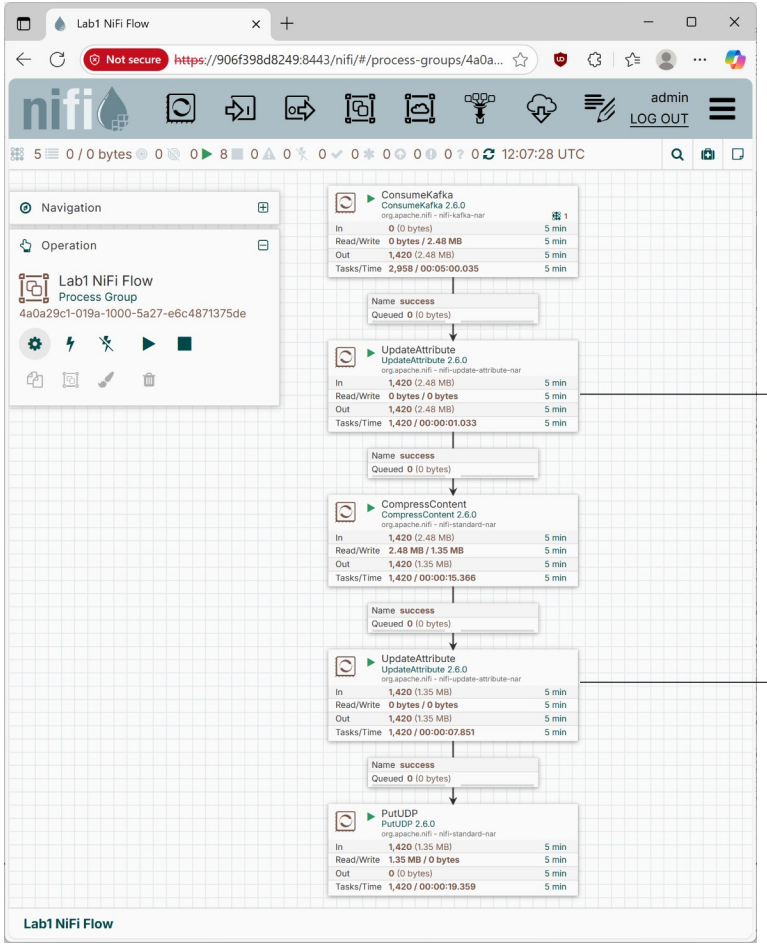
⇦ (Keep a running max stats of the message size. Should remain below 64kb UDP datagram size)

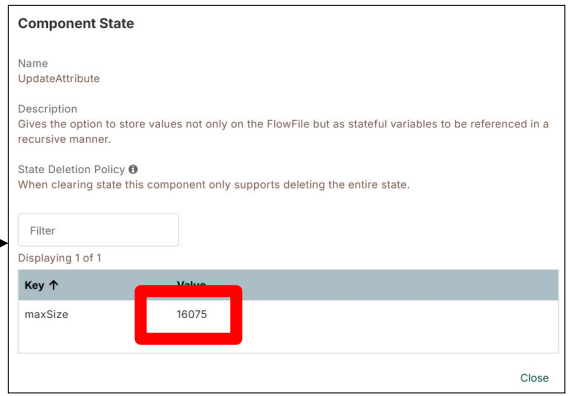
⇦ (Compress using gzip just in case)

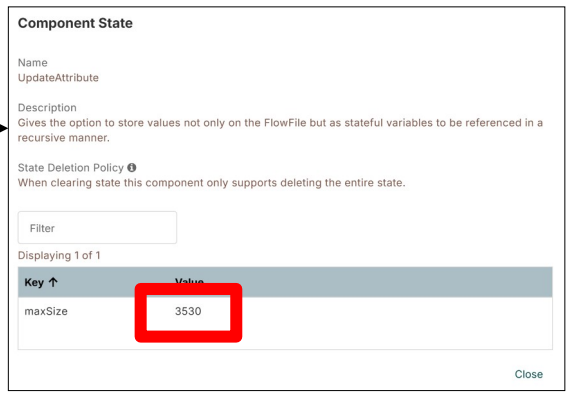
⇦ (Keep a running max stats of the message size. Should remain below 64kb UDP datagram size)

⇦ (Transmit events to Lab0 using UDP)

2. Kafka and Nifi







The only use of the UpdateAttribute processors is keeping an eye on the max event size using “View State”. This needs to stay onder 64 kb because it won’t fit in one UDP datagram. We could create elaborate contraptions to split here in Lab1 and merge in Lab0 using Nifi but so far we haven’t seen events that warrant that, so we compress instead just to be sure.

2. Kafka and Nifi

1. ConsumeKafka

Processor Details | ConsumeKafka 2.6.0

Settings | Scheduling | Properties

Required field

Property	Value
Kafka Connection Service	Kafka3ConnectionService
Group ID	nifi1
Topic Format	names
Topics	lab1

Controller Service Details

Settings | Properties

Required field

Property	Value
Bootstrap Servers	192.168.37.129:9092
Security Protocol	PLAINTEXT
Transaction Isolation Level	Read Committed
Max Poll Records	10000
Client Timeout	60 sec
Max Metadata Wait Time	5 sec
Acknowledgment Wait Time	5 sec

2. UpdateAttributes

Processor Details | UpdateAttribute 2.6.0

Settings | Scheduling | Properties

Required field

Property	Value
Delete Attributes Expression	*No value set*
Store State	Store state locally
Stateful Variables Initial Value	0
Cache Value Lookup Cache Size	100

Advanced

Use original FlowFile for matching rules

Search

bereken_maxSize

fallback_set_maxSize

Conditions

Expression
${fileSize:toNumber():gt(${getStateValue('maxSize'):toNumber()})}

Actions

Attribute	Value
maxSize	${fileSize}

Conditions

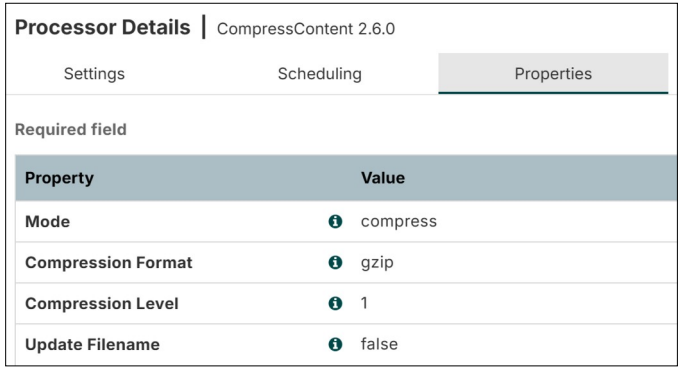
Expression
${fileSize:gt(-1)}

Actions

Attribute	Value
maxSize	${getStateValue('maxSize')}

2. Kafka and Nifi

3. CompressContent



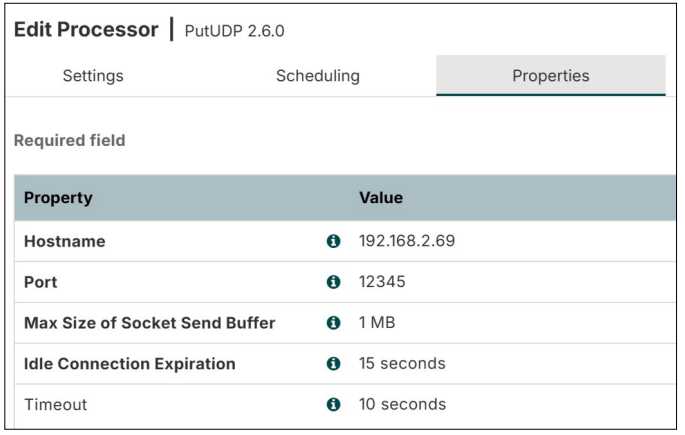
Processor Details | CompressContent 2.6.0

Settings | Scheduling | Properties

Required field

Property	Value
Mode	compress
Compression Format	gzip
Compression Level	1
Update Filename	false

5. PutUDP



Edit Processor | PutUDP 2.6.0

Settings | Scheduling | Properties

Required field

Property	Value
Hostname	192.168.2.69
Port	12345
Max Size of Socket Send Buffer	1 MB
Idle Connection Expiration	15 seconds
Timeout	10 seconds

Create a static arp entry aan for IP 192.168.2.69, because arp who-has requests will fail with a data diode and we won't reach the other side:

```
arp -s 192.168.2.69 00:c1:de:ad:be:ef
```

Configuration Lab0

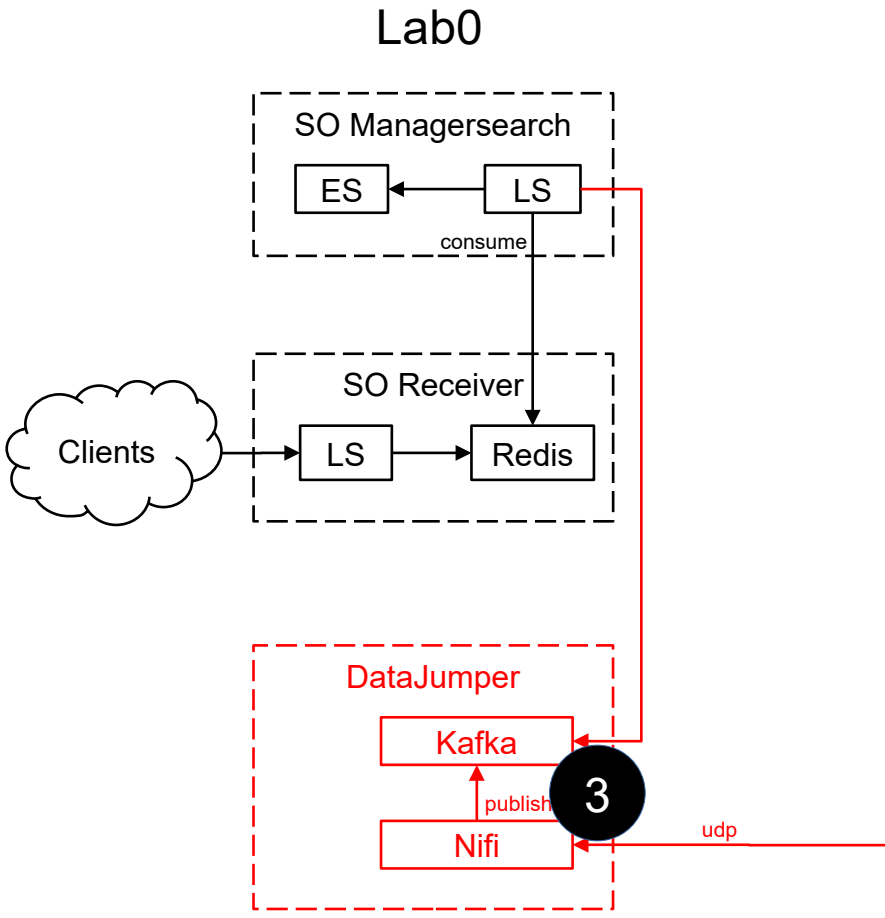
Based on the Open Source
Version of Security Onion

3. Nifi and Kafka

OVERVIEW

Nifi in Lab0:

- receives events via UDP
- publishes to a Kafka topic.



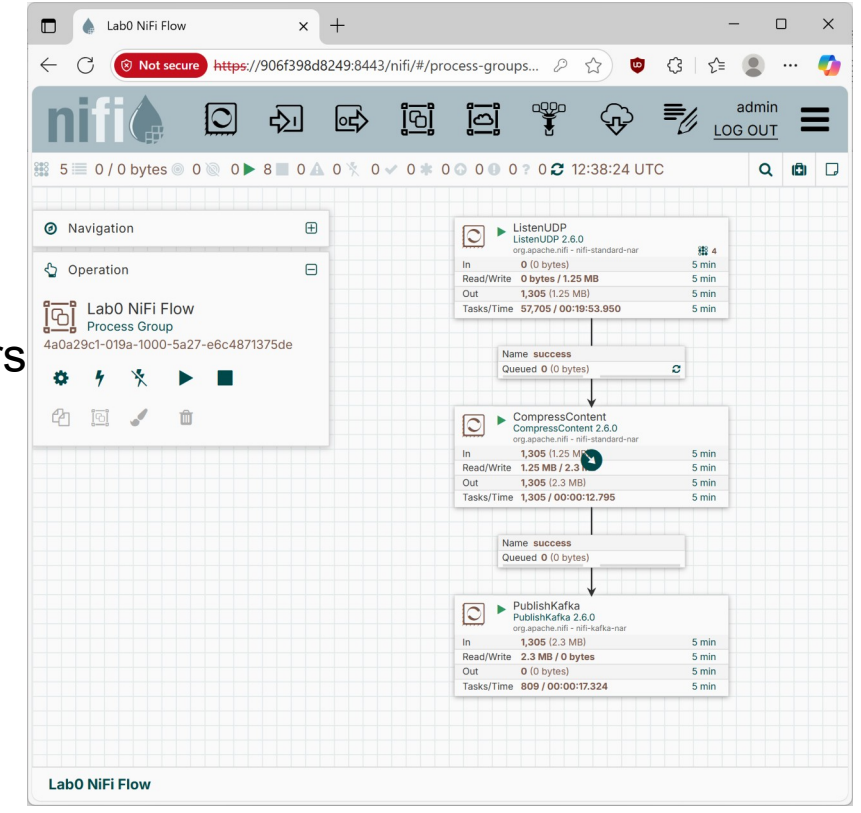
3. Nifi and Kafka

a) In Elastic Fleet change the namespace to lab0.

b) Install Nifi and Kafka containers like in the previous step 2.
Add the listening UDP port to the podman run args:
`-p 12345:12345/udp`

c) Configure dataflow in Nifi by adding, configuring and linking these processors:

1) ListenUDP
2) CompressContent
3) PublishKafka



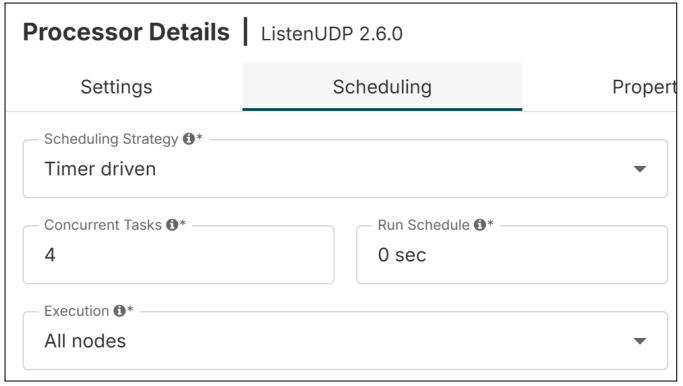
⇦ (Listen on a UDP port)

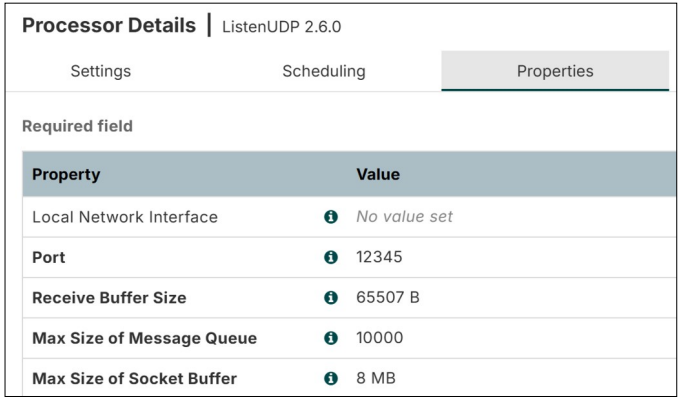
⇦ (Decompress the events

⇦ (Publish to lab0 Kafka topic)

3. Nifi and Kafka

1. ListenUDP





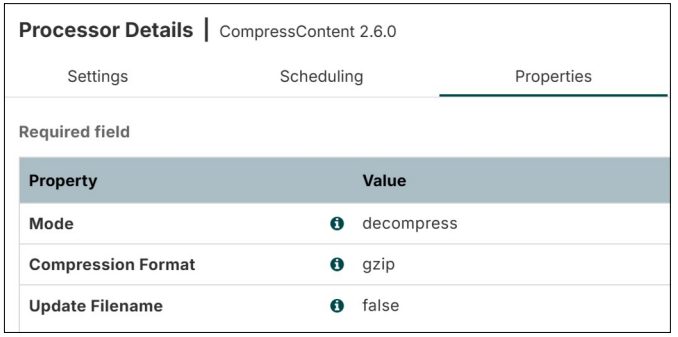
Raise the kernel max receive buffer to prevent packet loss [0]:

```
# sysctl -w net.core.rmem_max=8388608
net.core.rmem_max = 8388608
#
```

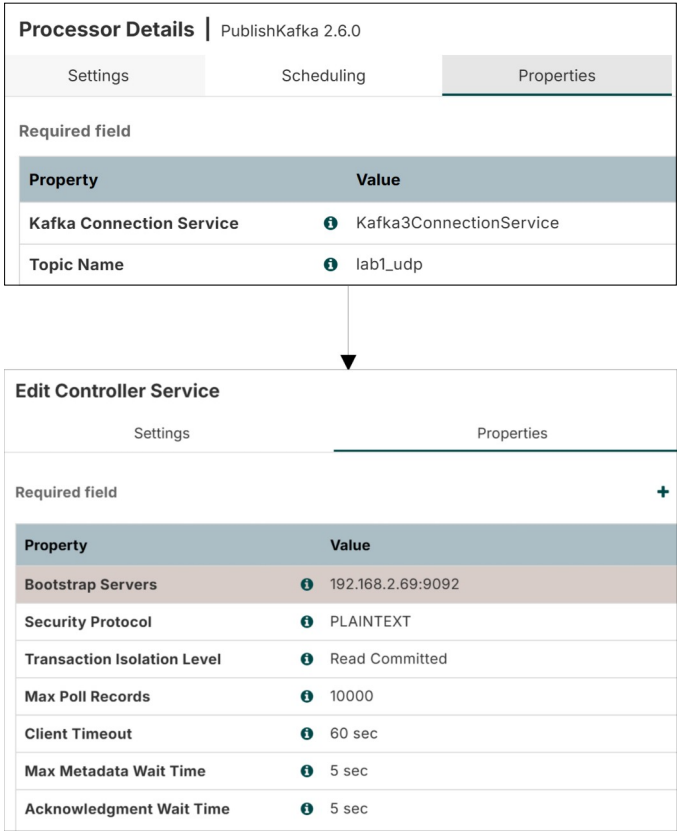
[0] https://github.com/Vrolijk/OSDD/blob/main/packetloss_explained.md

3. Nifi and Kafka

2. CompressContent



3. PublishKafka



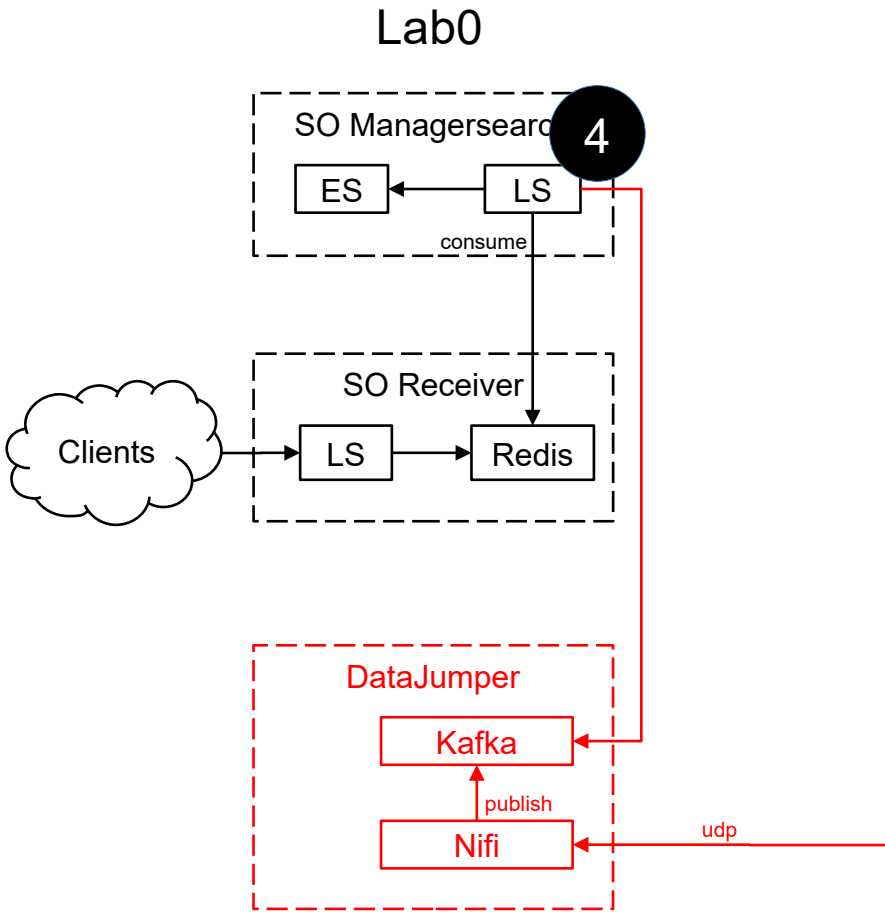
4. Kafka input

OVERVIEW

Add a custom Logstash pipeline that consumes events from the Lab1 Kafka Topic via:

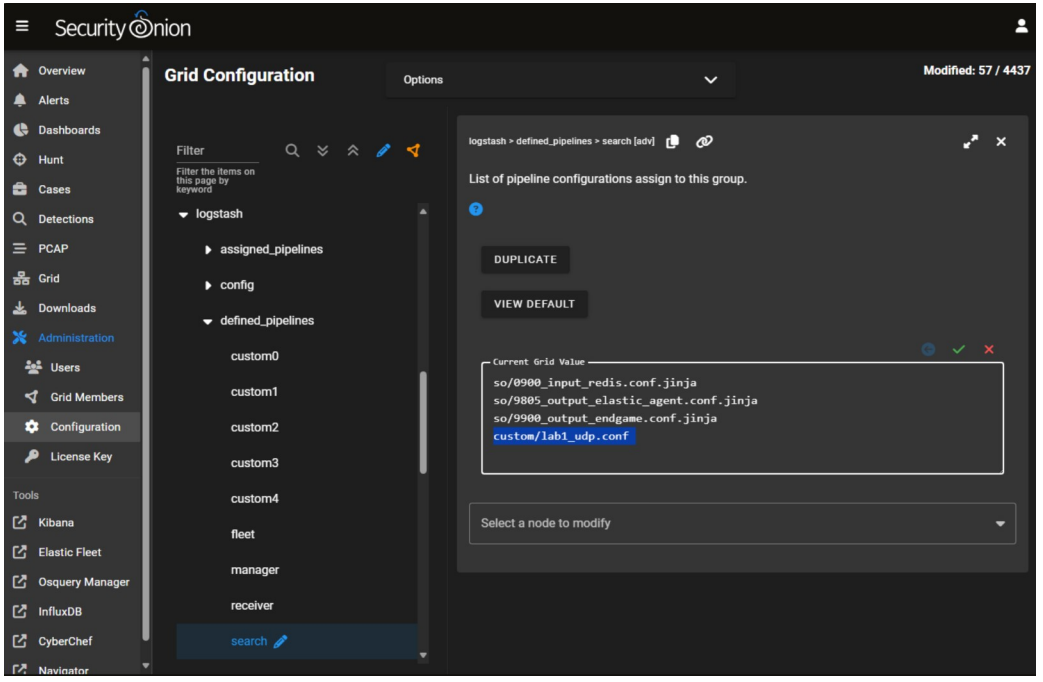
- Security Onion Console
- Manager: /opt/so/saltstack/local/…

In contrast to Lab1, we add it so the Search role pipeline instead of the Receiver pipeline.



4. Kafka input

a) Security Onion Console



b) File on Manager

/opt/so/saltstack/local/salt/logstash/pipelines/config/custom/lab1_udp.conf

```
input {
  kafka {
    bootstrap_servers => "192.168.2.69:9092"
    topics => ["lab1_udp"]
  }
}
```

c) Sync Grid

d) Check on Managersearch via SSH:

```
sudo salt-call pillar.get logstash:defined_pipelines
```

```
[admin@manager ~]$ sudo salt-call pillar.get logstash:defined_pipelines
[sudo] password for admin:
local:
    ----------
    search:
        - so/0900_input_redis.conf.jinja
        - so/9805_output_elastic_agent.conf.jinja
        - so/9900_output_endgame.conf.jinja
        - custom/lab1_udp.conf
```

e) Dont want to wait 15 minutes? Execute on Managersearch:

```
sudo salt-call state.highstate
```

DISCLAIMER

This is a lab-scale proof of concept

- No encryption
- No authentication
- No RBAC
- No persistence
- No redundancy, retry or fail-over
- No scaling