From ISC DHCPD to KEA DHCPD

TOPICS IN THIS PRESENTATION

- Why switch from ISC DHCP to KEA DHCP ?
- KEA DHCP has unique features
- Migration to KEA DHCP
- Monitoring and interesting case…

Why the name KEA:
*The ISC team (who built Kea after ISC DHCPd) wanted something short, easy to remember, and not bound to the old codebase. They chose **Kea**, the name of a clever parrot native to New Zealand, known for problem-solving and adaptability—traits they felt suited a next-generation DHCP server.*

WHY MIGRATE TO KEA DHCP ?

- ISC DHCP very stable/mature but:
- ISC decided to make it EOL in 2022.

- Old code, ISC decided to **start all over**
- ISC DHCP **No** (modern) **API**
- **Reboot** needed for changes
- Lease binding to **Option 82** not supported (Modem swaps)

KEA DHCP ARCHITECTURE AND FEATURES

- **Database** backend (CSV/PostgreSQL/MySQL) for leases, hosts and subnets
  Hooks Mechanism (Plugins). (Flex-id / Radius / Script / Legal Logging)

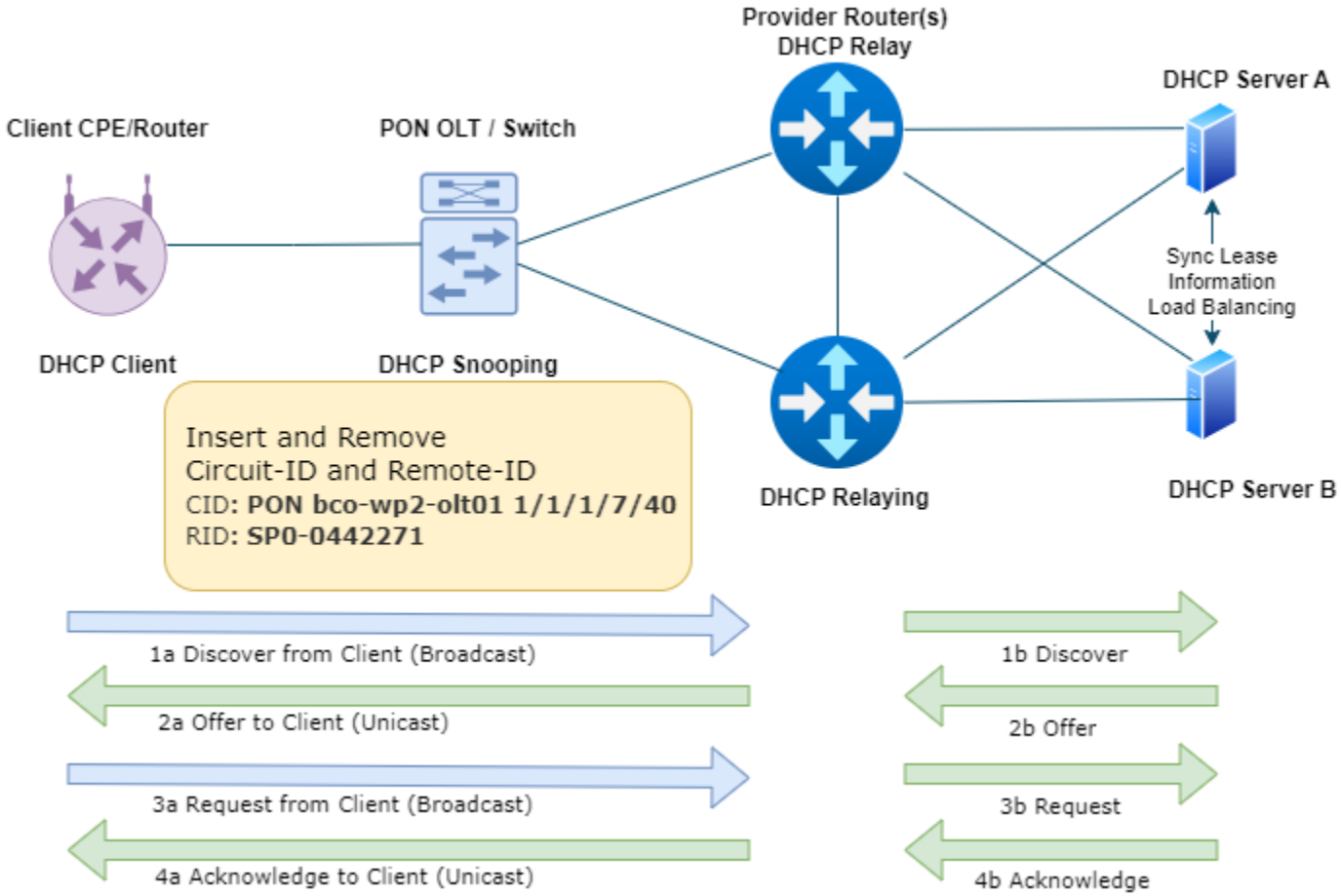
- **REST API** (Update leases/subnets/config check) 200+ API commands

- **High Availibilty** with heartbeat and detection of network outage with **sec**onds field.
- And a lot more (**Multi threading/extensive documention**)
- **Graphical dashboard** with Stork tool

```
{
    "command": "remote-subnet4-set",
    "service": ["dhcp4"],
    "arguments": {
        "subnets": [
        {
            "id" : 1,
            "subnet": "1.2.3.0/25",
            "shared-network-name": "rt-sdm-dr01-vlan100",
                "pools": [
                {
                        "pool": "1.2.3.0 - 1.2.3.39",
                        "client-class": "public-pool"
                }
                ],
                "option-data" : [ {
                        "name": "routers",
                        "data":  "1.2.3.1"
                }
                ]
        }
        ],
        "remote": {
            "type": "postgresql"
        },
        "server-tags": [ "dhcp-cluster01" ]
    }
}
```

HOE DELTA FIBER DOES DHCP - THE DORA PROCESS

- How does Delta Fiber use DHCP to assign IPv(4/6) addresses ?



DORA
Unforunately, In Ipv6 it's SARR

KEA FLEX-ID PLUGIN - LEASE API

- ISC DHCP only could use limited fields (MAC)and no choosen id as the client id

- KEA can use any DHCP option field (Option 82) as client id for lease.

```
{
  "library": "/usr/lib/x86_64-linux-gnu/kea/hooks/libdhcp_flex_id.so",
  "parameters": {
      "identifier-expression": "relay6[1].option[37].hex",
      "identifier-expression": "relay4[1].hex",
      "replace-client-id": true
  }
},
```

- Old ISC lease database :

address	hwaddr (mac)	client_id*	valid_lifetime	RAI remote-id	RAI circuit-id
100.68.0.2	f4:fd:96:f8:c8:10	f4:fd:96:f8:c8:10	86400	SP0-123456	PON vri-poc-olt01 1/1/1/2/6/100
100.64.128.7	c0:60:0a:39:2a:e8	c0:60:0a:39:2a:e8	86400	SP0-123458	PON sdm-knt99-olt01 1/1/1/5/7/100

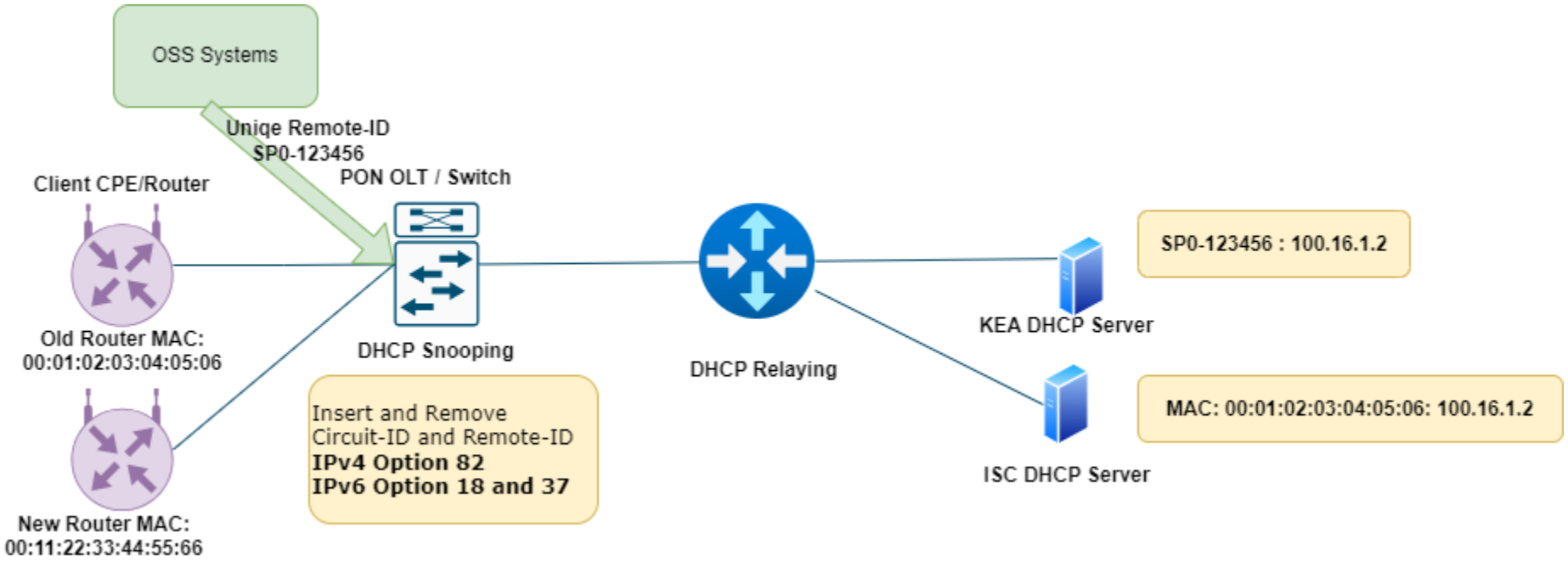
- New KEA lease database :

address	hwaddr (mac)	client_id*	valid_lifetime	RAI remote-id	RAI circuit-id
100.68.0.2	f4:fd:96:f8:c8:10	SP0-123456	86400	SP0-123456	PON vri-poc-olt01 1/1/1/2/6/100
100.64.128.7	c0:60:0a:39:2a:e8	SP0-123458	86400	SP0-123458	PON sdm-knt99-olt01 1/1/1/5/7/100

LONGER LEASE TIMES => ANTI FRAGILE

- Delta Fiber used to have lease times of **30 minutes**
- Why ? Because otherwise modem swaps dit not work within 30m ☹
- After the implementation of KEA, we decided to go to **24h** lease times.
- Renew timers of 12h and rebind timer of **12h+10m**.
- Worst case of a major outage of DHCP platform, We can survive **12 hours** (Except new leases). Side effect**, lower load** on DHCP platform ☺

LEASE AFFINITY (STICKY LEASES)

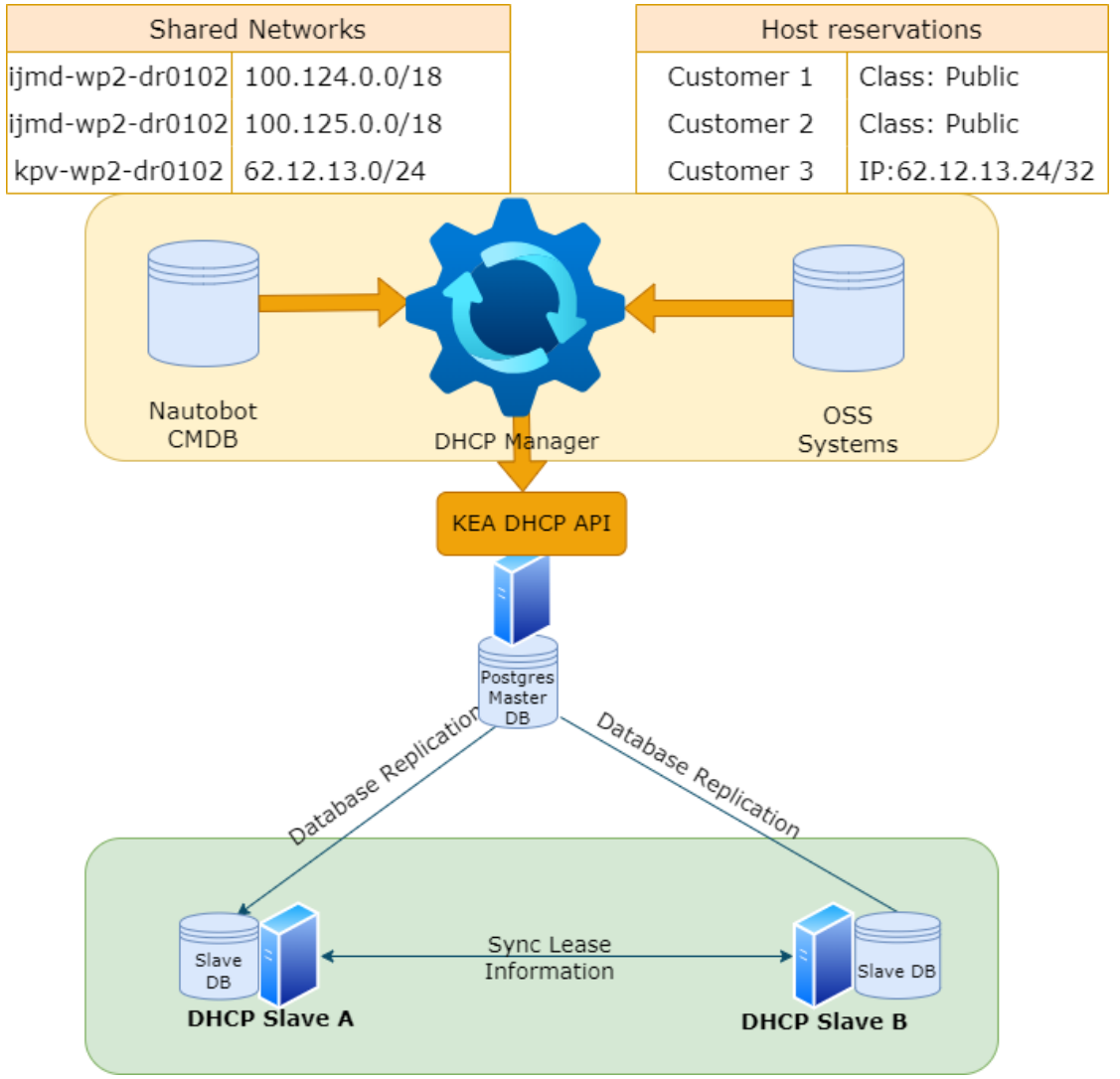


- Added extra DROP class for Dropping DHCPRELEASE
- Most CPE's are very strict to RFC and release lease when rebooting ☺ (Expired != Released)

```
"client-classes": [
  {
    "name": "DROP",
    "option-data": [ ],
    "test": "pkt6.msgtype==8"
  }
],
```

PLATFORM AND AUTOMATION / PROVISIONING

- Nautobot + Backoffice + DHCP Manager => KEA DHCP Master
- **DHCP Manager** to provision config via API to Master
- **DHCP Master** server per **Service**
- Slaves can run **independent** of Master and each other.
- **Ansible** manages all Master/Slave servers +config (around ~30)

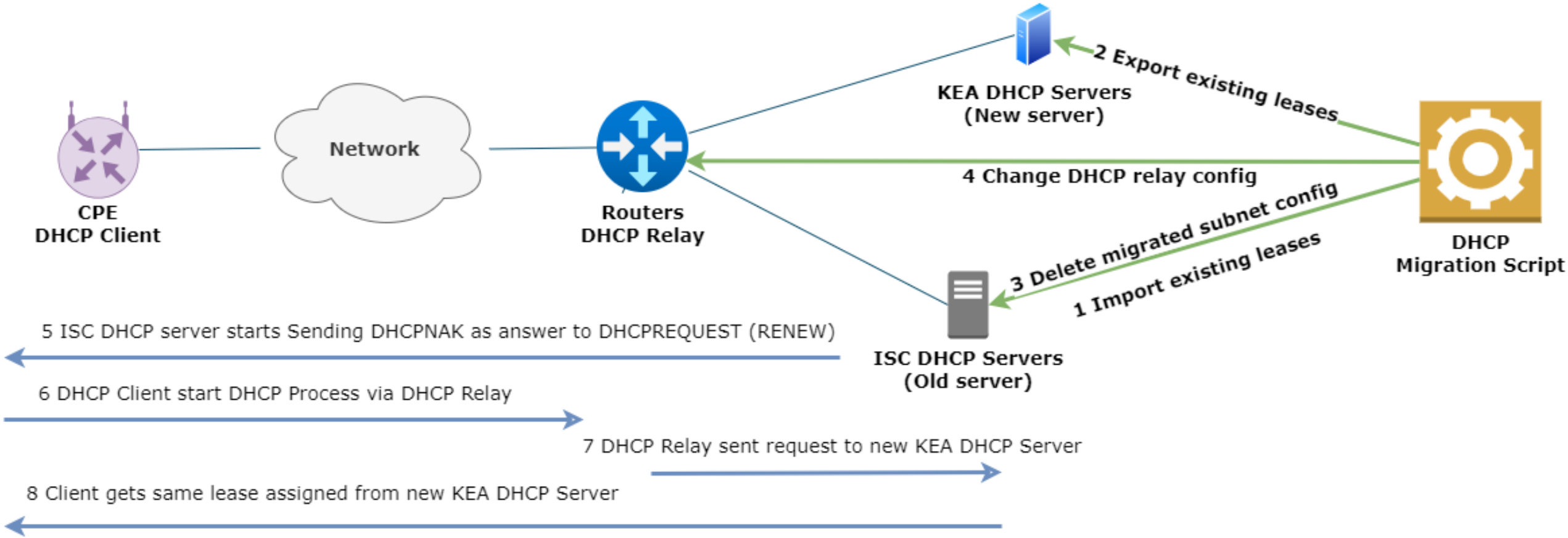


THE MIGRATION TO KEA

- Delta has **5** different **DHCP clusters** on about **260 Routing area**'s
- **VOIP/IPTV/Internet v4/Internet v6/Management**
- Start with the **easiest** platform (VOIP/IPTV). Start with **pre production**.
- Migration plan : **Crawl**, **walk** , **run**, **fly**

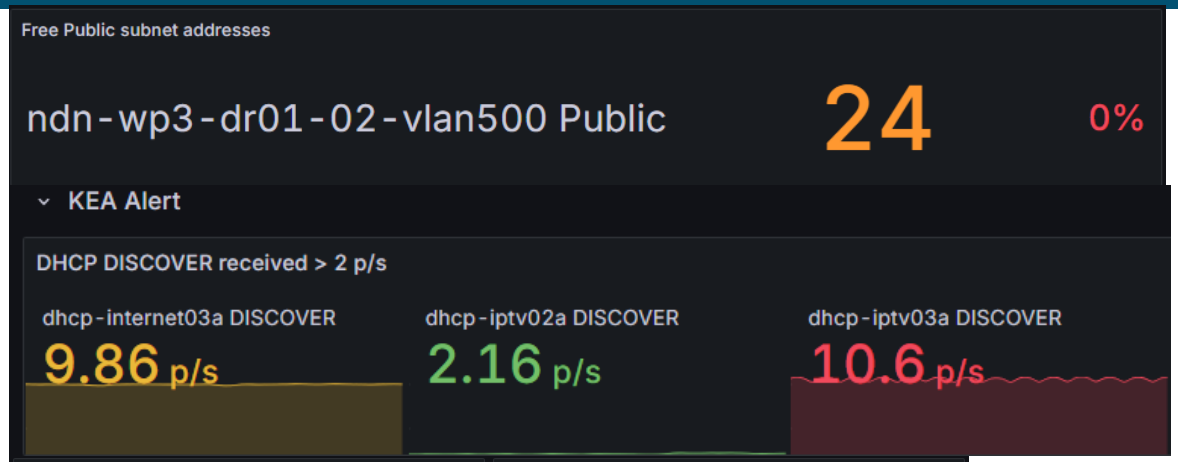
- **Internet IPv4** migration was the hardest job
  3 different **Pools** CGNAT / Public / Fixed
- Last step is to change **Management** and **IPv6 servers** to new Platform.

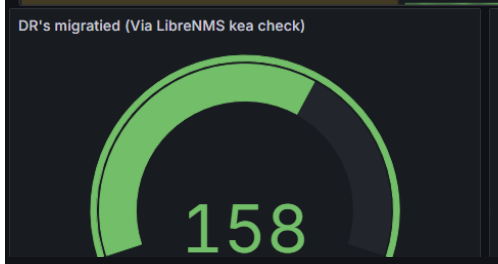
THE MIGRATION TO KEA

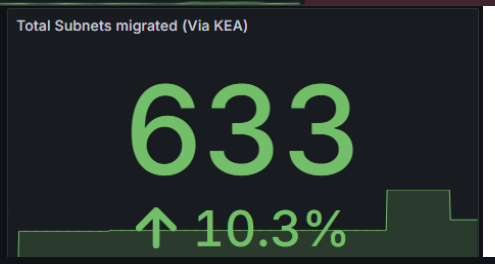


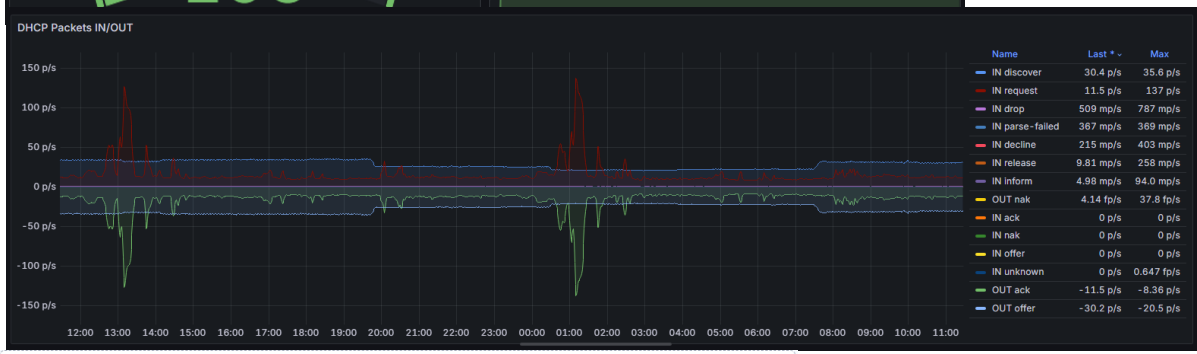
GRAFANA TO MONITOR MIGRATIONS

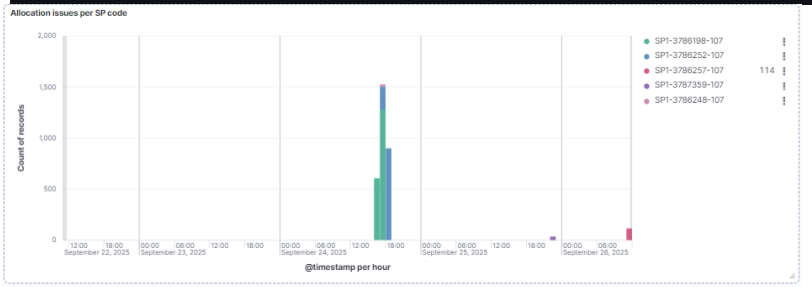
- Monitoring of **Pool usage** per:
- Monitor DHCP packets for **anomalies**:
- Migration **status** Project management:
- **Detailed** graph to debug issues:
- **Elasticsearch** if need to go Deep:



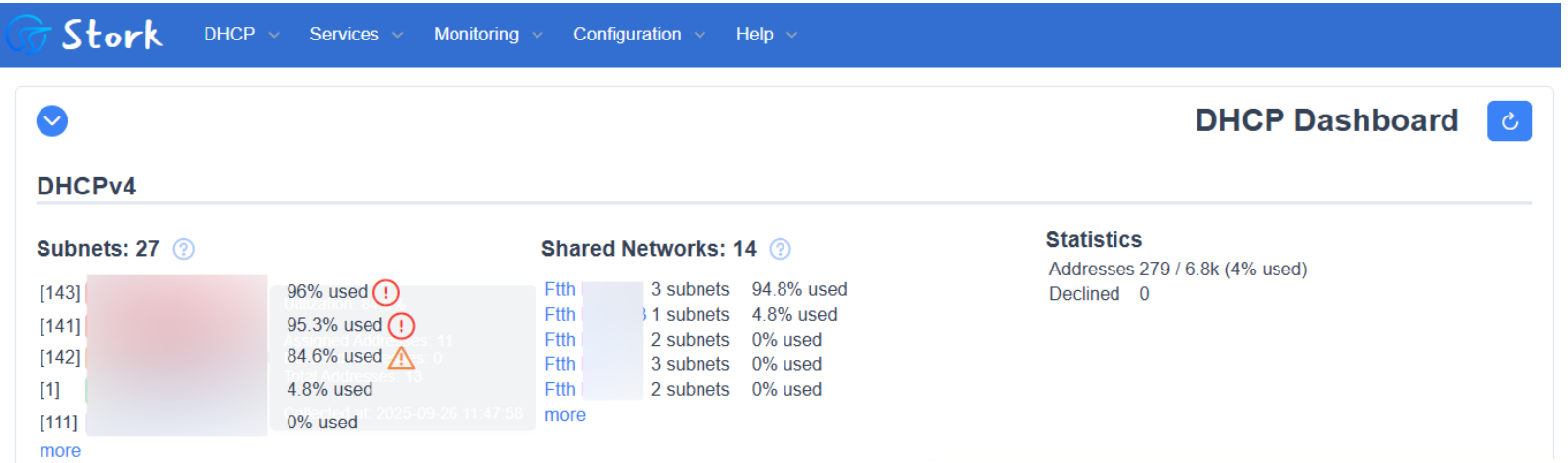


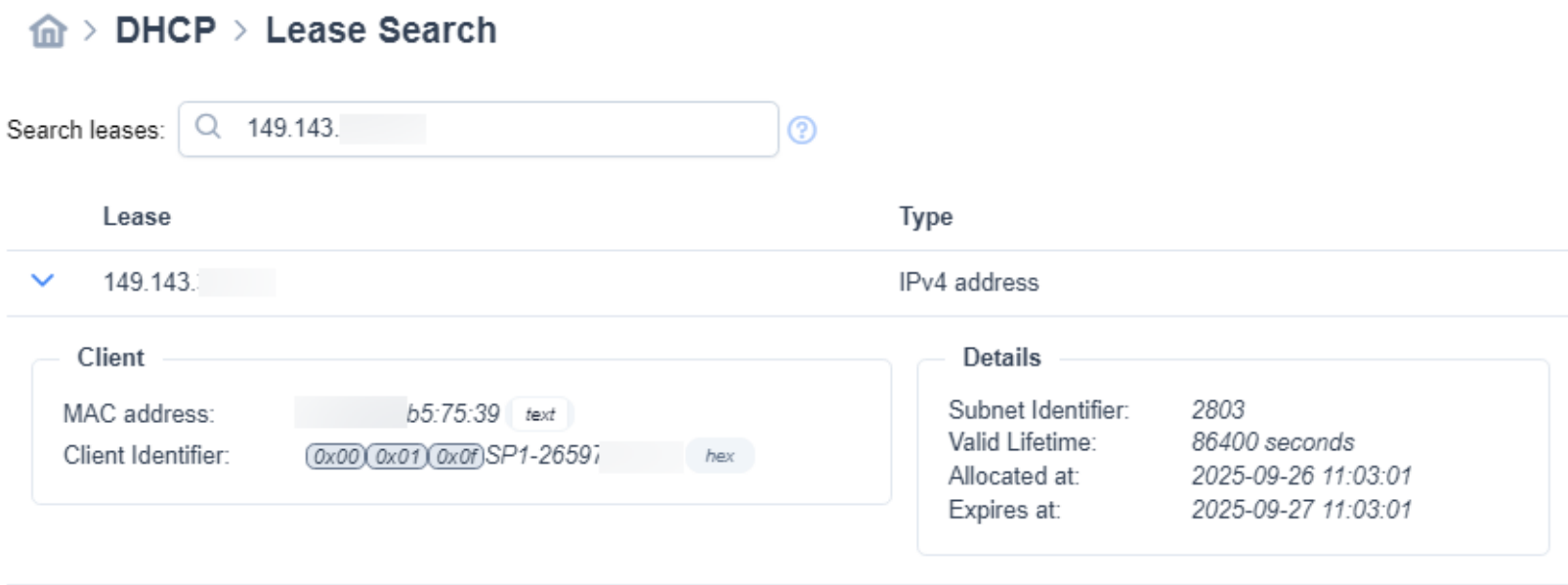






ISC STORK MONITORING DASHBOARD





HOW AUTOMATION CAN KILL YOUR NETWORK VERY GRACFULL

- On Friday , Nautobot **permissions** have changed
- DHCP provisioning lost some rights. Nautobot returned **Empty Data** set.
- Saturday **2:00 AM** DHCP provisioning **deleted all Subnets**
- **New clients/Reboots** did not get lease,
  Clients that came for **Renew** did not get renew of lease
- Around **4:00 AM monitoring** discovered the issue. It was fixed at **10:00AM**
- Impact was **reduced**, as we had 12 hour lease renew time. (Half the lease time)
- **Restore** of DB Backup/**shutdown** of **provisioning**/**Reset** of **Nautobot** permissions.
- Fix the provisioning with **extra checks**.

CONCLUSIONS / LESSONS LEARNED

- All **features** of ISC DHCP are **possible** in KEA… and much more **(Plugins!)**
- **Seperate DB backend** + small **config** makes it very managable
- KEA IPv4 and IPv6 very stable. No **major issues** during 4 years using KEA
- **Including current leases** in migration makes a customer friendly
- **Stork** still has some **bugs** (statistics), but it is getting better

- **Modern DHCP is not only the software, but it's the whole eco-system**
- If you are still using ISC DHCP, strong advise to **migrate**

QUESTIONS ?

kea