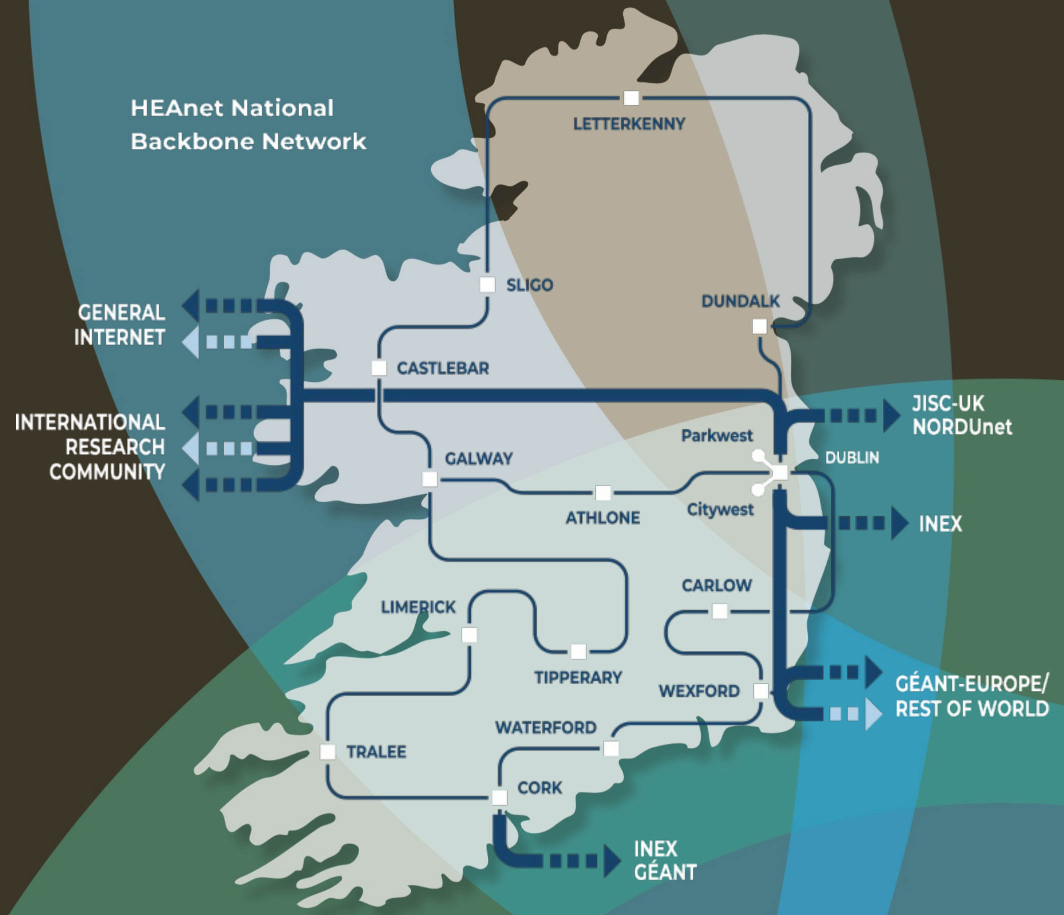
HEAnet

Ireland's National Education & Research Network

Our automation journey!

Workflow Orchestrator



Agenda

Where we’ve come from

Where we are

Demo

Who?

IR&D:

Andy Byrne (PM)

Donal Cunningham

Networks:

Garwin Liu

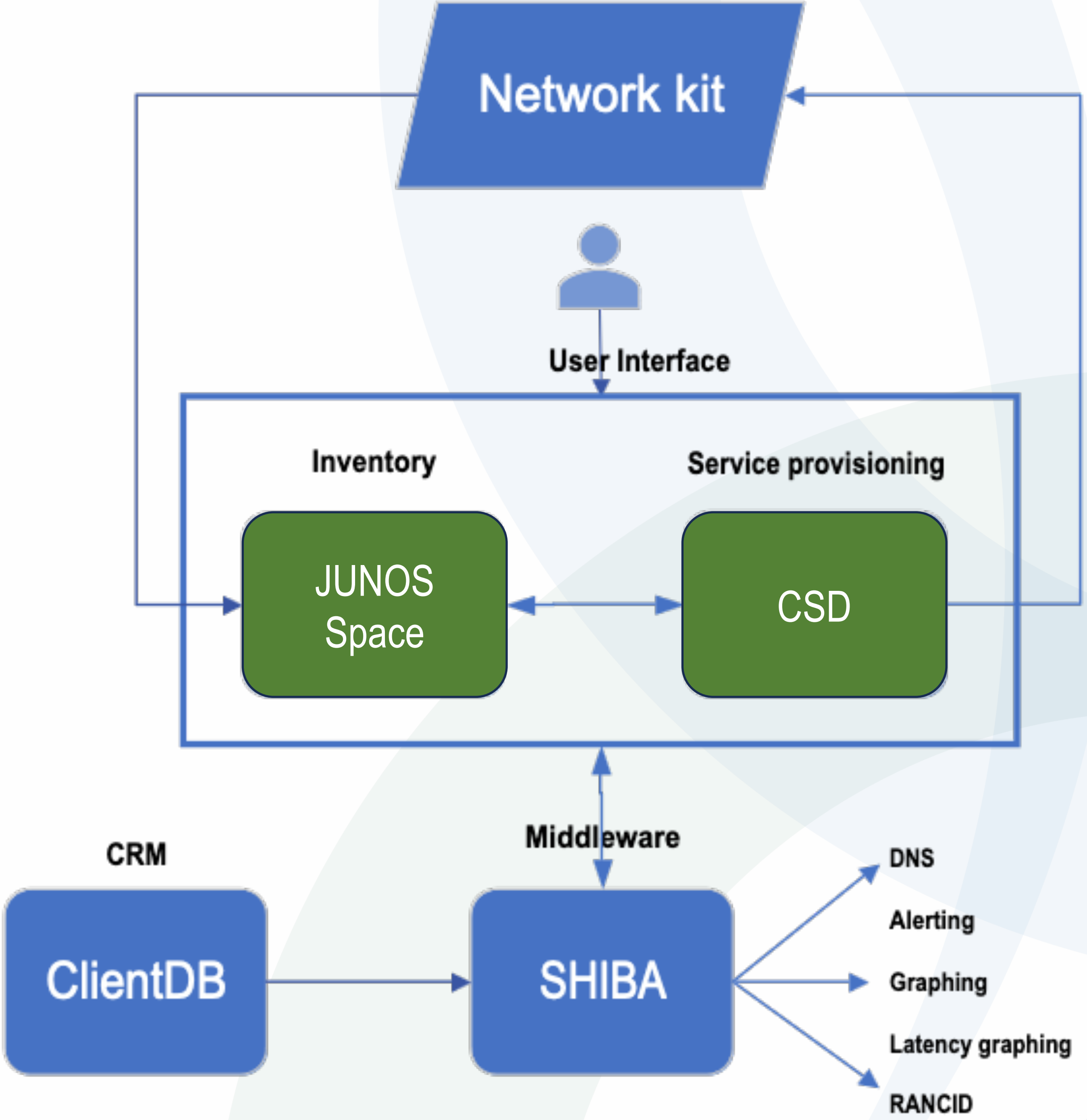
Mick O’Donovan

Architecture:

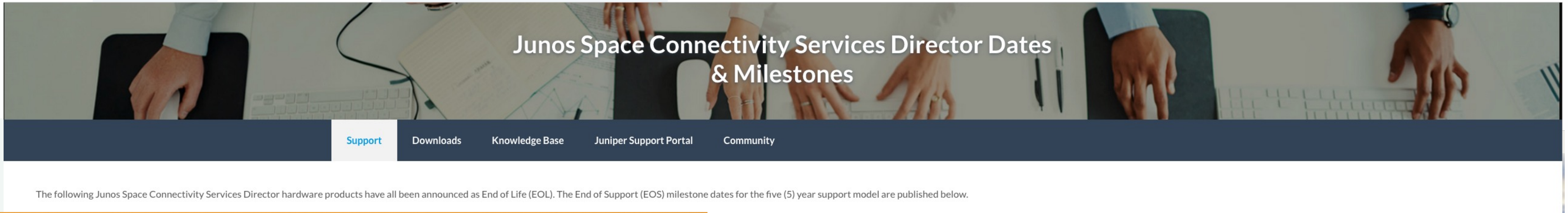
Anna Wilson

Brian McArdle

Erick Lopez


Network kit
User Interface
Inventory
Service provisioning
JUNOS Space
CSD
Middleware
CRM
ClientDB
SHIBA
DNS
Alerting
Graphing
Latency graphing
RANCID

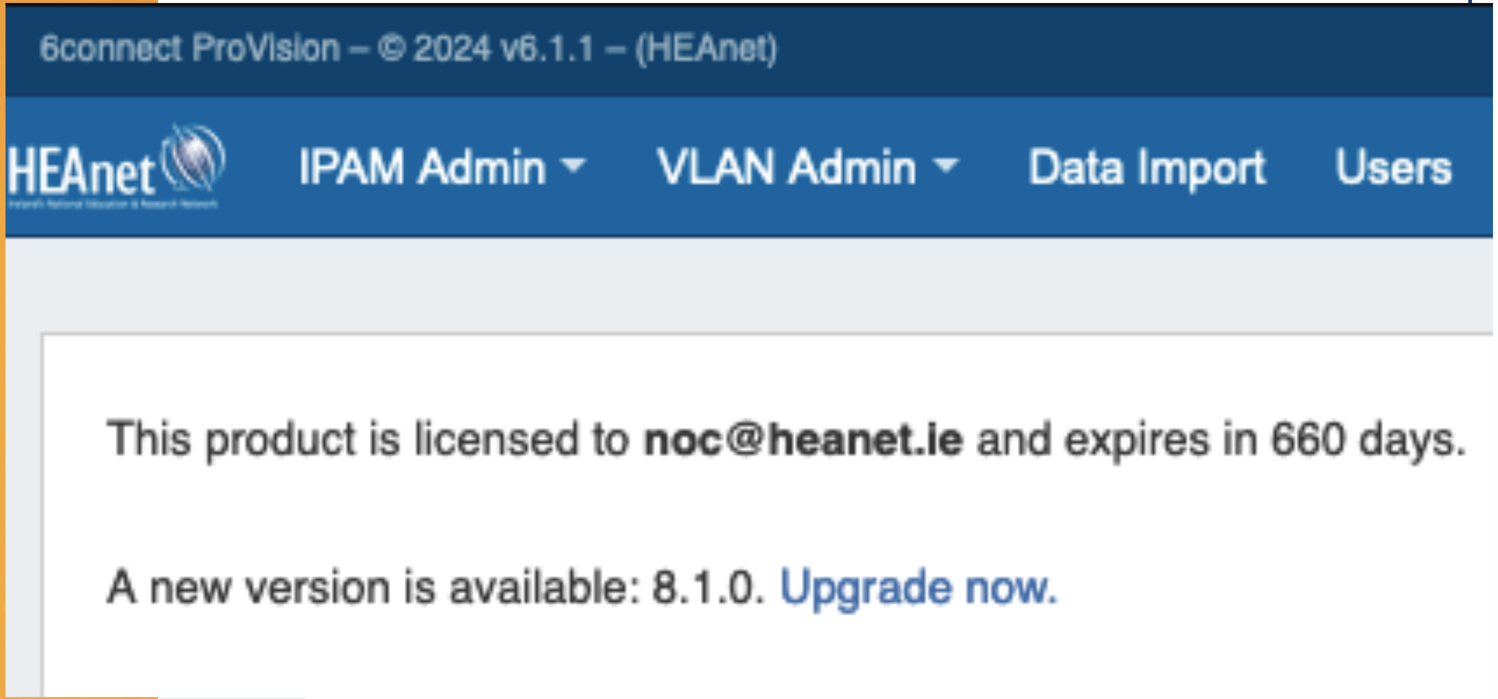
Where it all went wrong...



Junos Space Connectivity Services Director Dates & Milestones

The following Junos Space Connectivity Services Director hardware products have all been announced as End of Life (EOL). The End of Support (EOS) milestone dates for the five (5) year support model are published below.

quired).

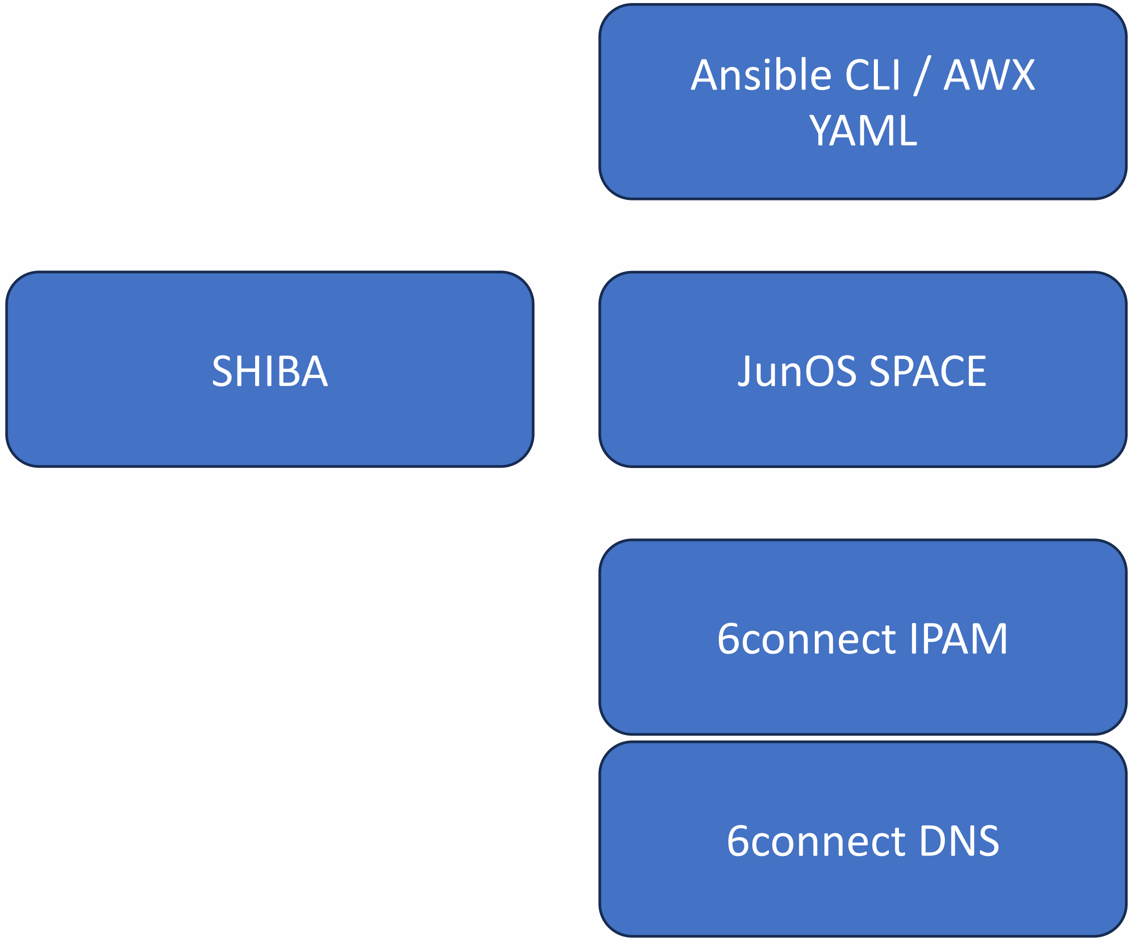


6connect ProVision – © 2024 v6.1.1 – (HEAnet)

This product is licensed to **noc@heanet.ie** and expires in 660 days.

A new version is available: 8.1.0. Upgrade now.

Interim solution



Ansible CLI / AWX
YAML

SHIBA

JunOS SPACE

6connect IPAM

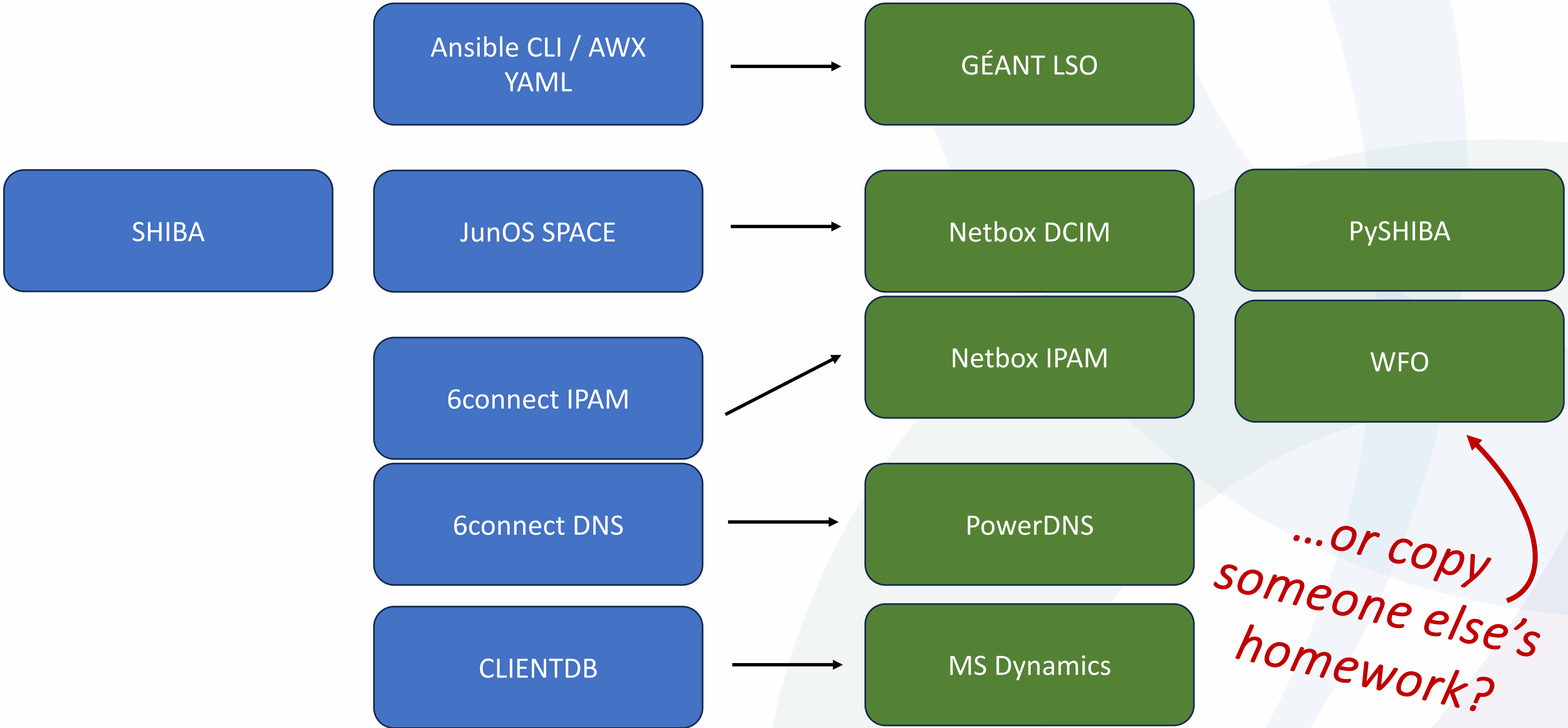
6connect DNS

Provision services

Still working… sorta?

🤞

Future solution



Ansible CLI / AWX
YAML

GÉANT LSO

SHIBA

JunOS SPACE

Netbox DCIM

PySHIBA

6connect IPAM

Netbox IPAM

WFO

6connect DNS

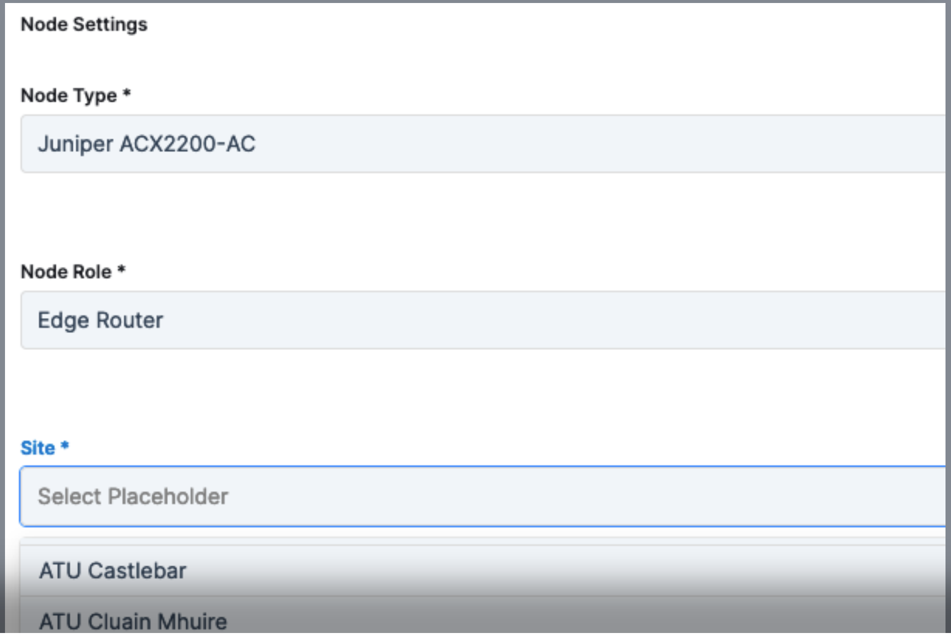
PowerDNS

CLIENTDB

MS Dynamics

…or copy someone else's homework?

Workflow Orchestrator



Node Settings

Node Type *

Juniper ACX2200-AC

Node Role *

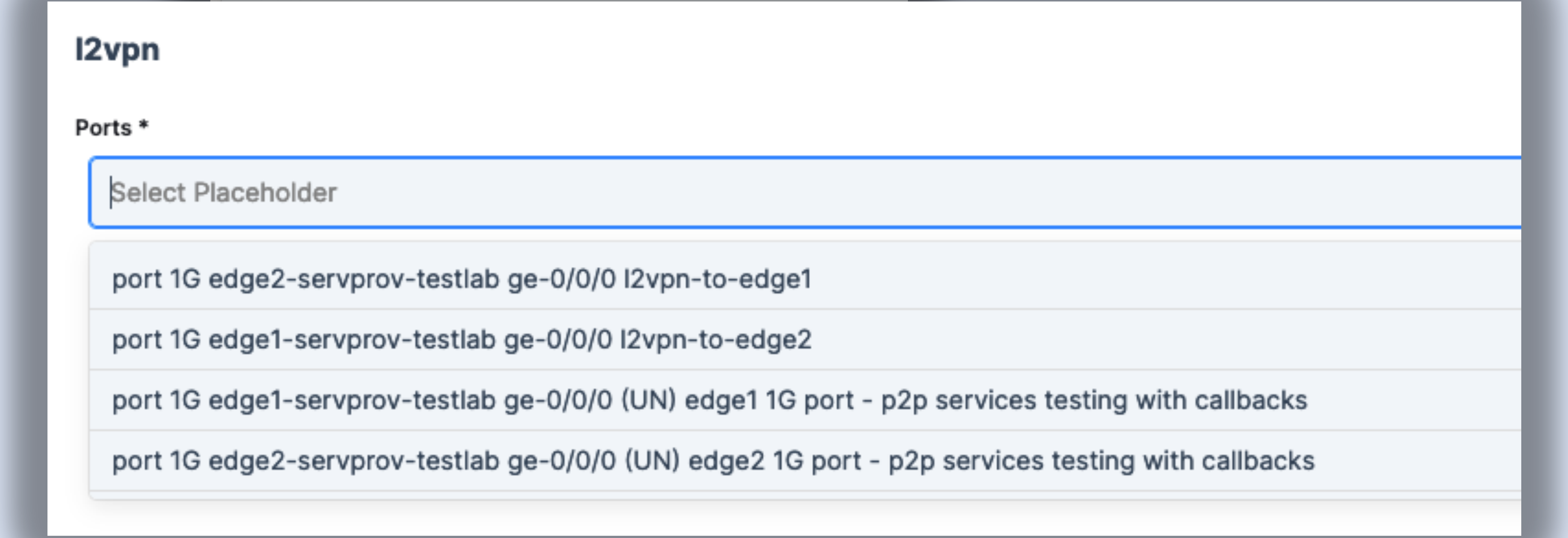
Edge Router

Site *

Select Placeholder

ATU Castlebar

ATU Cluain Mhuire



l2vpn

Ports *

Select Placeholder

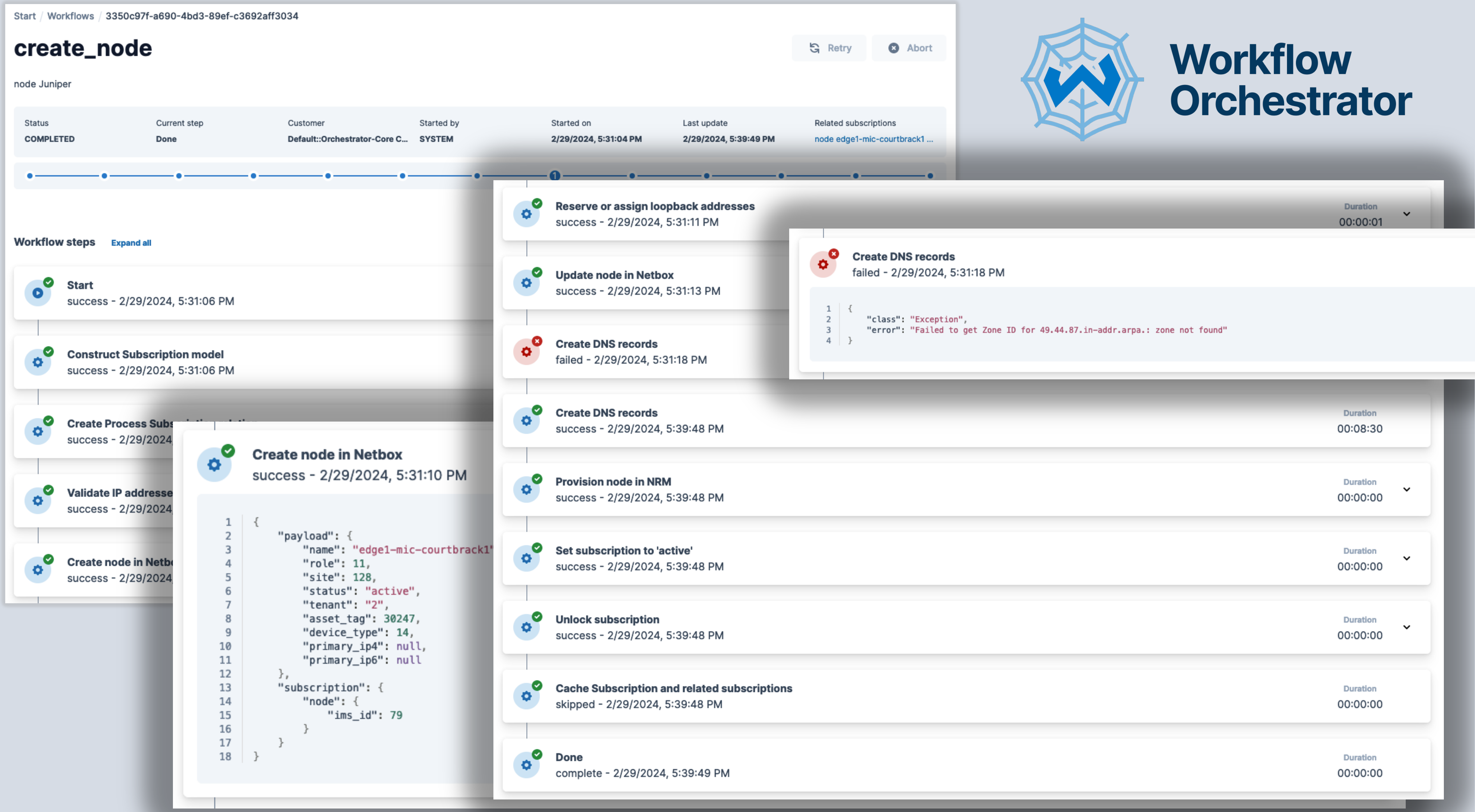
port 1G edge2-servprov-testlab ge-0/0/0 l2vpn-to-edge1

port 1G edge1-servprov-testlab ge-0/0/0 l2vpn-to-edge2

port 1G edge1-servprov-testlab ge-0/0/0 (UN) edge1 1G port - p2p services testing with callbacks

port 1G edge2-servprov-testlab ge-0/0/0 (UN) edge2 1G port - p2p services testing with callbacks

Workflow Orchestrator



Start / Workflows / 3350c97f-a690-4bd3-89ef-c3692aff3034

create_node

node Juniper

Status	Current step	Customer	Started by	Started on	Last update	Related subscriptions
COMPLETED	Done	Default::Orchestrator-Core C...	SYSTEM	2/29/2024, 5:31:04 PM	2/29/2024, 5:39:49 PM	node edge1-mic-courtbrack1 ...

Workflow steps

Start
success - 2/29/2024, 5:31:06 PM

Construct Subscription model
success - 2/29/2024, 5:31:06 PM

Create Process Subs
success - 2/29/2024

Validate IP addresse
success - 2/29/2024

Create node in Netb
success - 2/29/2024

Create node in Netbox
success - 2/29/2024, 5:31:10 PM

```
{
    "payload": {
        "name": "edge1-mic-courtbrack1"
        "role": 11,
        "site": 128,
        "status": "active",
        "tenant": "2",
        "asset_tag": 30247,
        "device_type": 14,
        "primary_ip4": null,
        "primary_ip6": null
    },
    "subscription": {
        "node": {
            "ims_id": 79
        }
    }
}
```

Reserve or assign loopback addresses
success - 2/29/2024, 5:31:11 PM
Duration
00:00:01

Update node in Netbox
success - 2/29/2024, 5:31:13 PM

Create DNS records
failed - 2/29/2024, 5:31:18 PM

Create DNS records
failed - 2/29/2024, 5:31:18 PM

```
{
    "class": "Exception",
    "error": "Failed to get Zone ID for 49.44.87.in-addr.arpa.: zone not found"
}
```

Create DNS records
success - 2/29/2024, 5:39:48 PM
Duration
00:08:30

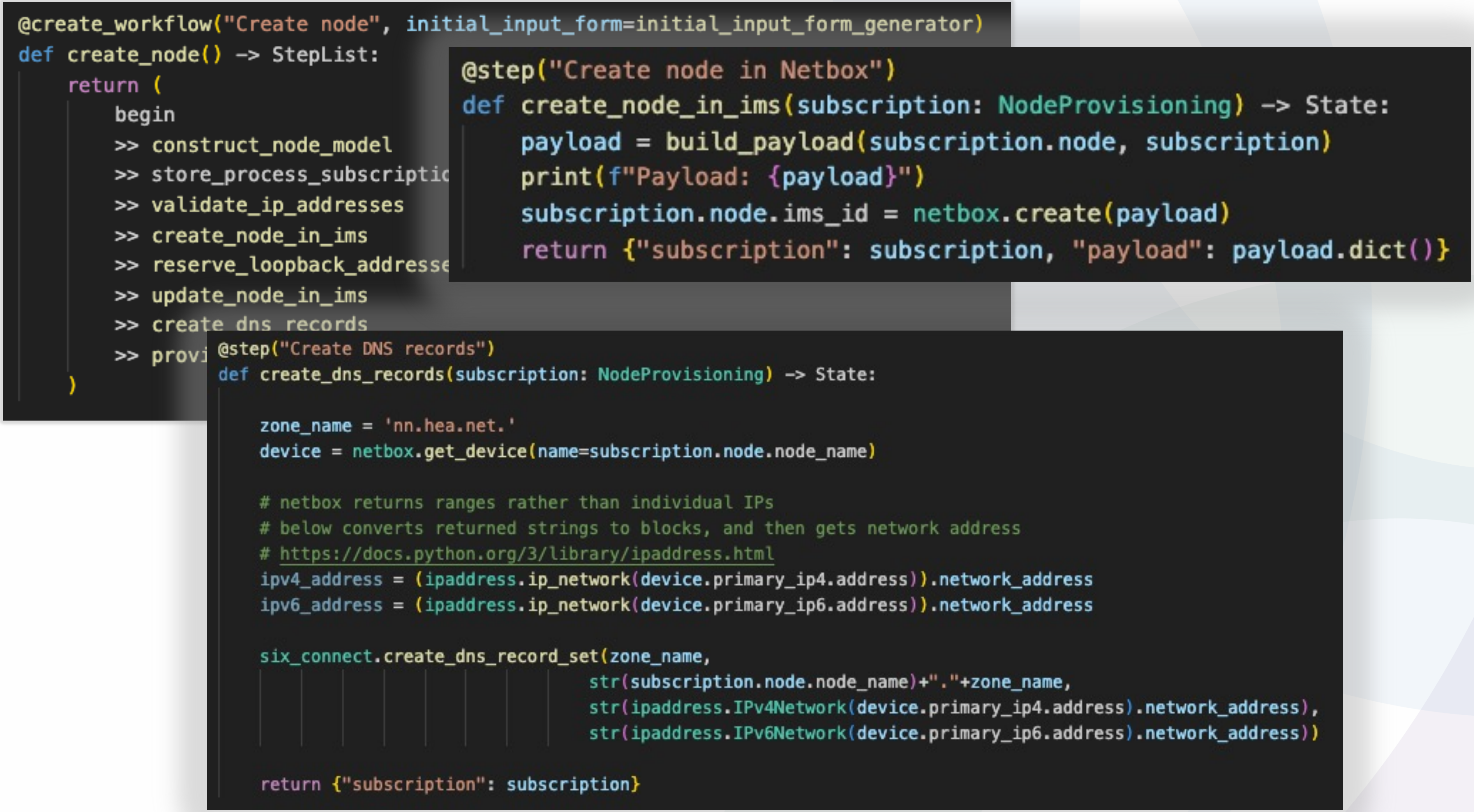
Provision node in NRM
success - 2/29/2024, 5:39:48 PM
Duration
00:00:00

Set subscription to 'active'
success - 2/29/2024, 5:39:48 PM
Duration
00:00:00

Unlock subscription
success - 2/29/2024, 5:39:48 PM
Duration
00:00:00

Cache Subscription and related subscriptions
skipped - 2/29/2024, 5:39:48 PM
Duration
00:00:00

Done
complete - 2/29/2024, 5:39:49 PM
Duration
00:00:00



```
@create_workflow("Create node", initial_input_form=initial_input_form_generator)
def create_node() -> StepList:
    return (
        begin
        >> construct_node_model
        >> store_process_subscriptic
        >> validate_ip_addresses
        >> create_node_in_ims
        >> reserve_loopback_addresse
        >> update_node_in_ims
        >> create_dns_records
        >> provi
    )
```

```
@step("Create node in Netbox")
def create_node_in_ims(subscription: NodeProvisioning) -> State:
    payload = build_payload(subscription.node, subscription)
    print(f"Payload: {payload}")
    subscription.node.ims_id = netbox.create(payload)
    return {"subscription": subscription, "payload": payload.dict()}
```

```
@step("Create DNS records")
def create_dns_records(subscription: NodeProvisioning) -> State:

    zone_name = 'nn.hea.net.'
    device = netbox.get_device(name=subscription.node.node_name)

    # netbox returns ranges rather than individual IPs
    # below converts returned strings to blocks, and then gets network address
    # https://docs.python.org/3/library/ipaddress.html
    ipv4_address = (ipaddress.ip_network(device.primary_ip4.address)).network_address
    ipv6_address = (ipaddress.ip_network(device.primary_ip6.address)).network_address

    six_connect.create_dns_record_set(zone_name,
                                      str(subscription.node.node_name)+"."+zone_name,
                                      str(ipaddress.IPv4Network(device.primary_ip4.address).network_address),
                                      str(ipaddress.IPv6Network(device.primary_ip6.address).network_address))

    return {"subscription": subscription}
```

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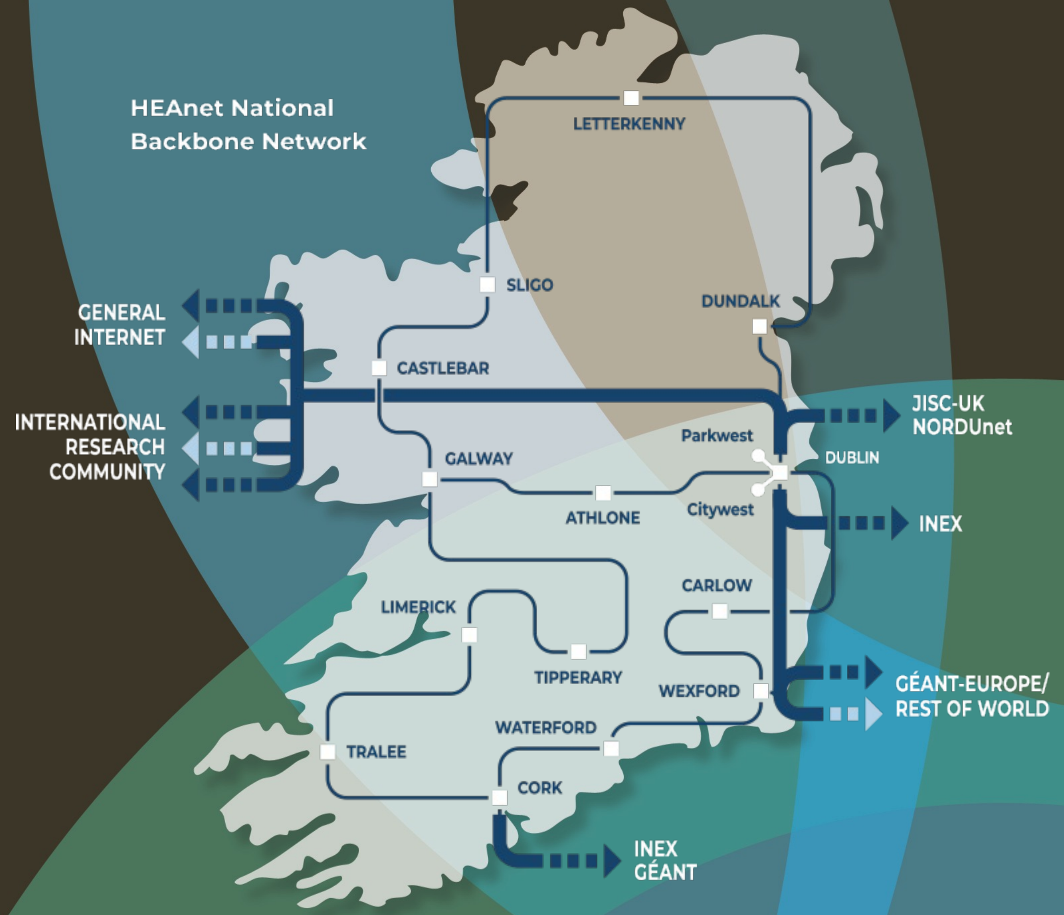
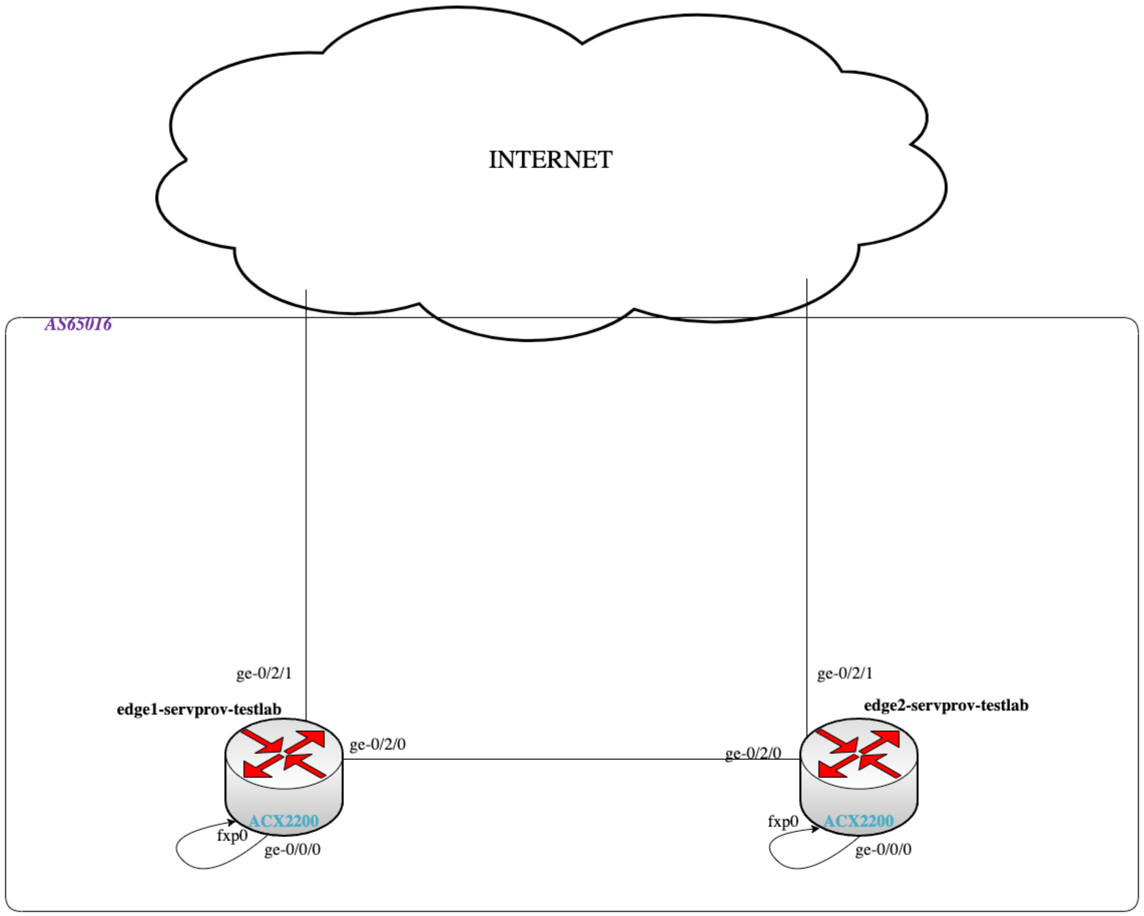
Demo

Workflow Orchestrator



The Demo Network

- 2x ACX2200 Routers
- Both have running MPLS
- Both within TESTLAB ASN
- Both have ge-0/0/0 interface patched back to the fxp0 interface



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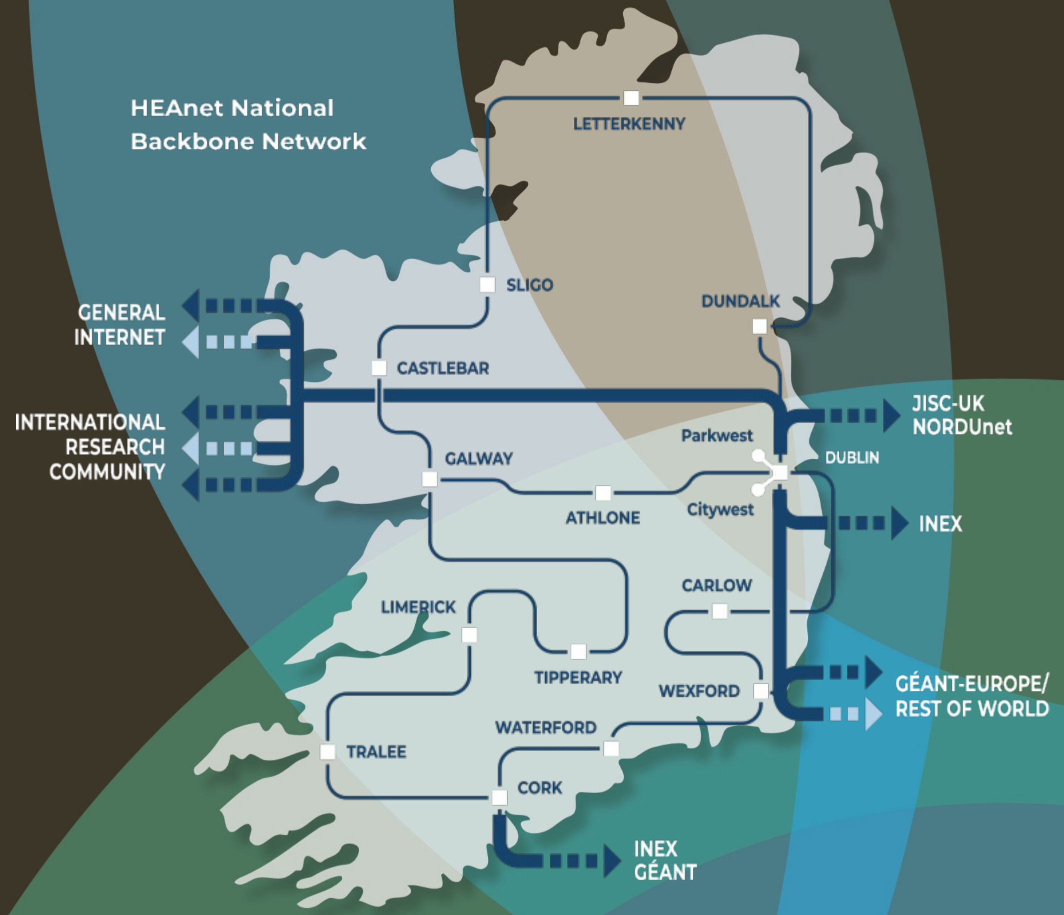
Wrap up

Workflow Orchestrator



HEAnet National
Backbone Network
LETTERKENNY
SLIGO
DUNDALK
CASTLEBAR
GENERAL
INTERNET
INTERNATIONAL
RESEARCH
COMMUNITY
JISC-UK
NORDUnet
Parkwest
DUBLIN
GALWAY
ATHLONE
Citywest
INEX
CARLOW
LIMERICK
TIPPERARY
WEXFORD
GÉANT-EUROPE/
REST OF WORLD
WATERFORD
TRALEE
CORK
INEX
GÉANT