HEAnet

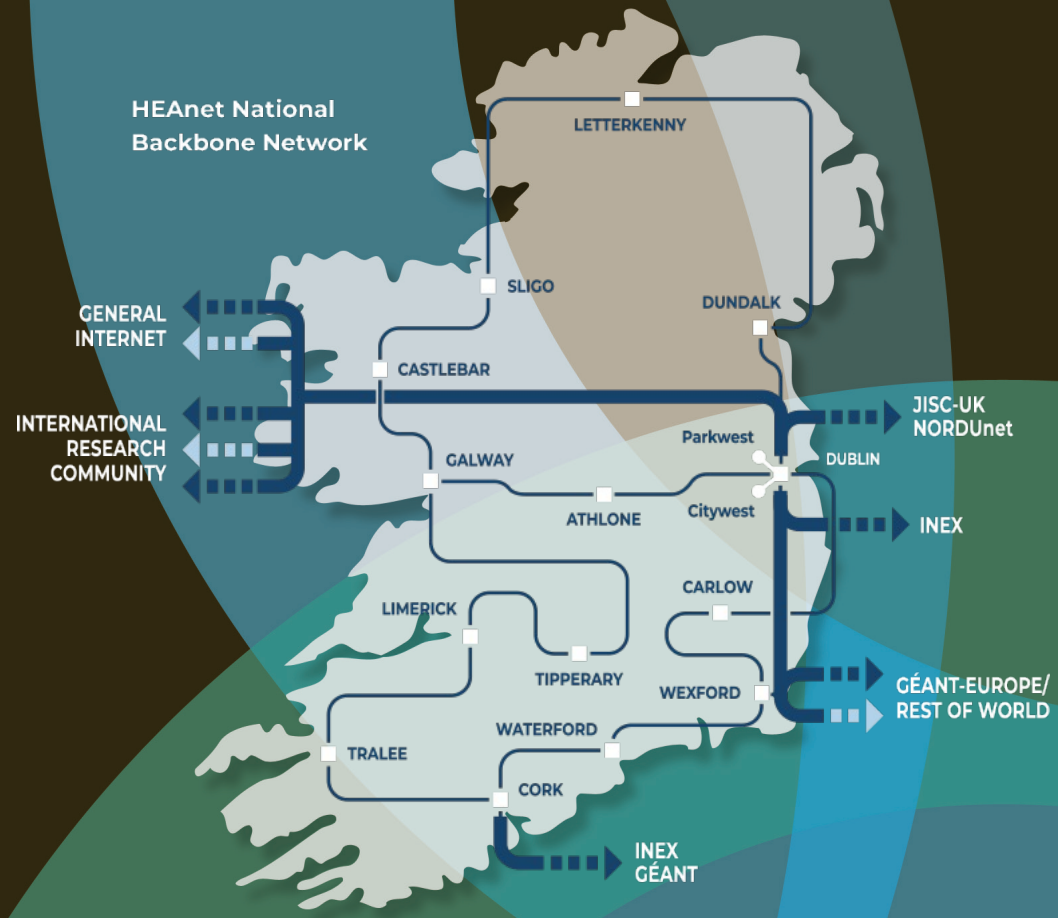
Ireland's National Education & Research Network

Conquering the Mountain

HEAnet's Automation Journey

Mick O'Donovan & Brian McArdle

TNC 2024



Agenda

The distant past

Stranded

Picking a route

Getting down

Après ski

The recent past

- Early 2023: planning for EoL 2025
- Mid-2023: crisis!
- Ansible playbooks
  - static inventory in YAML files

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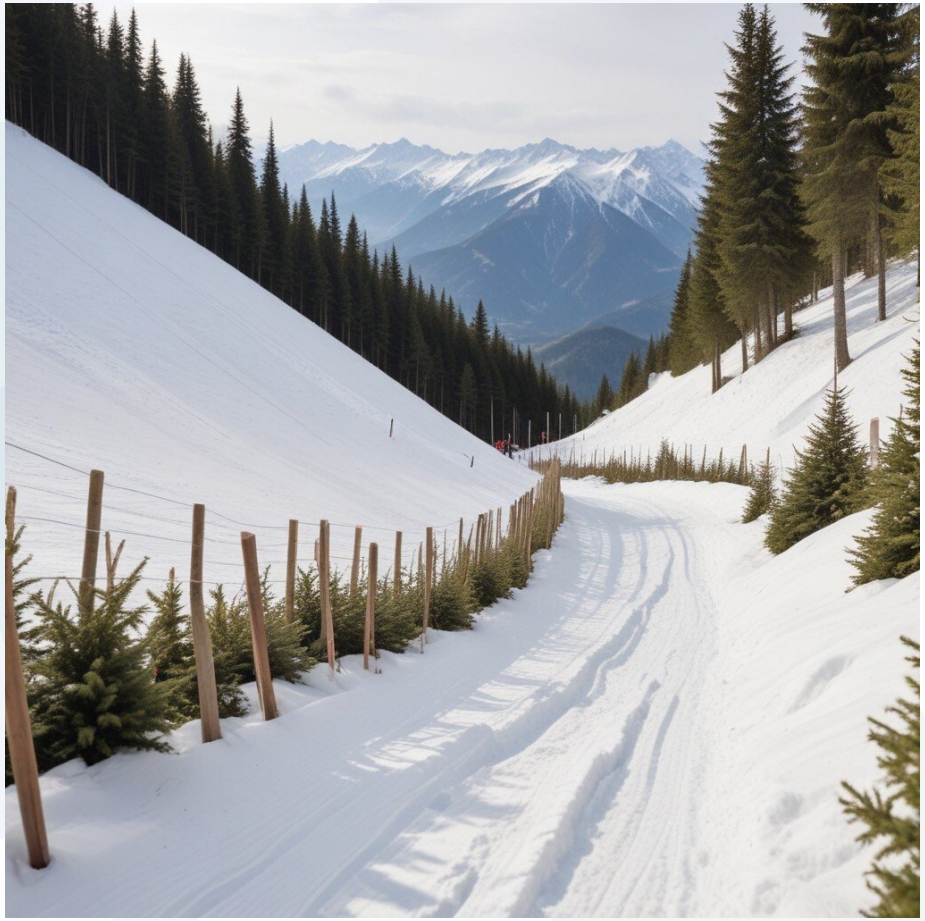
Build vs Buy



Workflow Orchestrator

- Community based
- Open sourced
- Customisable
- Python
- Beautiful web GUI

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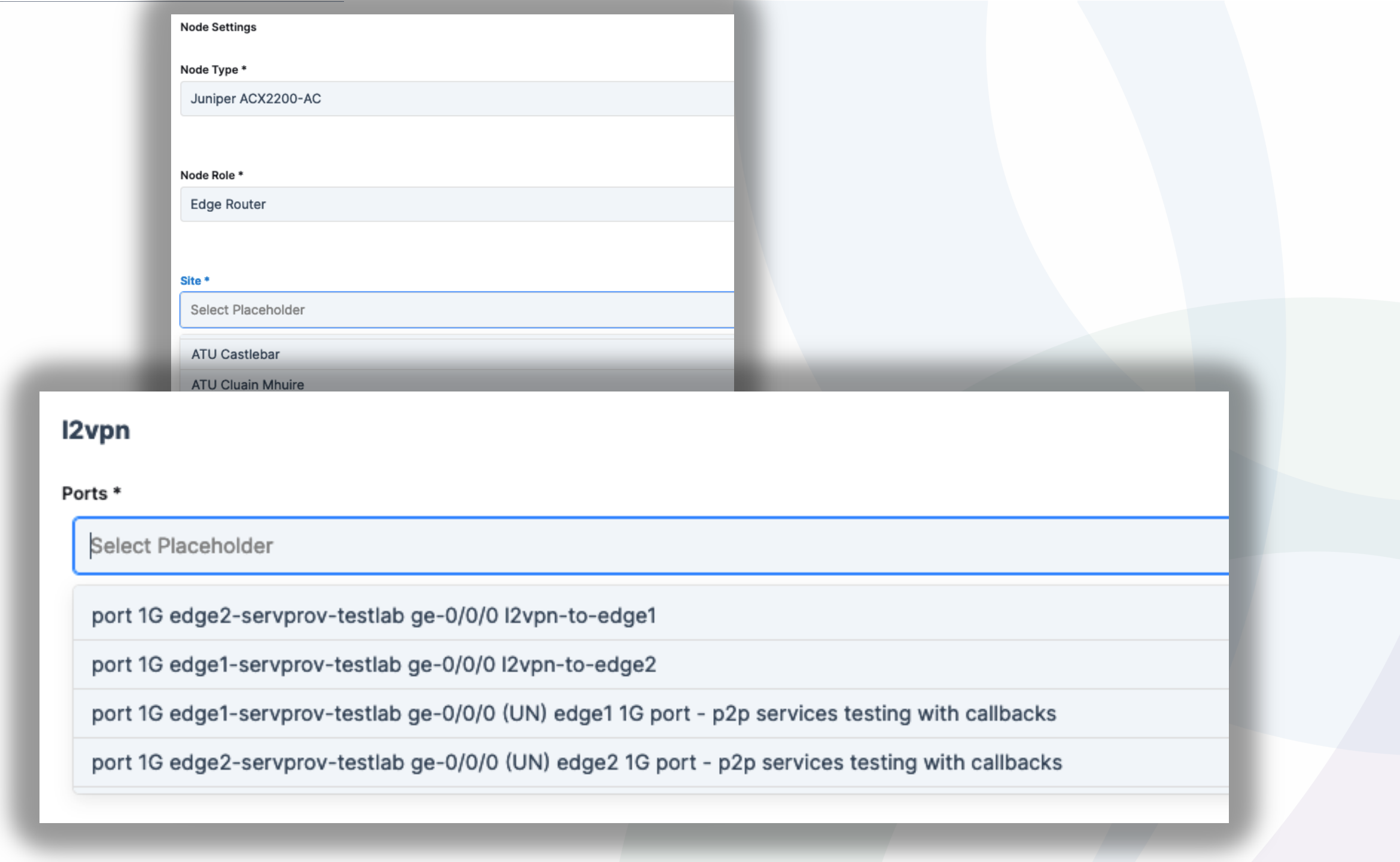
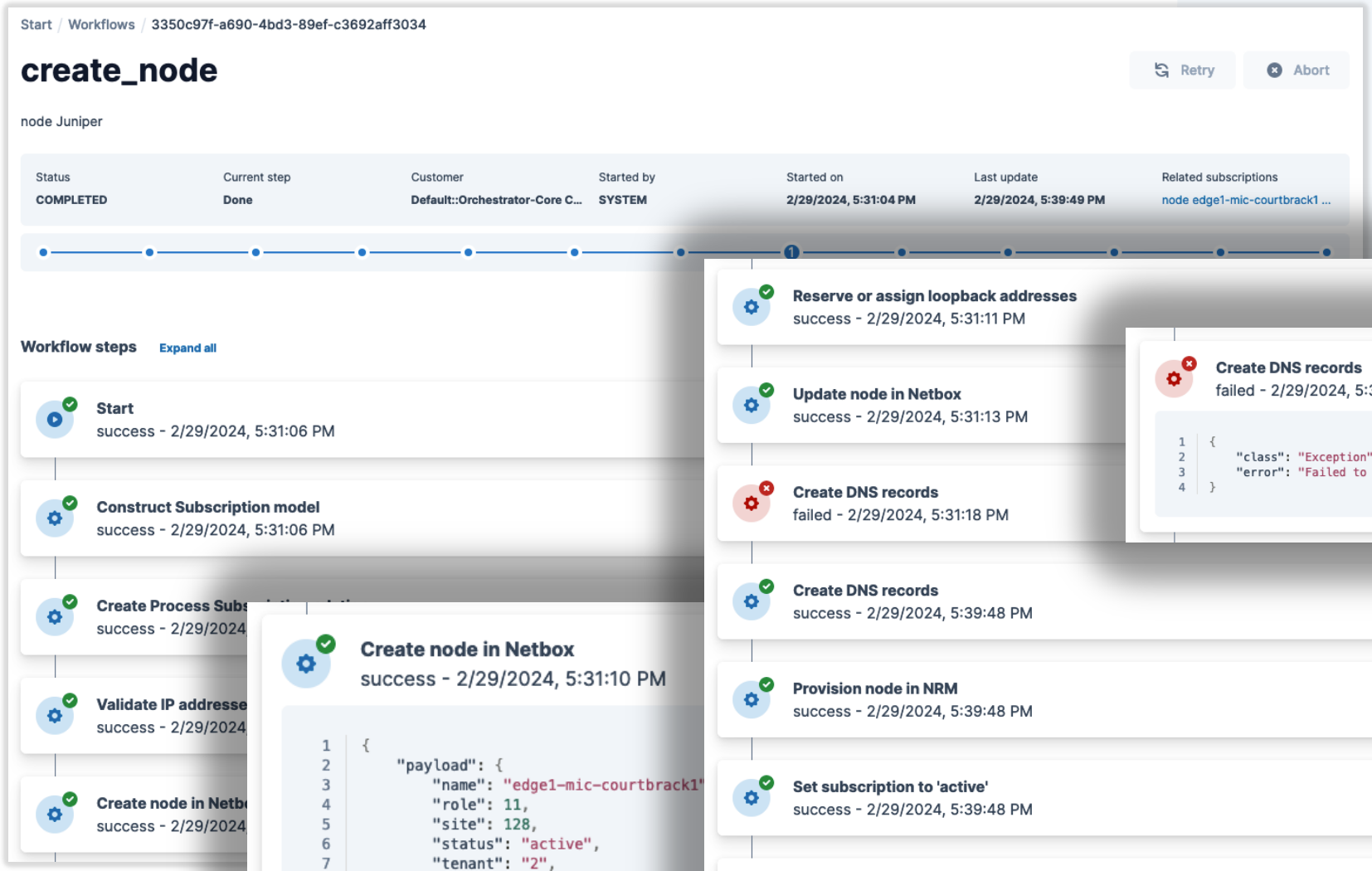

Node Settings
Node Type *
Juniper ACX2200-AC
Node Role *
Edge Router
Site *
Select Placeholder
ATU Castlebar
ATU Cluain Mhuire
l2vpn
Ports *
Select Placeholder
port 1G edge2-servprov-testlab ge-0/0/0 l2vpn-to-edge1
port 1G edge1-servprov-testlab ge-0/0/0 l2vpn-to-edge2
port 1G edge1-servprov-testlab 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

```python
@create_workflow("Create node", initial_input_form=initial_input_form_generator)
def create_node() -> StepLi
    return (
        begin
```

```python
@step("Create node in Netbox")
def create_node_in_ims(subscription: NodeProvisioning) -> State:
    payload = build_payload(subscription.node, subscription)
```

```python
@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}
```

netbox

- Our Single Source Of Truth
- Open sourced
- Lots of features
  - IP Address Management
  - Data Centre Inventory Management
  - Circuit catalogue
- Customisable

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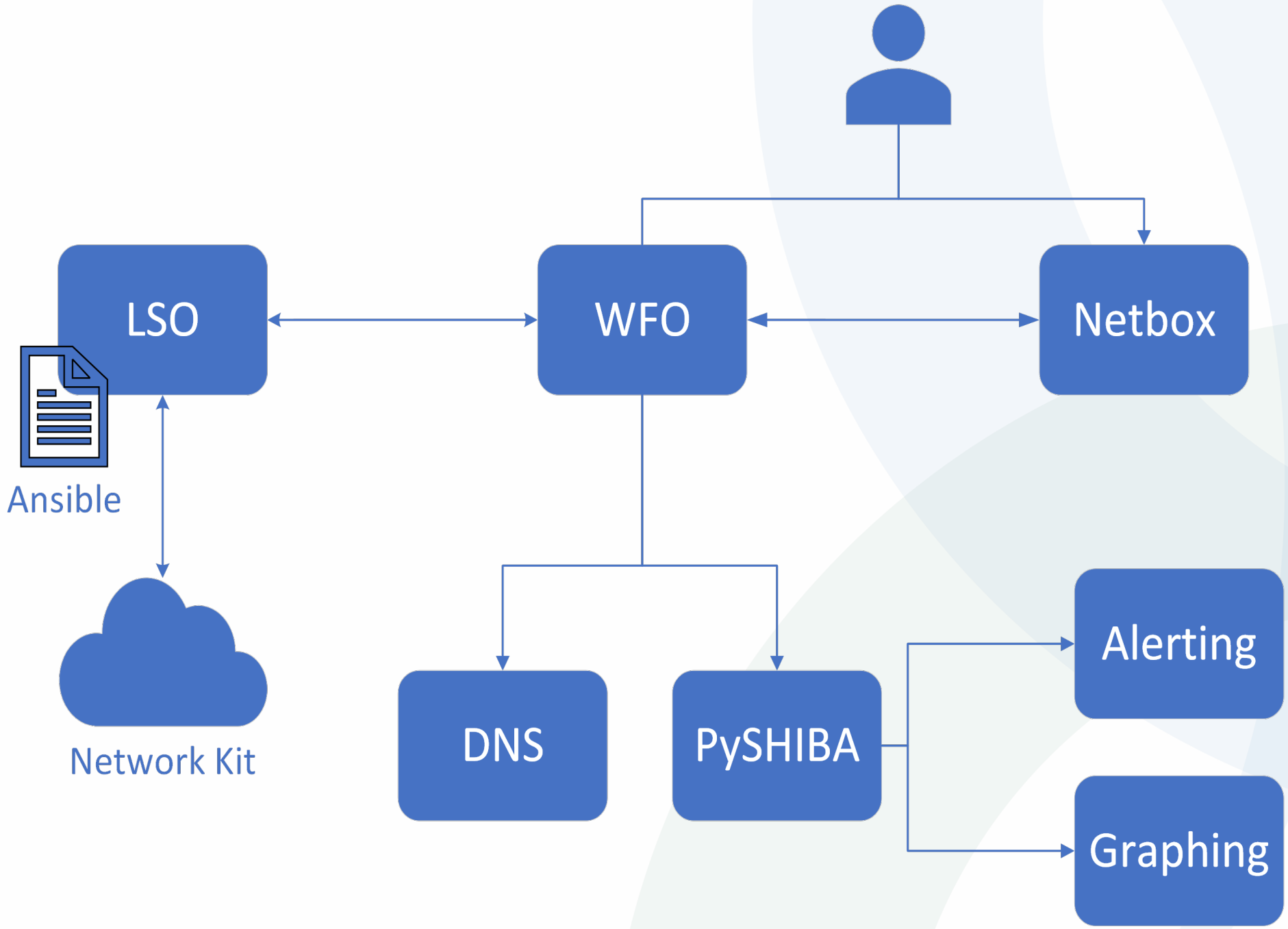
LSO

- Lightweight Service Orchestrator
  - API wrapper for Ansible
- Community based
- Open sourced
- Lightweight
- We can re-use our Ansible playbooks
  - Updated for variable management


LSO
WFO
Netbox
Ansible
Network Kit
DNS
PySHIBA
Alerting
Graphing

Organization
Devices
Connections
Wireless
IPAM
VPN
Virtualization
Circuits
Power
Provisioning
Customization
Operations
Admin
NetBox DNS
Topology Views
Plugins

Bookmarks

No bookmarks have been added yet.

Organization

Sites	254
Tenants	115
Contacts	0

Welcome!

This is your personal dashboard. Feel free to customize it by rearranging, resizing, or removing widgets. You can also add new widgets using the "add widget" button below. Any changes affect only *your* dashboard, so feel free to experiment!

IPAM

VRFs	0
Aggregates	19
Prefixes	144
IP Ranges	3
IP Addresses	562
VLANs	0

NetBox News

NetBox Labs Project Bundles for Partners: Streamlining Network Projects for Our Expert Partners and Their Clients

At NetBox Labs, we love our Expert Partners – the consulting, integrator, and services partners who work closely with customers large and small to build and refresh networks, modernize network management, implement network automation architectures, and so much more. NetBox Labs Expert Partners are trusted advisors to their clients, and often lead the charge at times...

NetBox Labs Announces Project Bundles for Partners to Accelerate Network Projects

NetBox Cloud and NetBox Enterprise Project Bundles for Partners Streamline and Simplify Access to Supported Editions of NetBox for Consulting, Integrator, and Services Partners NEW YORK, June 3, 2024 – Today, NetBox Labs announced immediate availability of new Project Bundles for Partners for all NetBox Cloud and NetBox Enterprise plans, making it easy for expert...

Circuits

Providers	11
Circuits	268
Provider Networks	0
Provider Accounts	0

DCIM

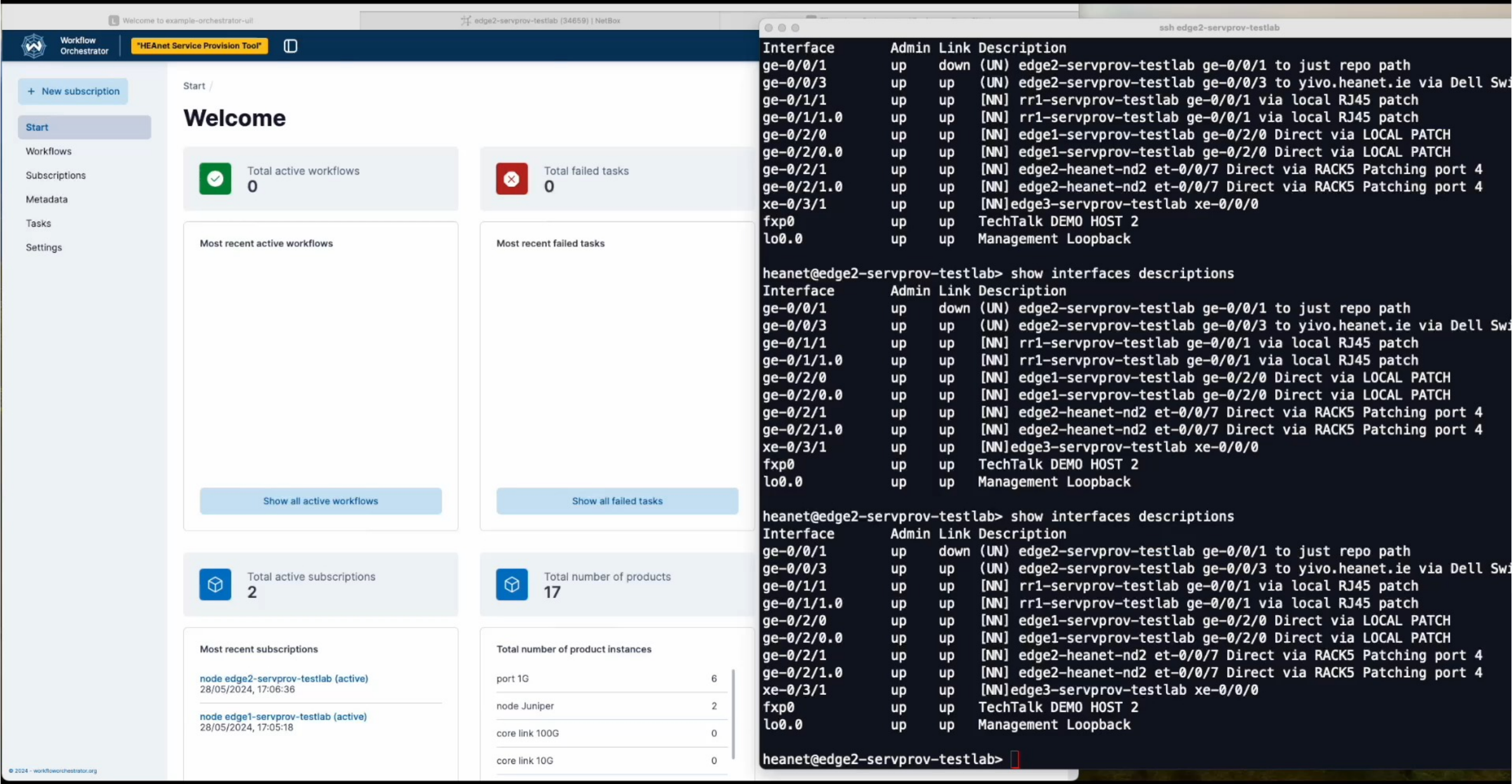
Sites	254
Racks	250
Device Types	20
Devices	279
Cables	1

Virtualization

Clusters	0
Virtual Machines	0

Change Log

ID	Time	Username	Full Name	Action	Type	Object	Request ID
25723	2024-05-29 11:20	heanet	—	Updated	Interface	lo0.0 (IN_USE)	8c409bc4-5c6f-4eb3-abf9-e4fdab93e2c1
25722	2024-05-29 11:20	heanet	—	Updated	Interface	fxp0	f2251e74-9fd0-4963-bc69-ebe620878f8f
25721	2024-05-29 11:20	heanet	—	Updated	Interface	xe-0/3/1 (NNI_ONLY)	a3cdcfb9-70b6-442c-a97d-e6865a7e0554
25720	2024-05-29 11:20	heanet	—	Updated	Interface	xe-0/3/0 (AVAILABLE_FOR_USE)	2ff5c1fb-699b-4327-b338-444babf348f7
25719	2024-05-29 11:20	heanet	—	Updated	Interface	ge-0/2/1 (NNI_ONLY)	06b8c08c-9f9c-4395-8388-89ee6d6a03bb
25718	2024-05-29 11:20	heanet	—	Updated	Interface	ge-0/2/0 (NNI_ONLY)	dbd55e83-a271-4527-99a3-723870403fe0
25717	2024-05-29 11:20	heanet	—	Updated	Interface	ge-0/1/3 (AVAILABLE_FOR_USE)	5d235515-e60e-4e11-8d45-cb429b7b21b4
25716	2024-05-29 11:20	heanet	—	Updated	Interface	ge-0/1/2 (AVAILABLE_FOR_USE)	fa55619a-e10a-4123-901b-4eb535ef7c2f
25715	2024-05-29 11:20	heanet	—	Updated	Interface	ge-0/1/1 (AVAILABLE_FOR_USE)	2ebaa9ae-0cc7-4d51-8000-1d5300d0e3a8
25714	2024-05-29 11:20	heanet	—	Updated	Interface	ge-0/1/0 (AVAILABLE_FOR_USE)	29ea0f8b-f3f4-4b2d-a79d-f6b0aa691198
25713	2024-05-29 11:20	heanet	—	Updated	Interface	ge-0/0/3 (NNI_ONLY)	ea7073ca-ba9d-4a09-8c36-3799bbdeb38c


Workflow Orchestrator
"HEAnet Service Provision Tool"
+ New subscription
Start
Workflows
Subscriptions
Metadata
Tasks
Settings
Start /
Welcome
Total active workflows
0
Total failed tasks
0
Most recent active workflows
Most recent failed tasks
Show all active workflows
Show all failed tasks
Total active subscriptions
2
Total number of products
17
Most recent subscriptions
node edge2-servprov-testlab (active)
28/05/2024, 17:06:36
node edge1-servprov-testlab (active)
28/05/2024, 17:05:18
Total number of product instances
port 1G 6
node Juniper 2
core link 100G 0
core link 10G 0
ssh edge2-servprov-testlab
Interface Admin Link Description
ge-0/0/1 up down (UN) edge2-servprov-testlab ge-0/0/1 to just repo path
ge-0/0/3 up up (UN) edge2-servprov-testlab ge-0/0/3 to yivo.heanet.ie via Dell Swi
ge-0/1/1 up up [NN] rr1-servprov-testlab ge-0/0/1 via local RJ45 patch
ge-0/1/1.0 up up [NN] rr1-servprov-testlab ge-0/0/1 via local RJ45 patch
ge-0/2/0 up up [NN] edge1-servprov-testlab ge-0/2/0 Direct via LOCAL PATCH
ge-0/2/0.0 up up [NN] edge1-servprov-testlab ge-0/2/0 Direct via LOCAL PATCH
ge-0/2/1 up up [NN] edge2-heanet-nd2 et-0/0/7 Direct via RACK5 Patching port 4
ge-0/2/1.0 up up [NN] edge2-heanet-nd2 et-0/0/7 Direct via RACK5 Patching port 4
xe-0/3/1 up up [NN]edge3-servprov-testlab xe-0/0/0
fxp0 up up TechTalk DEMO HOST 2
lo0.0 up up Management Loopback
heanet@edge2-servprov-testlab> show interfaces descriptions
Interface Admin Link Description
ge-0/0/1 up down (UN) edge2-servprov-testlab ge-0/0/1 to just repo path
ge-0/0/3 up up (UN) edge2-servprov-testlab ge-0/0/3 to yivo.heanet.ie via Dell Swi
ge-0/1/1 up up [NN] rr1-servprov-testlab ge-0/0/1 via local RJ45 patch
ge-0/1/1.0 up up [NN] rr1-servprov-testlab ge-0/0/1 via local RJ45 patch
ge-0/2/0 up up [NN] edge1-servprov-testlab ge-0/2/0 Direct via LOCAL PATCH
ge-0/2/0.0 up up [NN] edge1-servprov-testlab ge-0/2/0 Direct via LOCAL PATCH
ge-0/2/1 up up [NN] edge2-heanet-nd2 et-0/0/7 Direct via RACK5 Patching port 4
ge-0/2/1.0 up up [NN] edge2-heanet-nd2 et-0/0/7 Direct via RACK5 Patching port 4
xe-0/3/1 up up [NN]edge3-servprov-testlab xe-0/0/0
fxp0 up up TechTalk DEMO HOST 2
lo0.0 up up Management Loopback
heanet@edge2-servprov-testlab> show interfaces descriptions
Interface Admin Link Description
ge-0/0/1 up down (UN) edge2-servprov-testlab ge-0/0/1 to just repo path
ge-0/0/3 up up (UN) edge2-servprov-testlab ge-0/0/3 to yivo.heanet.ie via Dell Swi
ge-0/1/1 up up [NN] rr1-servprov-testlab ge-0/0/1 via local RJ45 patch
ge-0/1/1.0 up up [NN] rr1-servprov-testlab ge-0/0/1 via local RJ45 patch
ge-0/2/0 up up [NN] edge1-servprov-testlab ge-0/2/0 Direct via LOCAL PATCH
ge-0/2/0.0 up up [NN] edge1-servprov-testlab ge-0/2/0 Direct via LOCAL PATCH
ge-0/2/1 up up [NN] edge2-heanet-nd2 et-0/0/7 Direct via RACK5 Patching port 4
ge-0/2/1.0 up up [NN] edge2-heanet-nd2 et-0/0/7 Direct via RACK5 Patching port 4
xe-0/3/1 up up [NN]edge3-servprov-testlab xe-0/0/0
fxp0 up up TechTalk DEMO HOST 2
lo0.0 up up Management Loopback
heanet@edge2-servprov-testlab>

Starting was hard

- What's a subscription?
- How do I write a workflow?
- When do I use a task?
- How many arms should I have?

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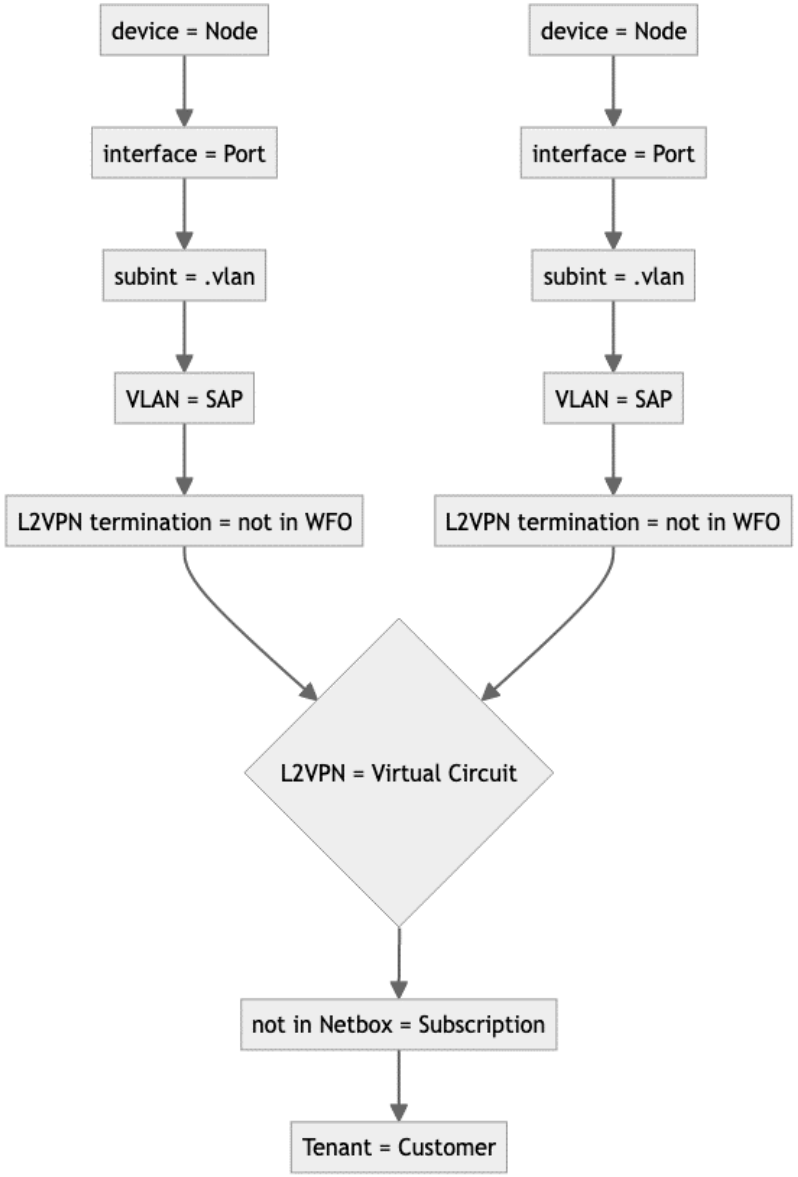
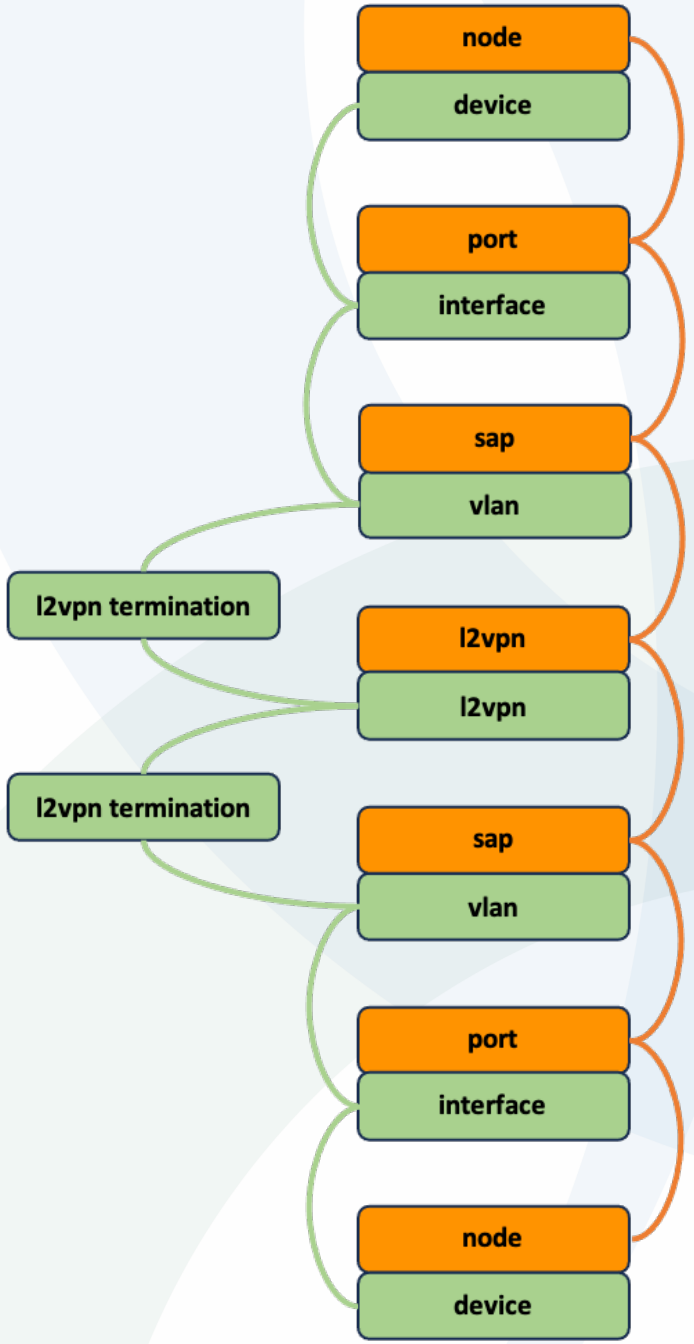
Building momentum

- Three days in Utrecht
- Crossover skills
  - Developers
  - Networks
- Three months learning
- Implementing and iterating workflows
- Product modelling

Product modelling





But…

- Project managing software development is hard!
- New technologies
- Middleware application

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We did well

- Internal collaboration
- External collaboration
- Good suite of collaborative development tools
  - MS Visual Studio Code
  - Gitlab
  - MS Teams
  - Docker
- Existing Ansible playbooks

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Smooth skiing

- Modernised provisioning stack
- Everything is integrated from the start
- No vendor lock-in

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Apres ski – beer o’clock

- WFO gives us freedom and control
- Push or pull data with any API
  - Any Python library
  - Any Ansible module

← This could be you!

The community is here to help

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Thank you

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