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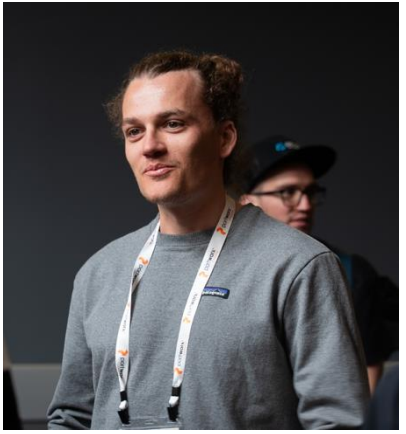
THE ACCIDENTAL PLATFORM TEAM: KUBERNETES OPERATORS AT SWISSCOM

February 12 2026, Lea Brühwiler, Fabian Schulz



Fabian Schulz

DevOps Engineer

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Lea Brühwiler

DevOps Engineer

lea.bruehwiler@swisscom.com


swisscom

User Equipment

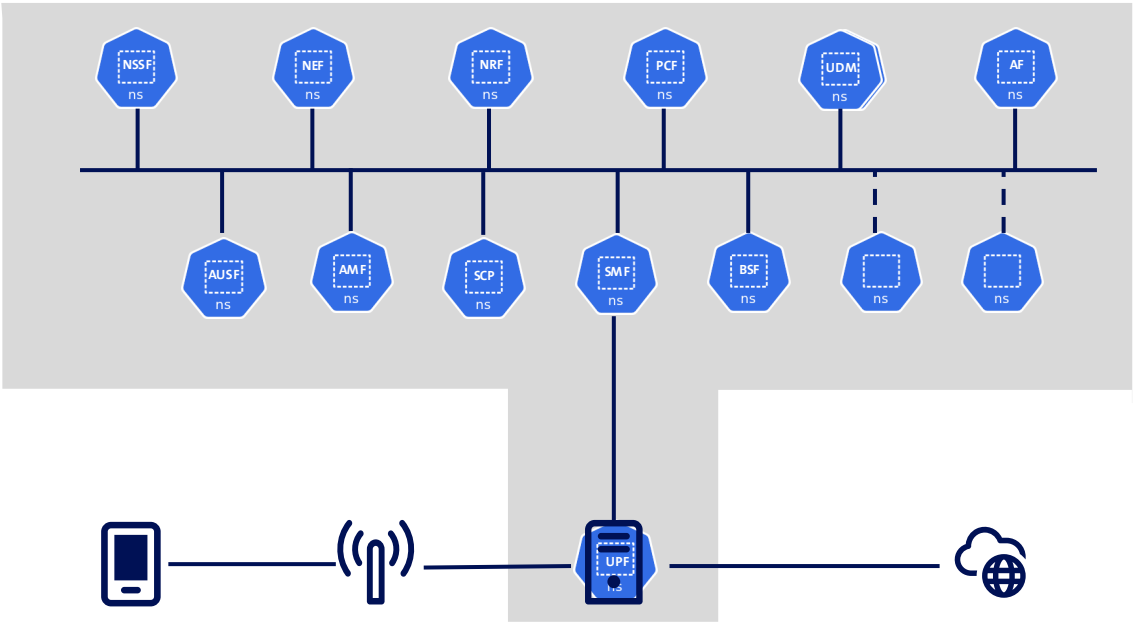
(e.g. Phone, IoT Device)

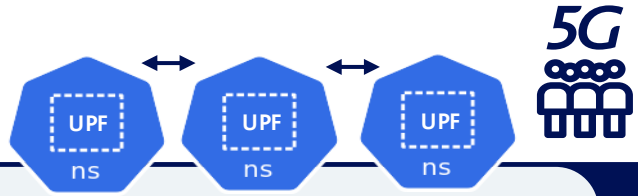
Radio Access Network

Mobile Data Core

Data Network

(e.g. Internet)


NSSF
ns
NEF
ns
NRF
ns
PCF
ns
UDM
ns
AF
ns
AUSF
ns
AMF
ns
SCP
ns
SMF
ns
BSF
ns
ns
ns
UPF
ns



5G core deployment

routers

Kubernetes

OS

Server Hardware

routers

Create IP tables

2 days

Collect IP in IPAM

2 days

Populate inventory

1 day

Create change requests

5-10 days

MetalLB

k8s /CNF

Thor UI

edge router

Integrate, test and observe

5 - 10 days

AAT

Landslide

routers

5G

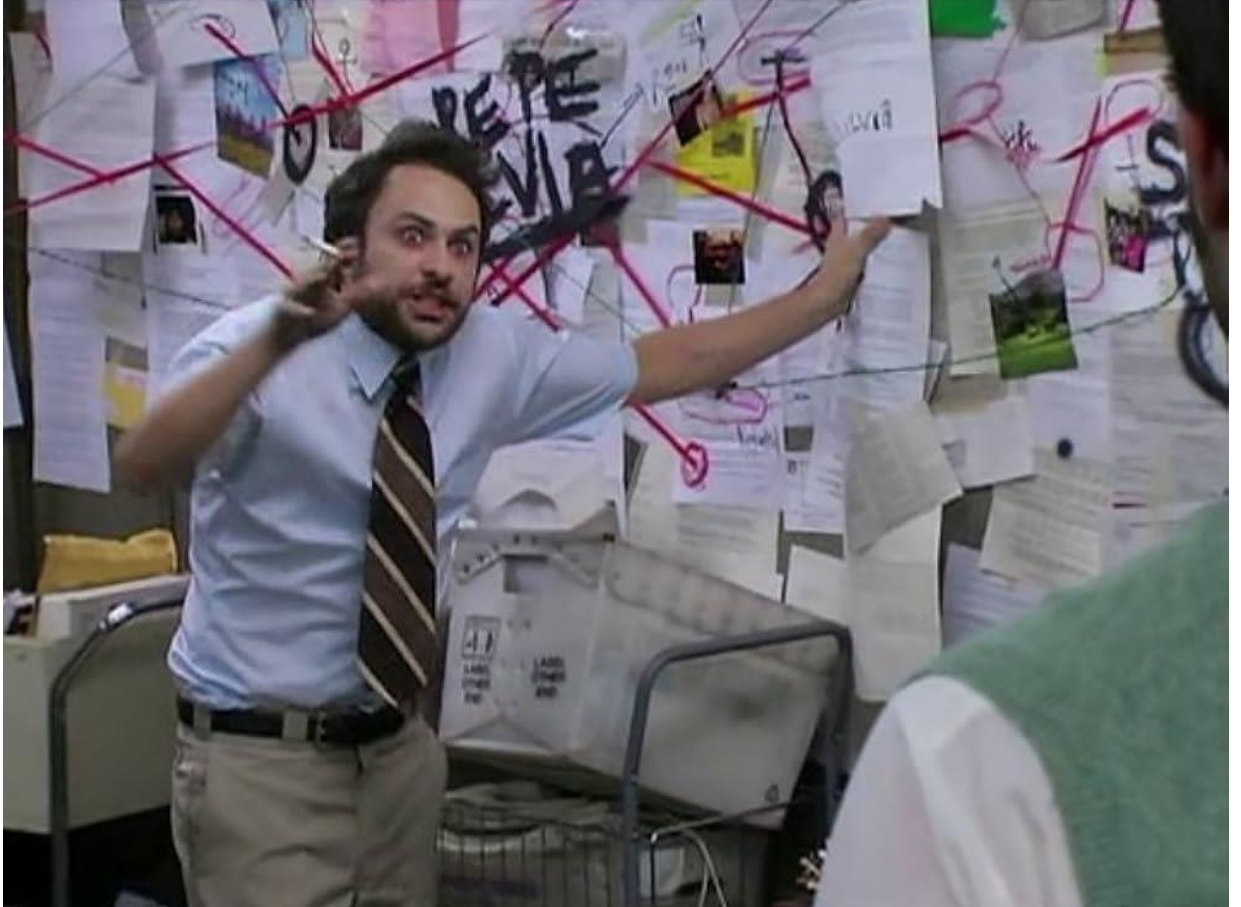
UPF ns UPF ns UPF ns

5G core deployment

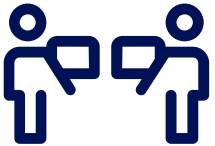
Kubernetes

OS

Server Hardware



Pain points when deploying a 5G core network

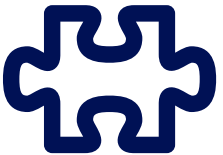


Cross-domain knowledge

Manual process

Static config

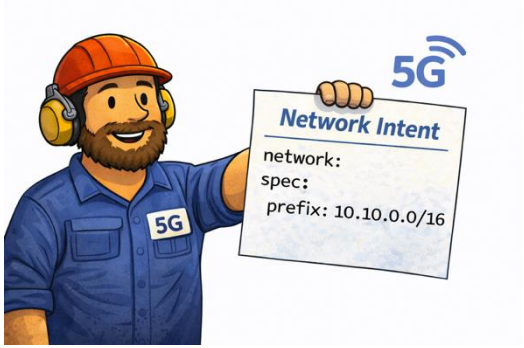
Kubernetes as resource orchestrator

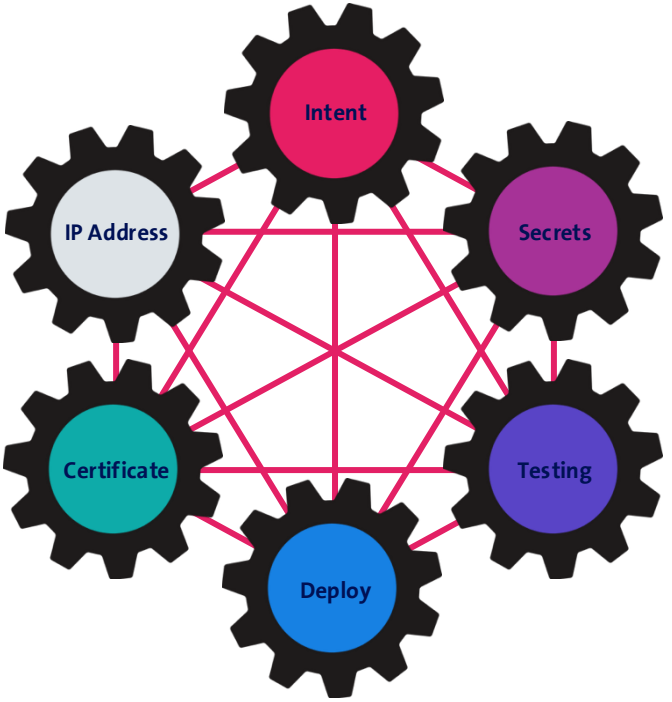


Kubernetes resource model

Intent driven

Constant reconciliation

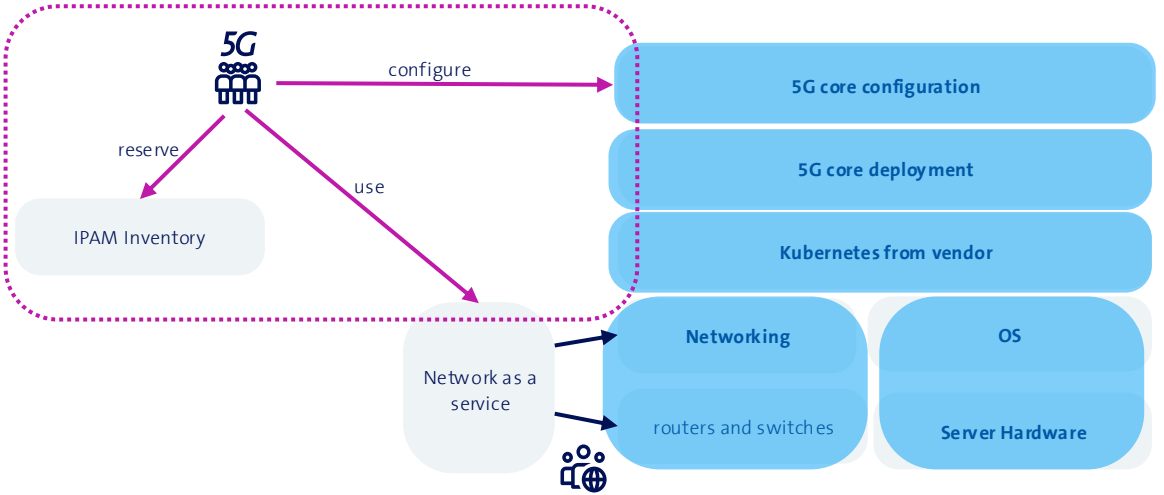

5G
Network Intent
network:
spec:
prefix: 10.10.0.0/16
5G


Intent
IP Address
Secrets
Certificate
Testing
Deploy

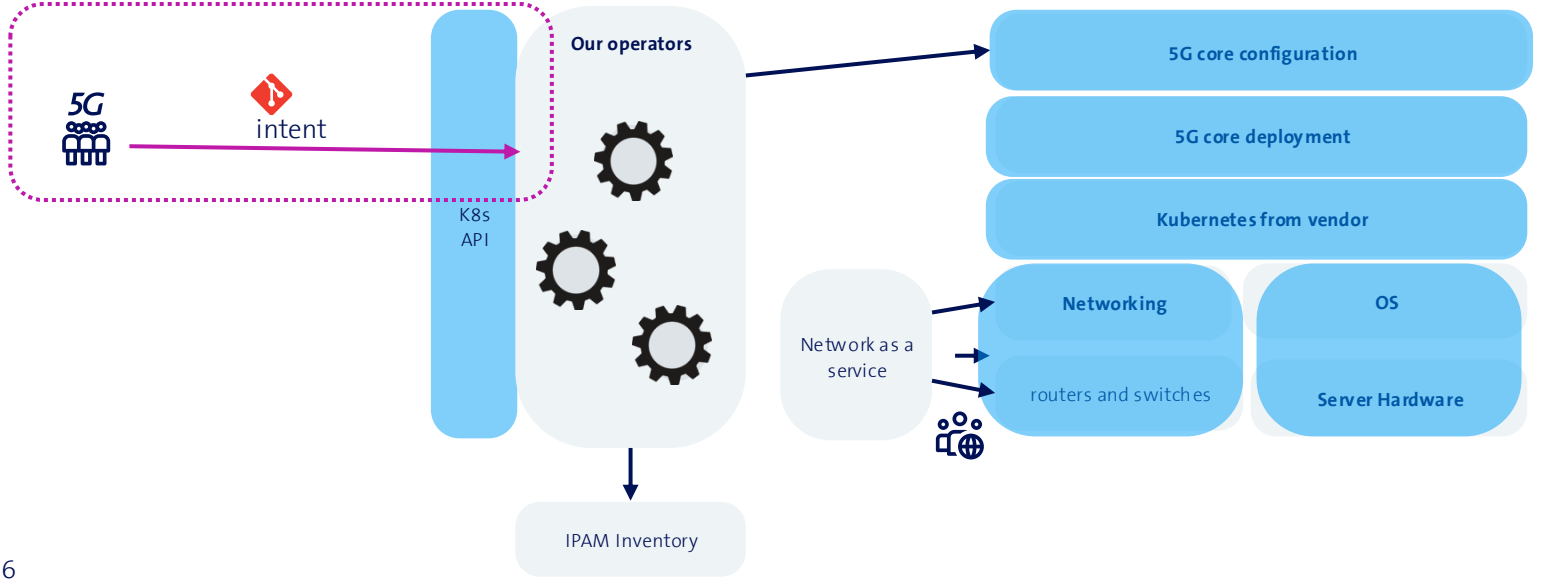
ROPEs Team

We build resource operators

Multiple Interfaces to configure a 5G Core deployment



Single Interfaces to configure 5G Core deployment

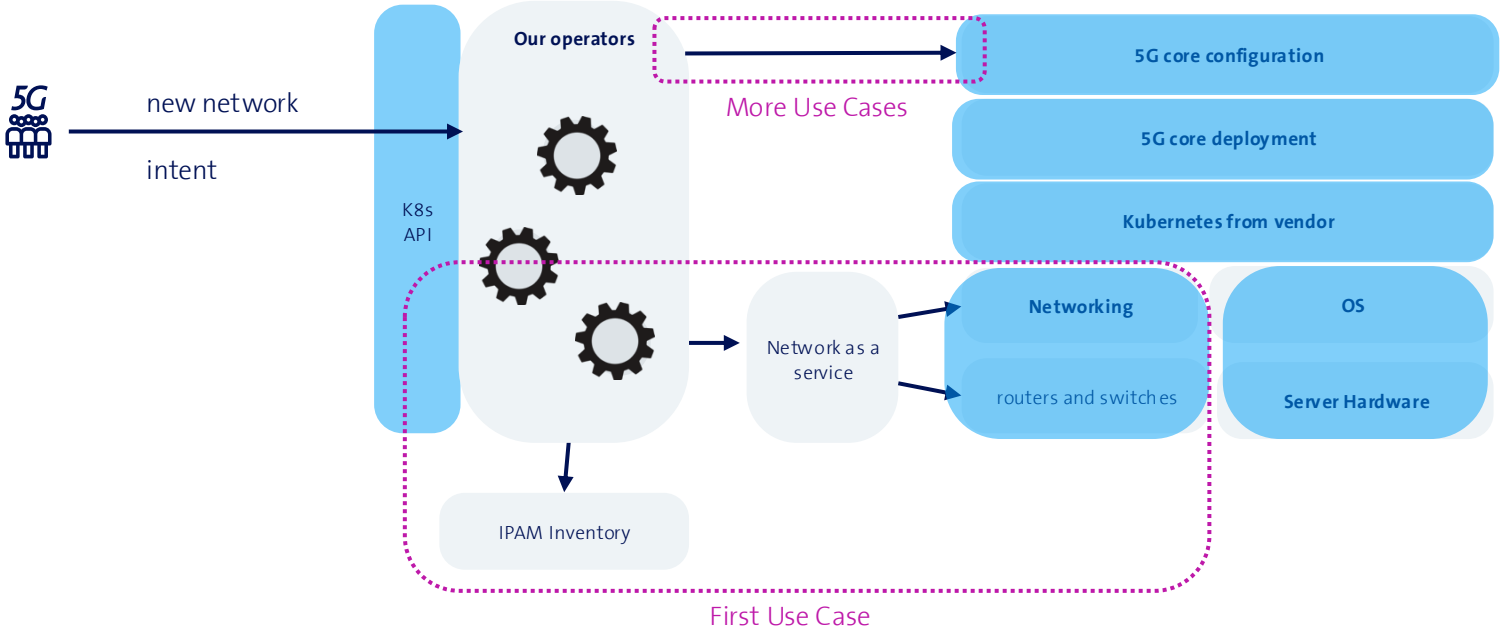


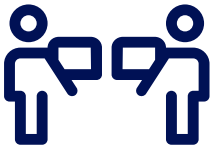
Gradual approach

Select first easy use case

Ship first prototype early

Iterate on feedback


5G
new network
intent
K8s
API
Our operators
IPAM Inventory
Network as a
service
More Use Cases
5G core configuration
5G core deployment
Kubernetes from vendor
Networking
routers and switches
OS
Server Hardware
First Use Case



Cross-domain knowledge

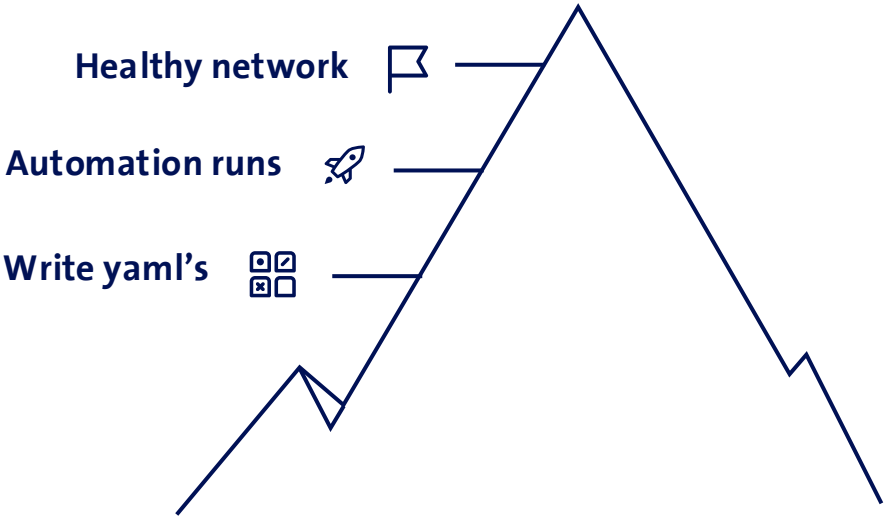
Domain Knowledge in Operators

Manual process

Automation

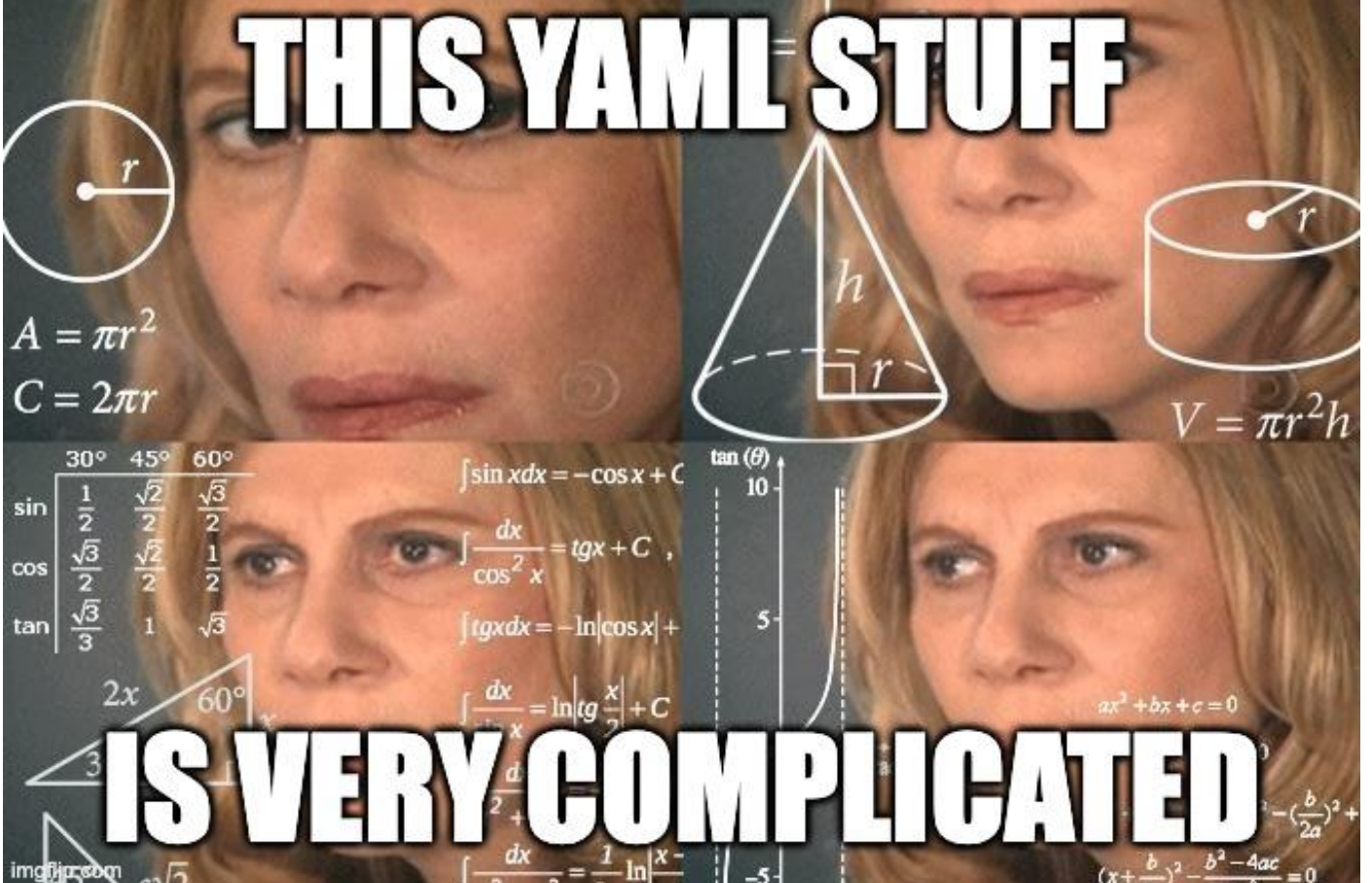
Static config

Constant Reconciliation

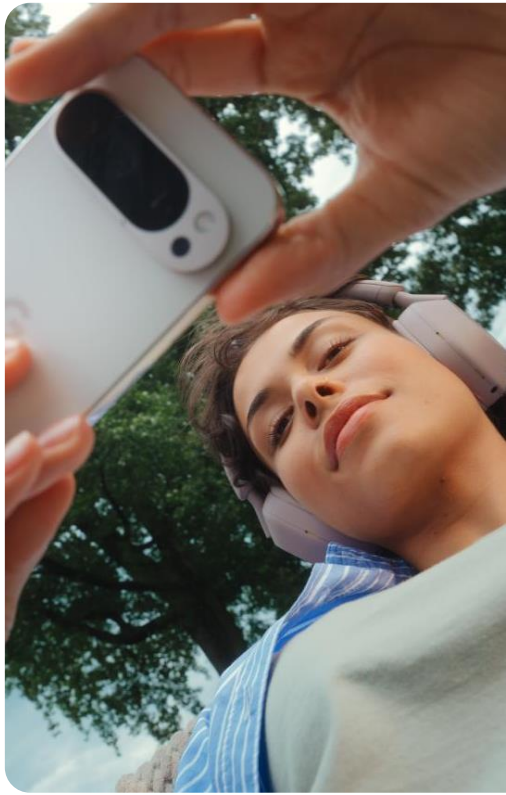


Let's goooo

```go
// PrefixSpec defines the desired state of Prefix
// +kubebuilder:validation:XValidation:rule="!has(oldSelf.site) || has(self.site)", message="Site is requi
type PrefixSpec struct {
    // The Prefix in CIDR notation that should be reserved in NetBox
    // Field is immutable, required
    // Example: "192.168.0.0/24"
    //+kubebuilder:validation:Required
    //+kubebuilder:validation:Format=cidr
    //+kubebuilder:validation:XValidation:rule="self == oldSelf",message="Field 'prefix' is immutable"
    Prefix string `json:"prefix"`

    // The NetBox Site to be assigned to this resource in NetBox. Use the `name` value instead of the `slu
    // Field is immutable, not required
    //+kubebuilder:validation:XValidation:rule="self == oldSelf || self != ''",message="Field 'site' is re
    Site string `json:"site,omitempty"`

    // The NetBox Tenant to be assigned to this resource in NetBox. Use the `name` value instead of the `s
    // Field is immutable, not required
    // Example: "Initech" or "Cyberdyne Systems"
    //+kubebuilder:validation:XValidation:rule="self == oldSelf",message="Field 'tenant' is immutable"
    Tenant string `json:"tenant,omitempty"`

    // The NetBox Custom Fields that should be added to the resource in NetBox.
    // Note that currently only Text Type is supported (GitHub #129)
    // More info on NetBox Custom Fields:
    // https://github.com/netbox-community/netbox/blob/main/docs/customization/custom-fields.md
    // Field is mutable, not required
    // Example:
    //   customfield1: "Production"
    //   customfield2: "This is a string"
    CustomFields map[string]string `json:"customFields,omitempty"`

    // Description that should be added to the resource in NetBox
    // Field is mutable, not required
    Description string `json:"description,omitempty"`

    // Comment that should be added to the resource in NetBox
    // The NetBox Custom Fields that should be added to the r
    // Note that currently only Text Type is supported (GitHu
    // More info on NetBox Custom Fields:
    // https://github.com/netbox-community/netbox/blob/main/d
    // Field is mutable, not required
    // Example:
    //   customfield1: "Production"
    //   customfield2: "This is a string"
    CustomFields map[string]string `json:"customFields,omitem

    // Description that should be added to the resource in Ne
    // Field is mutable, not required
    Description string `json:"description,omitempty"`

    // Comment that should be added to the resource in NetBox
    // Field is mutable, not required
    Comments string `json:"comments,omitempty"`

    // Defines whether the Resource should be preserved in Ne
    // Kubernetes Resource is deleted.
    // - When set to true, the resource will not be deleted b
    //   NetBox upon CR deletion
    // - When set to false, the resource will be cleaned up i
    //   upon CR deletion
    // Setting preserveInNetbox to true is mandatory if the u
    // resources from NetBox (e.g. Sticky CIDRs even if resou
    // recreated in Kubernetes)
    // Field is mutable, not required
    PreserveInNetbox bool `json:"preserveInNetbox,omitempty"`
}
```


THIS YAML STUFF
IS VERY COMPLICATED
$A = \pi r^2$
$C = 2\pi r$
$V = \pi r^2 h$
$\int \sin x dx = -\cos x + C$
$\int \frac{dx}{\cos^2 x} = tgx + C$
$\int tgx dx = -\ln|\cos x| +$
$\int \frac{dx}{x} = \ln\left|tg\frac{x}{2}\right| + C$
$ax^2 + bx + c = 0$
imgflip.com

1. You cannot deploy a 5G Core with GitOps because there will always be manual changes on the box!
2. How can I see which changes will be applied to the cluster?
3. We had a UI which was more intuitive!
4. I don’t understand Kubernetes.
5. I just did it myself using a Gitlab pipeline.
6. How do I see what is going on?
7. How can I be sure it worked?
8. I like to interact directly with the cli on the device.
9. How do we do compliance / audit?
10. I think we’re faster the way we did it



Discover your possibilities

Try the ROPEs k8s operators

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Gradual adoption

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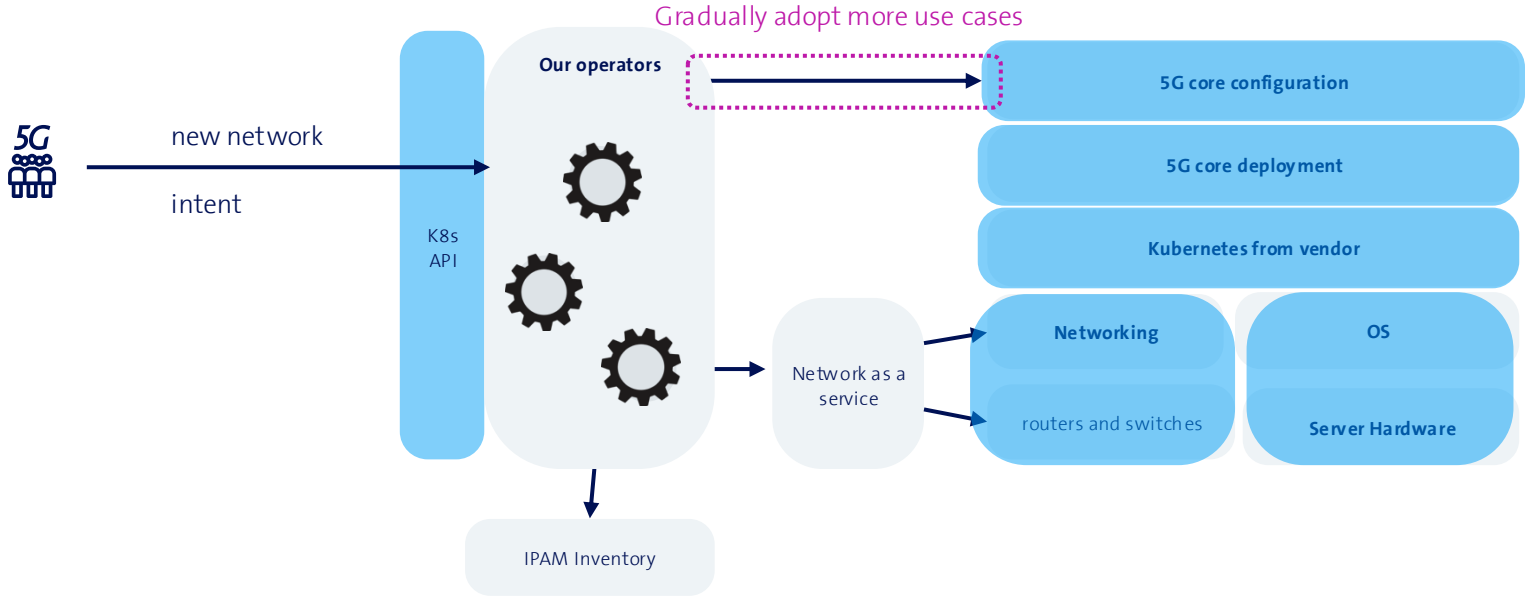
Gradually adopt more use cases
5G
new network
intent
K8s
API
Our operators
5G core configuration
5G core deployment
Kubernetes from vendor
Network as a
service
Networking
routers and switches
OS
Server Hardware
IPAM Inventory

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Knowledge sharing & Graphical UI

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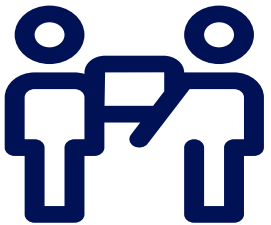
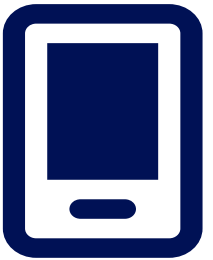
Keep users close

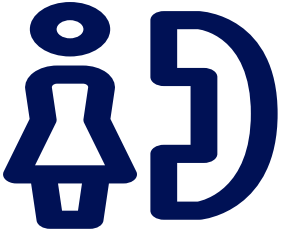
Design / feedback sessions

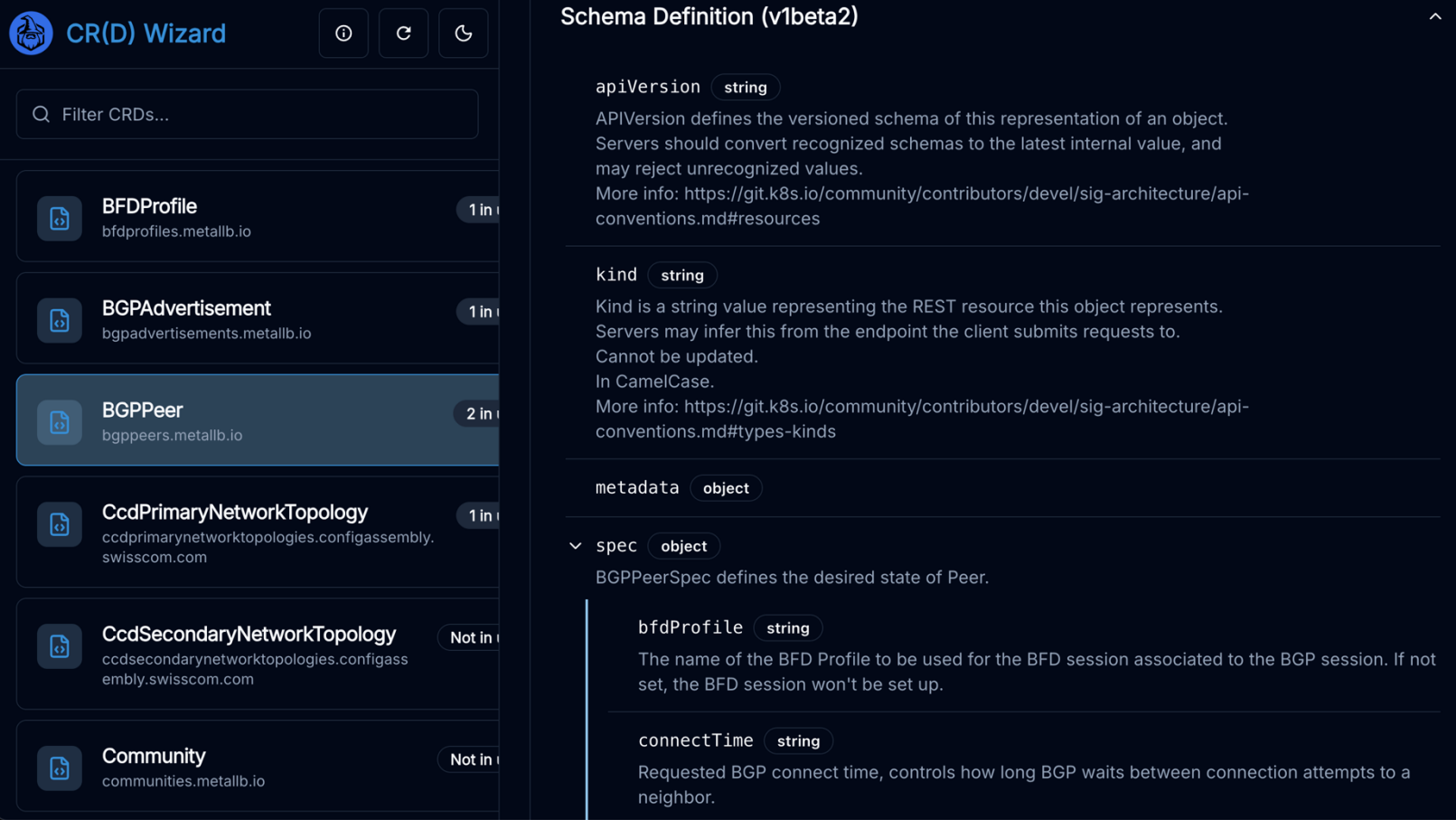


Teams chats per topic / working group



Regular check ins




CR(D) Wizard
Filter CRDs...
BFDProfile
bfdprofiles.metallb.io
1 in
BGPAdvertisement
bgpadvertisements.metallb.io
1 in
BGPPeer
bgppeers.metallb.io
2 in
CcdPrimaryNetworkTopology
ccdprimarynetworktopologies.configassembly.swisscom.com
1 in
CcdSecondaryNetworkTopology
ccdsecondarynetworktopologies.configassembly.swisscom.com
Not in
Community
communities.metallb.io
Not in
Schema Definition (v1beta2)
apiVersion string
APIVersion defines the versioned schema of this representation of an object. Servers should convert recognized schemas to the latest internal value, and may reject unrecognized values.
More info: https://git.k8s.io/community/contributors/devel/sig-architecture/api-conventions.md#resources
kind string
Kind is a string value representing the REST resource this object represents. Servers may infer this from the endpoint the client submits requests to.
Cannot be updated.
In CamelCase.
More info: https://git.k8s.io/community/contributors/devel/sig-architecture/api-conventions.md#types-kinds
metadata object
spec object
BGPPeerSpec defines the desired state of Peer.
bfdProfile string
The name of the BFD Profile to be used for the BFD session associated to the BGP session. If not set, the BFD session won't be set up.
connectTime string
Requested BGP connect time, controls how long BGP waits between connection attempts to a neighbor.

Cluster

Headlamp

Search Press / to search

Hello

- Home
- Clusters *kind-kind*
  - Namespaces
  - Nodes
  - Advanced Search (Beta)
- Map
- Workloads
- Storage
- Network
- Gateway (beta)
- Security
- Configuration
- Custom Resources
- Flux

+ Create

v1.35.0

Overview

CPU 2 units

Memory 7.74 GB

Pods 18 / 19 Requested — 94.7 %

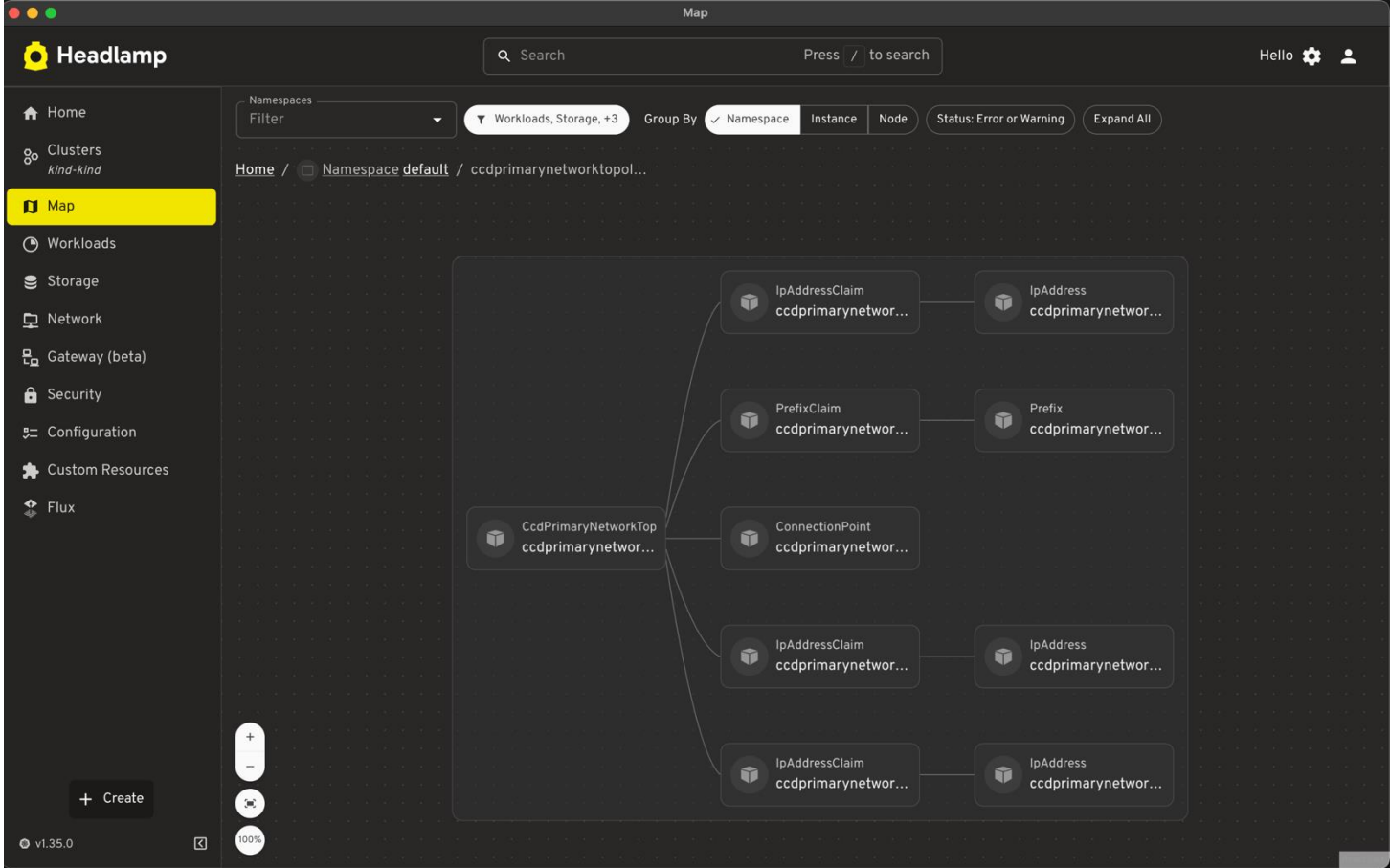
Nodes 1 / 1 Ready — 100.0 %

Events

Only warnings (18)

Namespaces: Filter

Type	Name	Namespace	Reason	Message	Last Seen	Actions
Pod	netbox-valkey-replicas-2	default	FailedScheduling	0/1 nodes are available: 1 Insufficient cpu. no new claims to deallocate, preemption: 0/1 nodes are available: 1 No preemption victims found for incoming pod.	3m	
Pod	crd-wizard-66fbd9666-5r8r4	default	BackOff	Back-off restarting failed container crd-wizard in pod crd-wizard-66fbd9666-5r8r4_default(e4964ca3-2546-4b90-ad50-8152d2d6b8ba)	34m	
Pod	crd-wizard-b447d4d4d-7q52n	default	FailedScheduling	0/1 nodes are available: 1 Insufficient cpu. no new claims to deallocate, preemption: 0/1 nodes are available: 1 No preemption victims found for incoming pod.	36m	
CcdPrimaryNetworkTopology	ccdprimarynetworktopology-kubernetes1	default	NotAllConditionsTrue	Not all Conditions are True	39m	


Map
Headlamp
Search
Press / to search
Hello
Home
Clusters
kind-kind
Map
Workloads
Storage
Network
Gateway (beta)
Security
Configuration
Custom Resources
Flux
Create
v1.35.0
Namespaces
Filter
Workloads, Storage, +3
Group By
Namespace
Instance
Node
Status: Error or Warning
Expand All
Home / Namespace default / ccdprimarynetworktopol...
CcdPrimaryNetworkTop
ccdprimarynetwor...
IpAddressClaim
ccdprimarynetwor...
IpAddress
ccdprimarynetwor...
PrefixClaim
ccdprimarynetwor...
Prefix
ccdprimarynetwor...
ConnectionPoint
ccdprimarynetwor...
IpAddressClaim
ccdprimarynetwor...
IpAddress
ccdprimarynetwor...
IpAddressClaim
ccdprimarynetwor...
IpAddress
ccdprimarynetwor...
100%

Community of Practice

Rent an Engineer

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Gradual adoption

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Knowledge sharing & Graphical UI

6. How do I see what is going on?
7. How can I be sure it worked?

Observability

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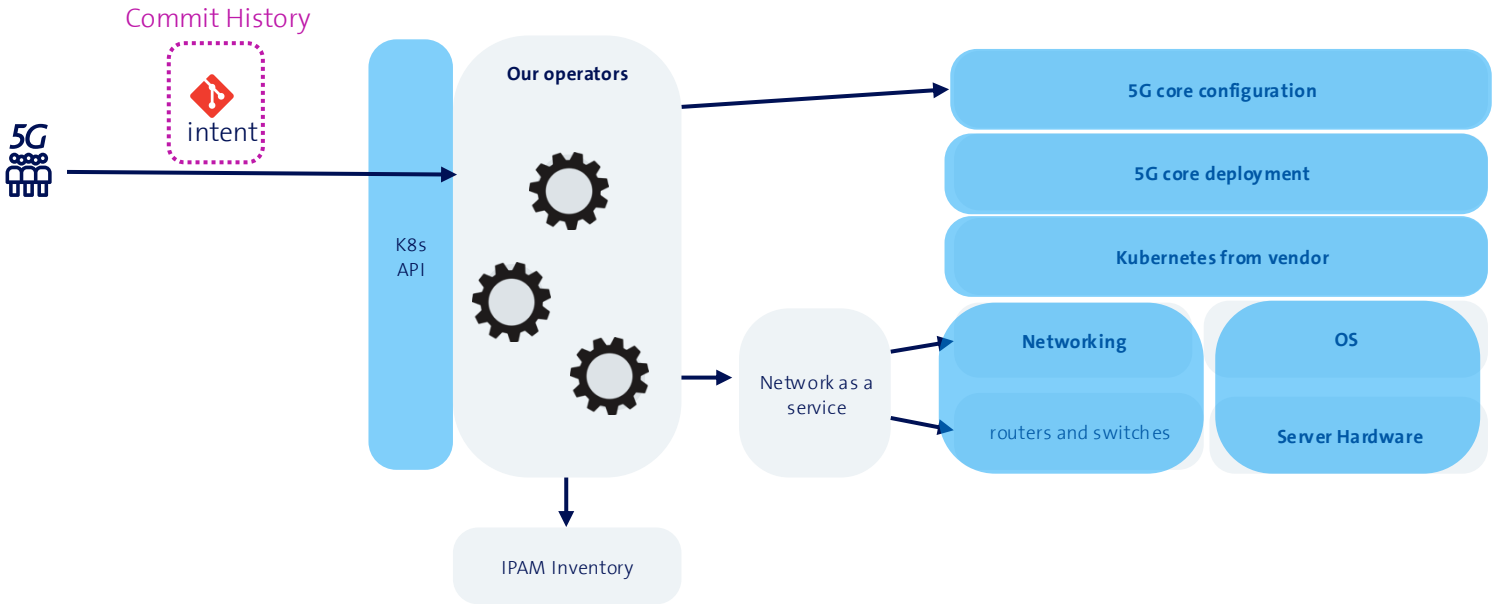
Commit History
intent
5G
K8s
API
Our operators
IPAM Inventory
Network as a
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5G core deployment
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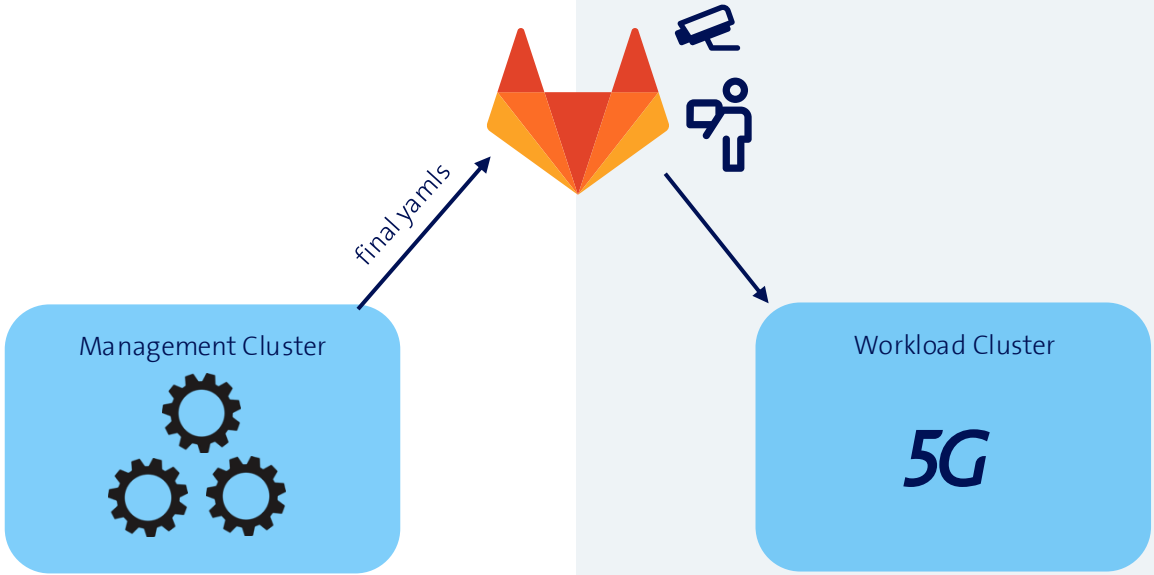
final yamls
Management Cluster
Workload Cluster
5G

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→ **Gradual adoption**

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→ **Knowledge sharing & Graphical UI**

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→ **History in Git**

10. I think we're faster the way we did it


Home › Dashboards › ROPEs Production
Add
Share
Last 6 hours
Tenants
5G
Total Connection Points
77
Total Static Routes
144
Prefix Claims
491
IP Range Claims
134
Primary Networks
32
Secondary Networks
27
IP Address Claims
205
MetalLB IP Pools
169
Network Instances
6
Network Instances
6
Network Instance
Network Instance
Status
Ready
Network Instance
Network Instance
Status
Ready
Primary Networks
Primary Network Na
Status
Ready
Secondary Networks
Secondary Network
Status
Ready
Static Routes
Static Route Name
Status
Ready

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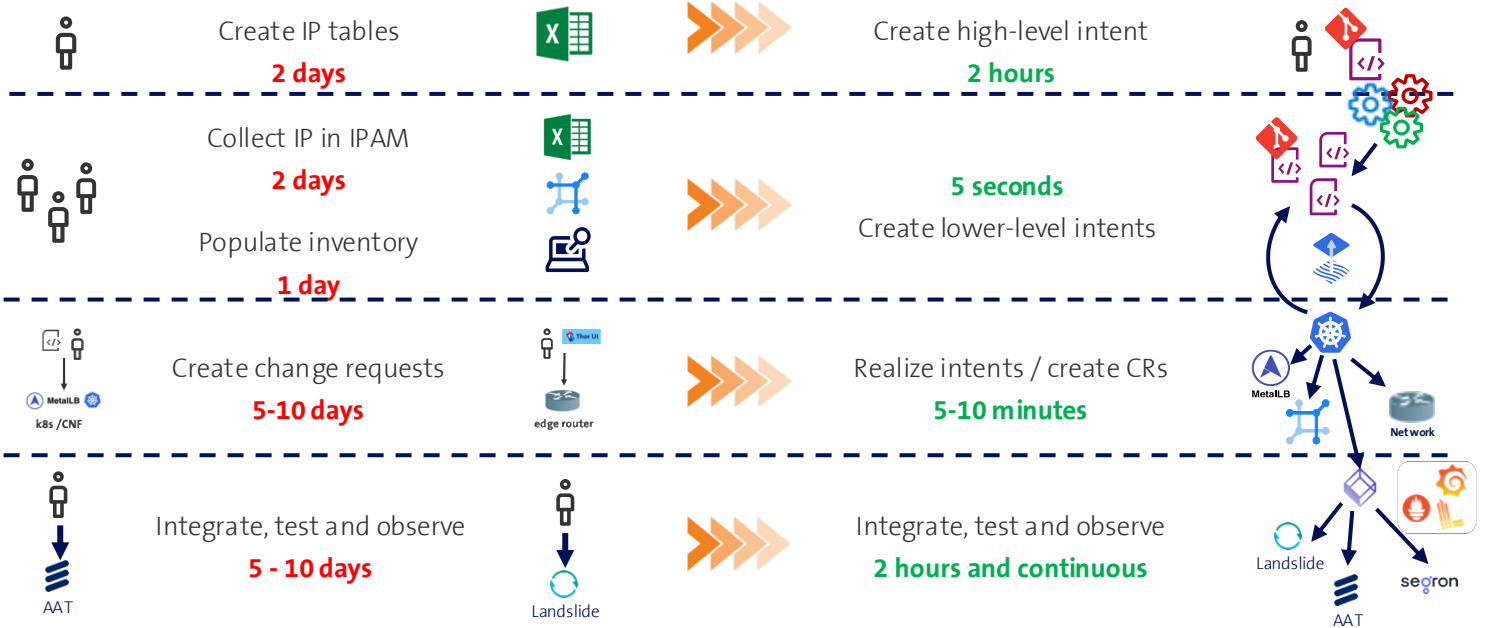
> **Measure it**


Create IP tables
2 days
Create high-level intent
2 hours
Collect IP in IPAM
2 days
Populate inventory
1 day
5 seconds
Create lower-level intents
MetalLB
k8s /CNF
Create change requests
5-10 days
edge router
Realize intents / create CRs
5-10 minutes
MetalLB
Network
AAT
Integrate, test and observe
5 - 10 days
Landslide
Integrate, test and observe
2 hours and continuous
Landslide
AAT
segron

Thanks to the colleagues from Ropes for what we've achieved **together** in the past **1.5 years**.

All endpoints created **without a single error**!

I'm convinced that we've **saved a week or two of toil**.

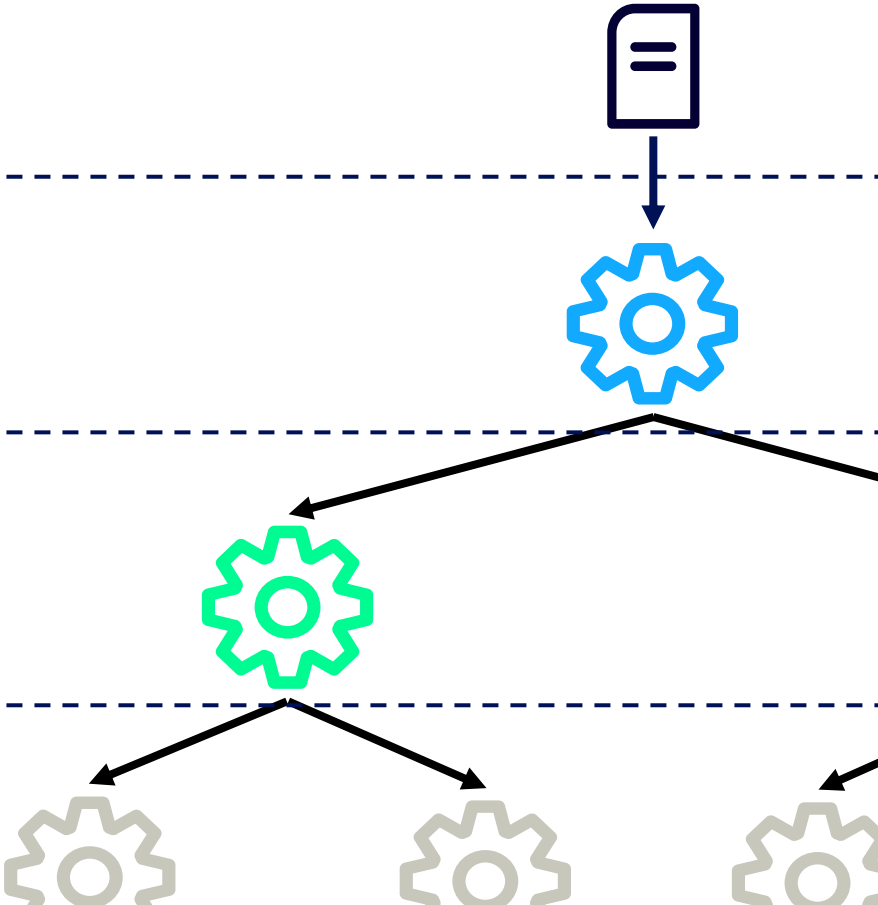
Now, it took me **less than one hour** to create those networks!

High level intent

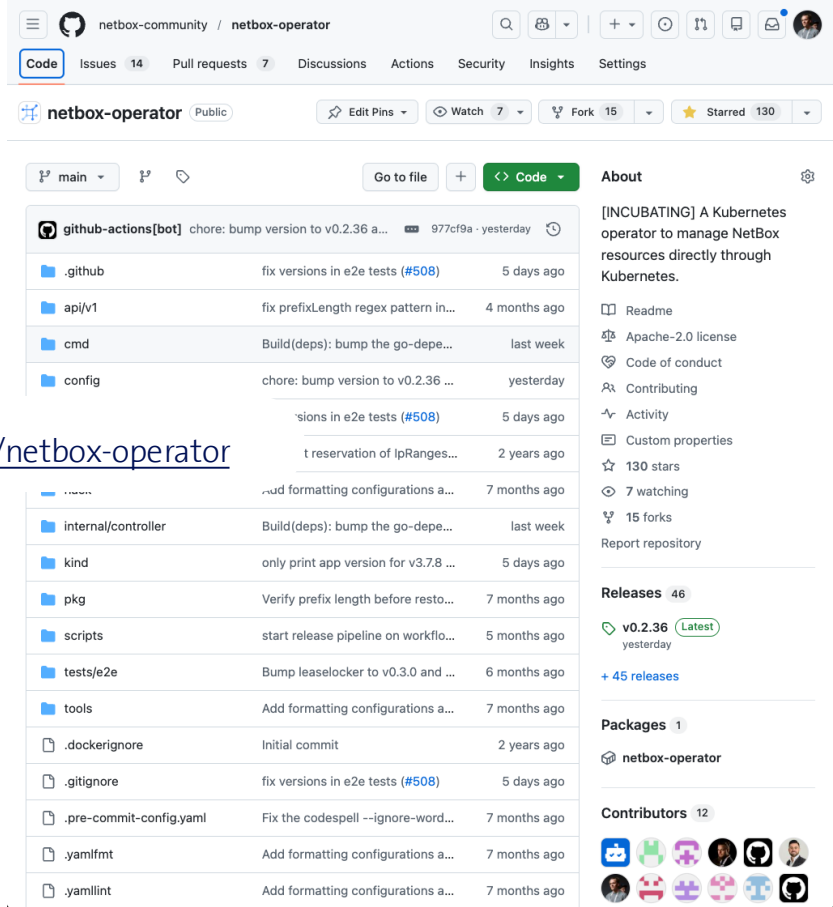
First Level Operator

Second Level Operators

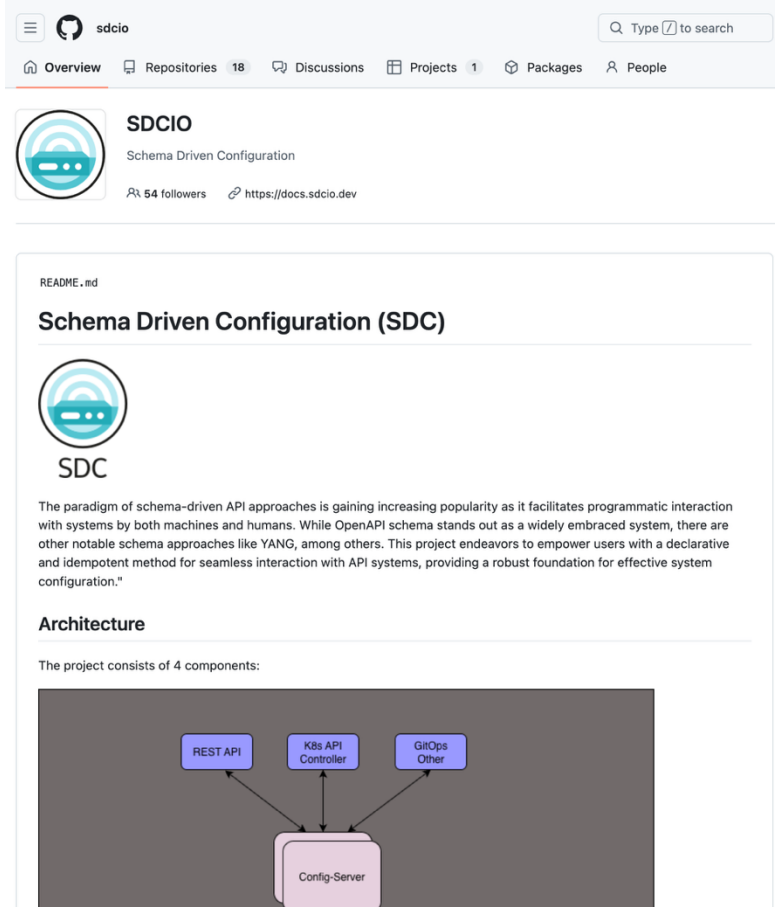
Third Level Operators



https://github.com/netbox-community/netbox-operator



https://github.com/sdcio



The accidental platform team

Phase 1

First successful automation

Phase 2

Other engineers hear about it

Phase 3

What is your SLA?

We need this feature!

Phase 4

Automated change requests
Manual steps in automation

Full automation
Some imperative systems are difficult to transform into declarative approach

AI
Do we need it?

Add monitoring early
Help users understand

Provide prototype early
Find misalignments

Gradual adoption
Demonstrate successful use-case

Upskill your customers
Get users excited for new possibilities

Keep your customers close

How We Are Moving from GitOps to Kubernetes Resource Model in 5G Core

KubeCon Europe

2024

Just Claim It: Simplifying Network Automation with NetBox Operator

Cloud Native Telco Day

2025

The Cloud-Native Advantage: Intent-based Network Automation (SDC)

Container Days Conference

2025

2024

Building and Operating a Highly Reliable Cloud Native DNS Service With Open-Source Technologies

Container Days Conference

2025

Keynote: Cloud Native Evolution in Telecom: 5G, 6G and Beyond!

KubeCon + CloudNativeCon Europe

Thanks!

github.com/swisscom/cloud-native-telco