



SURF

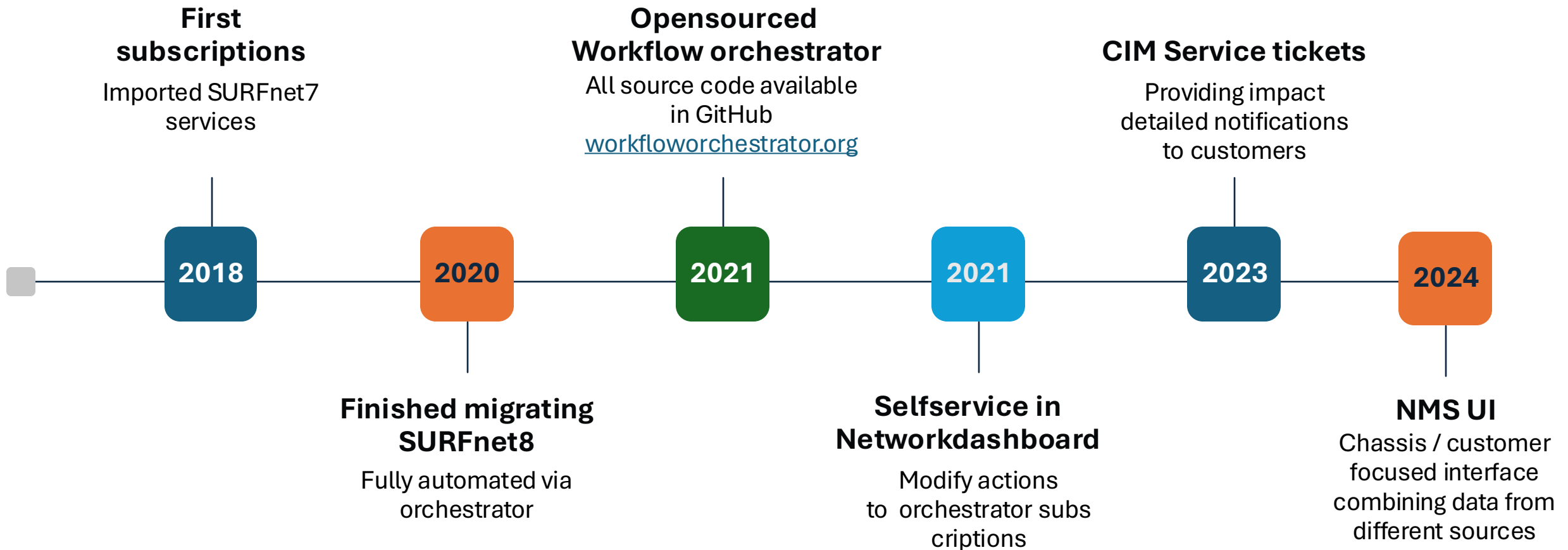


Next Level Orchestration at SURF

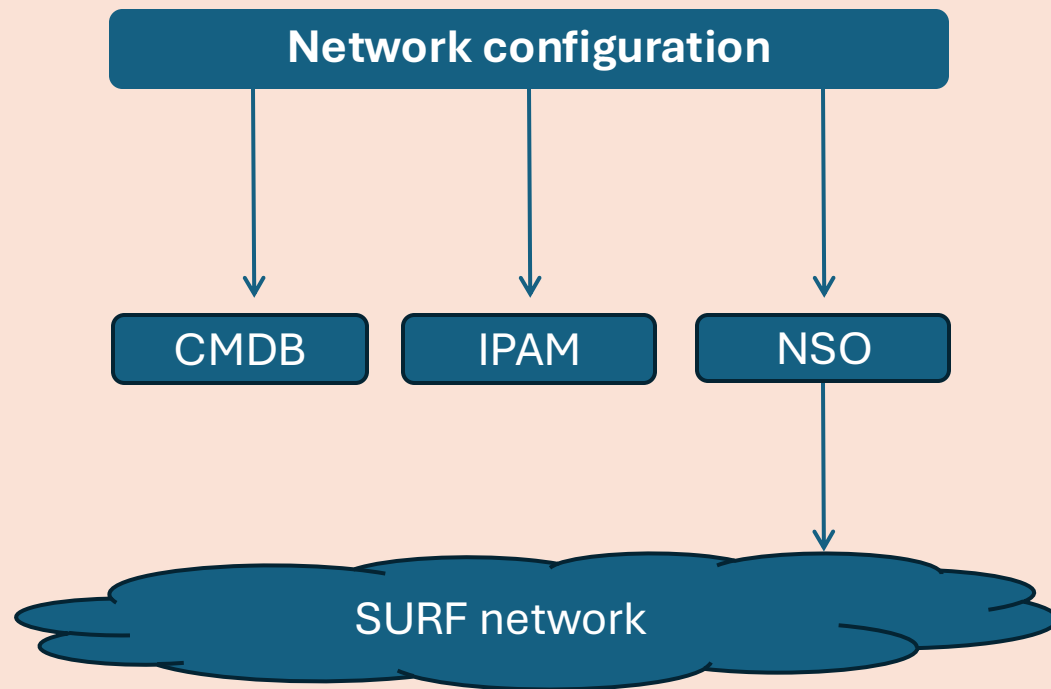
Peter Boers, Wouter Huisman

12 June 2025

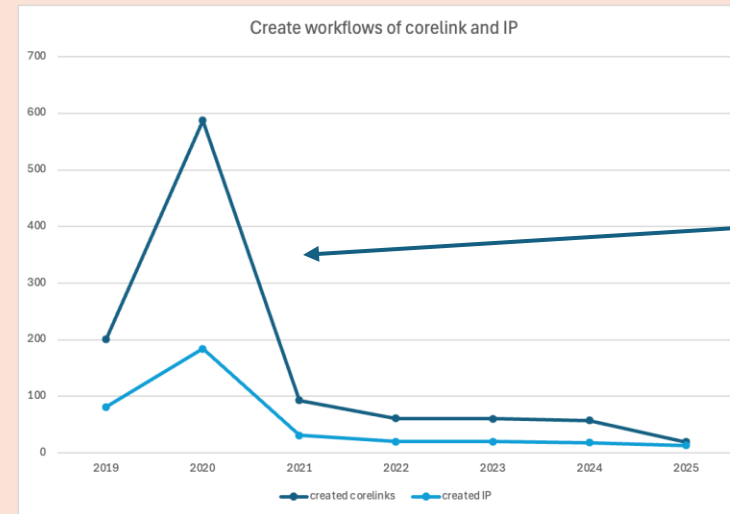
| SURF's Automation journey



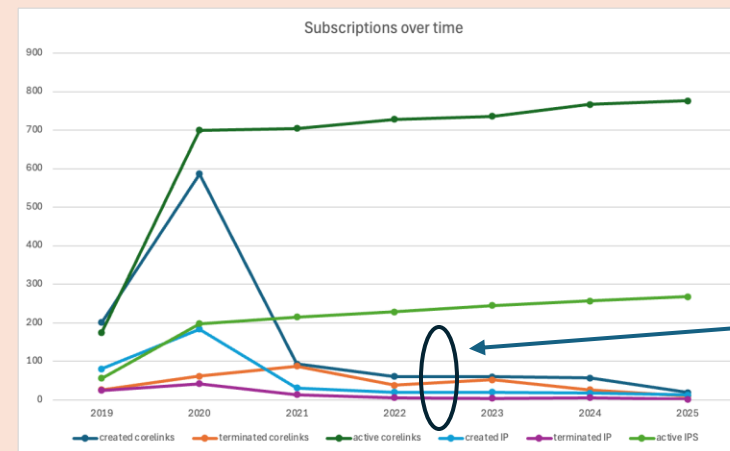
Network configuration in first years



SURF



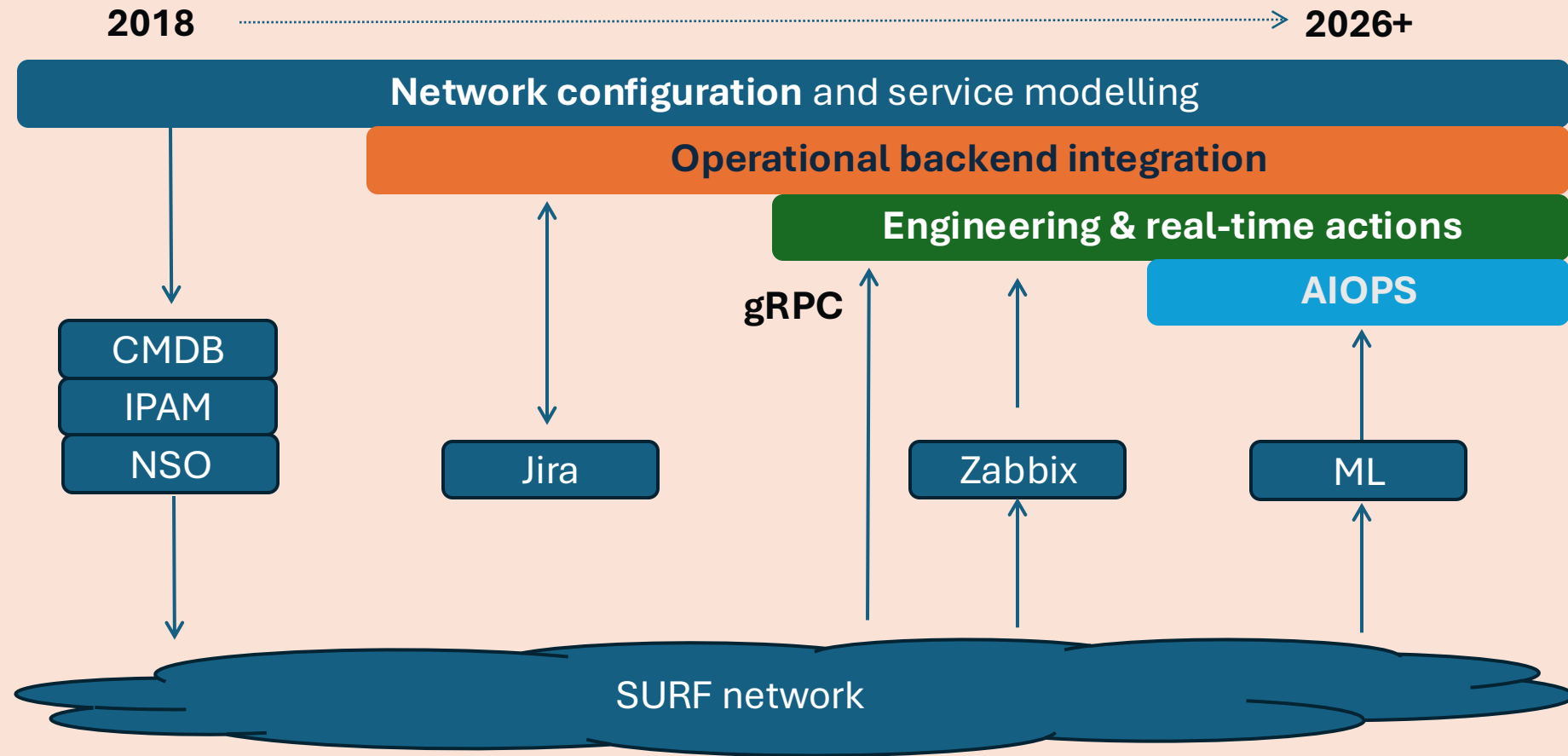
Migration to SURFnet8



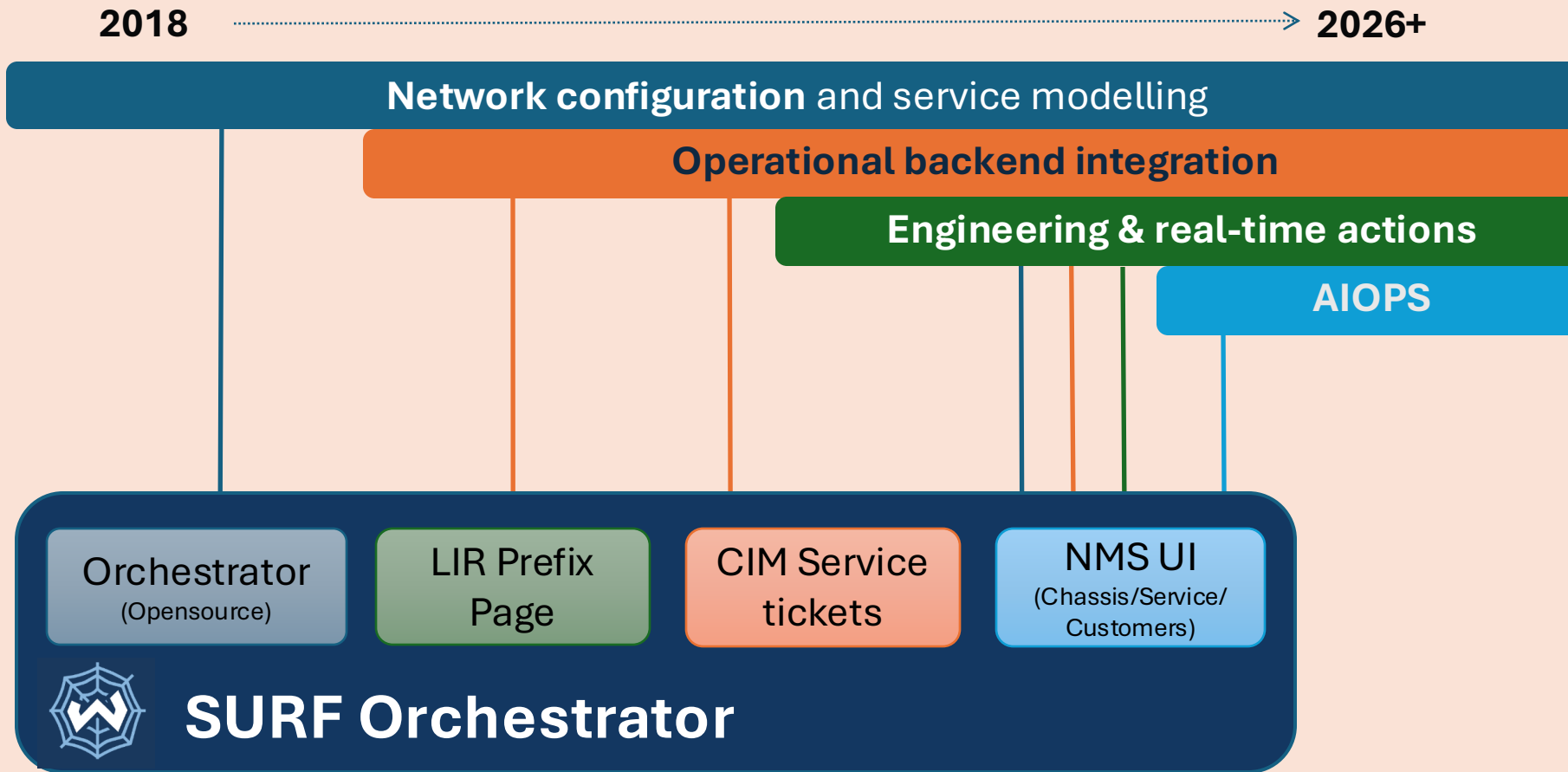
Many changes in a steady network.

One 5500 active subscriptions ~3000 workflows year on year

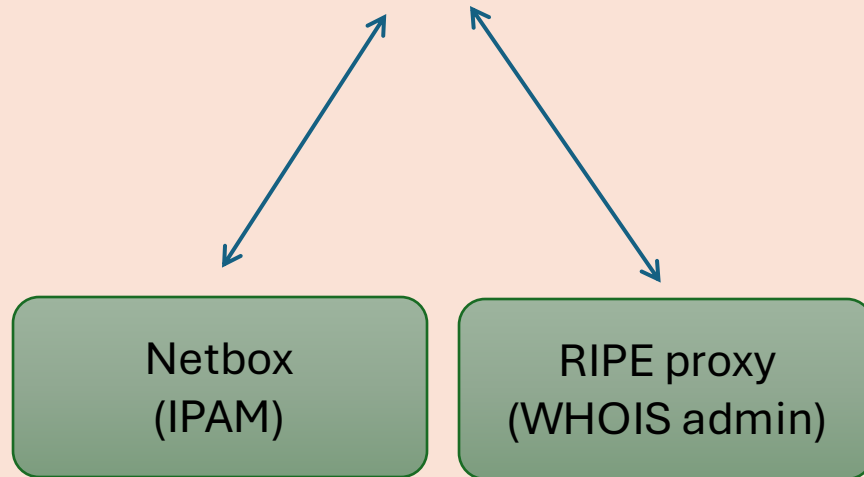
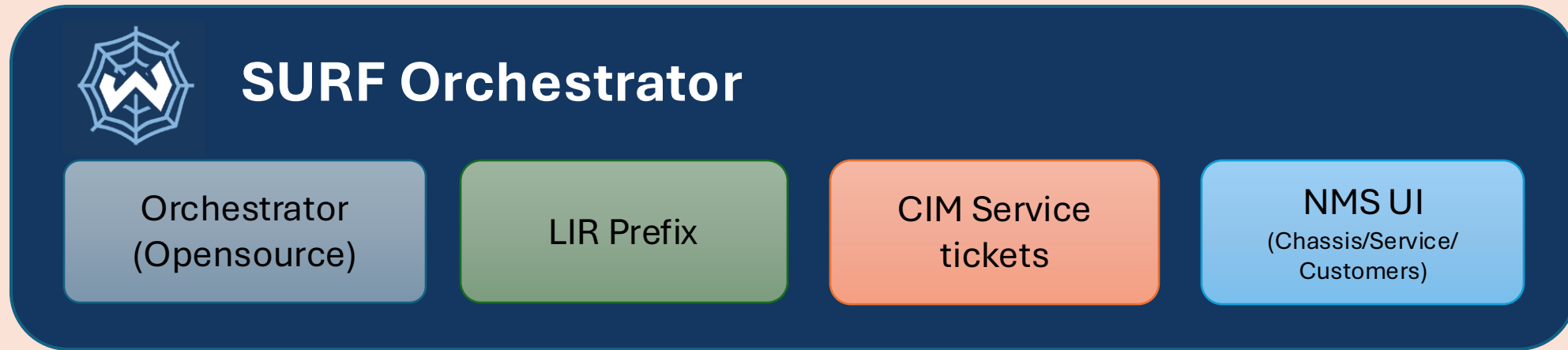
Shift from configuration to ops



New interfaces in UI



LIR prefix UI



LIR Prefix page provides

- 1 Overview of allocated subnets
- 2 Calculates free prefixes
- 3 Redirects to create workflow
- 4 Register subnet in RIPE

Claiming a new subnet for a customer

Workflow Orchestrator

Production

Engine is RUNNING 5

+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Lir-prefixes

LIR prefixes

Select root prefixes195.169.0.0/16 x2001:610::/29 x::/0 x

Select prefix stateFree xAllocated x

Search

Prefix ↑	Len	Customer	Description	State	Sub ID	Fam	Parent	Start date
195.169.0.0/24	/24	SURFnet bv	SURFNET (SURFnet PoPco/SURFcloud Tilb.	Allocated	210ced11	IPv4	195.169.0.0/16	24/01/2019
195.169.1.0/24	/24	SURFnet bv	SURFNET (SURFnet PoPco bij UMCU)	Allocated	2125e4da	IPv4	195.169.0.0/16	24/01/2019
195.169.2.0/24	/24	netSURF	NETSURF (Wibi Darknet 9/8/2004)	Allocated	a201a568	IPv4	195.169.0.0/16	24/01/2019
195.169.3.0/24	/24	ASTRON	ASTRON	Allocated	8c72babf	IPv4	195.169.0.0/16	24/01/2019
195.169.4.0/24	/24	Lentiz Onderwijsgroep	LENTIZ	Allocated	c8182a72	IPv4	195.169.0.0/16	24/01/2019
195.169.5.0/24	/24	N/A	Free space - generated	Free	Create	IPv4	195.169.0.0/16	16:18:12
195.169.6.0/23	/23	Previder	INTROWEB	Allocated	c18943e4	IPv4	195.169.0.0/16	24/01/2019
195.169.8.0/24	/24	N/A	Free space - generated	Free	Create	IPv4	195.169.0.0/16	16:18:12
195.169.9.0/24	/24	Deltion College	DELTION	Allocated	372f6603	IPv4	195.169.0.0/16	24/01/2019
195.169.10.0/24	/24	N/A	SVOPL	Allocated	36b92b53	IPv4	195.169.0.0/16	24/01/2019
195.169.11.0/24	/24	N/A	Free space - generated	Free	Create	IPv4	195.169.0.0/16	16:18:12
195.169.12.0/24	/24	N/A	Free space - generated	Free	Create	IPv4	195.169.0.0/16	16:18:12
195.169.13.0/24	/24	SURFnet bv	SURFNET (Mailfilter outbound SMTP)	Allocated	59439cff	IPv4	195.169.0.0/16	24/01/2019
195.169.14.0/24	/24	N/A	Free space - generated	Free	Create	IPv4	195.169.0.0/16	16:18:12
195.169.15.0/24	/24	Deltion College	DELTION	Allocated	2f0e1d40	IPv4	195.169.0.0/16	24/01/2019

Claiming a new subnet for a customer

The screenshot displays the Workflow Orchestrator interface. The top navigation bar includes the 'Workflow Orchestrator' logo, a 'Production' tab, and a status indicator 'Engine is RUNNING' with a red alert icon and the number '5'. The left sidebar contains a menu with options: '+ New subscription', 'Start', 'Chassis', 'Services', 'Customers', 'Service Tickets', 'LIR Prefixes' (highlighted), and 'Orchestrator'. The main content area is titled 'LIR prefixes' and shows a list of IP prefixes from 195.169.0.0/24 to 195.169.15.0/24. A modal window titled 'Create IP LIR Prefix' is open, showing a progress bar and a 'User input' section. The 'User input' section includes a form for 'IP Lir Prefix' with fields for 'Customer *', 'Customer contact persons' (Name, Email, Phone number), 'Jira ticket ID', and 'IP Prefix settings'. The 'IP Prefix settings' section shows 'IP Prefix *' set to '195.169.5.0/24'. The modal also has 'Cancel' and 'Next' buttons.

Workflow Orchestrator | Production | Engine is RUNNING 5

+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start | Lir-prefixes

LIR prefixes

Select root prefix

195.169.0.0/16 x

Search

Prefix ↑

195.169.0.0/24

195.169.1.0/24

195.169.2.0/24

195.169.3.0/24

195.169.4.0/24

195.169.5.0/24

195.169.6.0/23

195.169.8.0/24

195.169.9.0/24

195.169.10.0/24

195.169.11.0/24

195.169.12.0/24

195.169.13.0/24

195.169.14.0/24

195.169.15.0/24

Start | Workflows | New | Create_ip_lir_prefix

Create IP LIR Prefix ⚡

Retry | Abort

Status: create | Current step: form | Started by: - | Started on: - | Last update: -

User input

Please submit the form to start this workflow

IP Lir Prefix

Customer *

Search and select the customer for the product

Search and select a customer...

Customer contact persons

The persons to notify when the process is finished. You can add multiple emails, names and phone numbers.

Name | Email | Phone number

Search and add contact persons...

Jira ticket ID

The JIRA ticket ID that will be used/mentioned in the confirmation mail

IP Prefix settings

IP Prefix *

Select a free subnet

195.169.5.0/24

Cancel | Next

Claiming a new subnet for a customer

The screenshot displays the Workflow Orchestrator interface, which is used for managing network resources. The interface is divided into several sections:

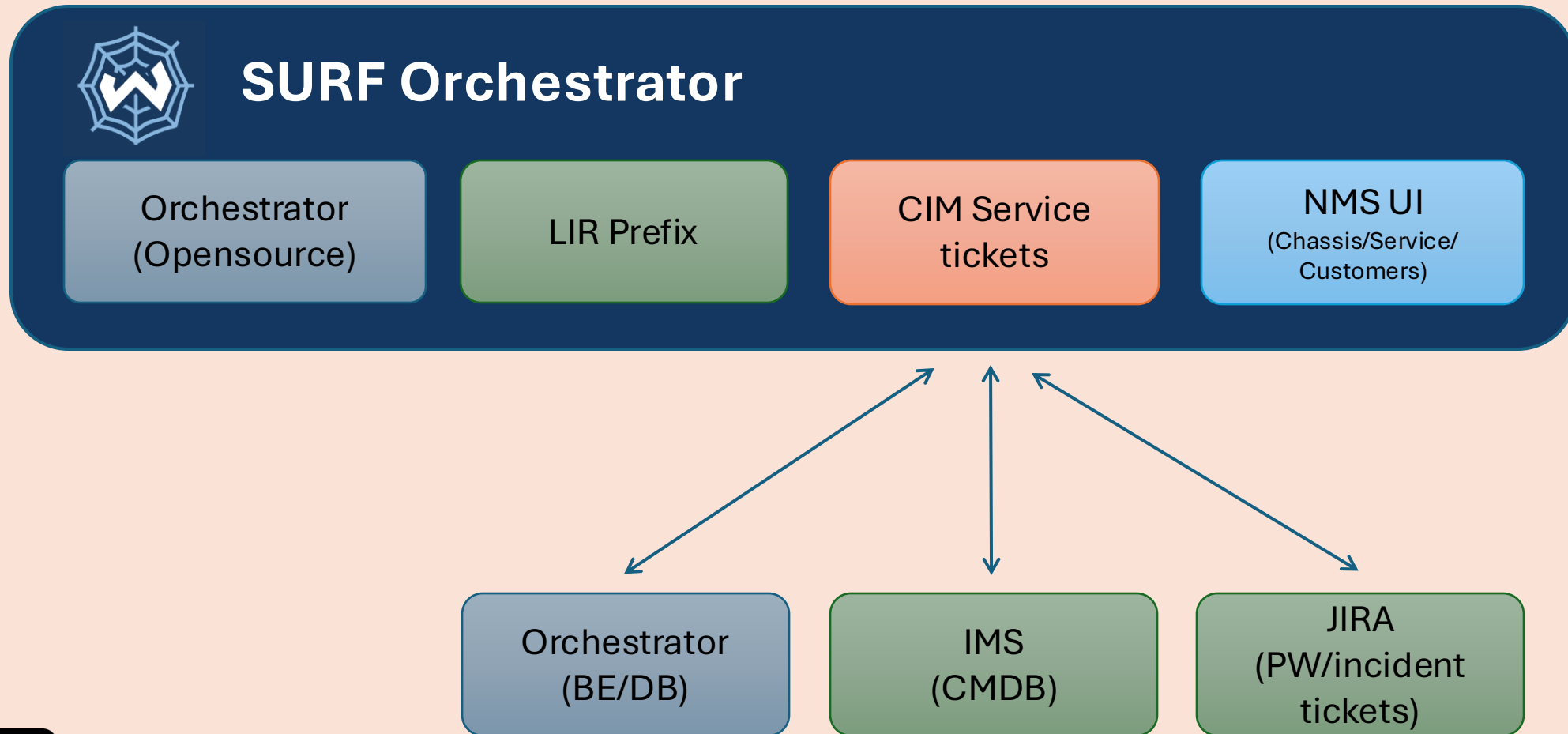
- Left Sidebar:** Contains navigation links for 'Start', 'Chassis', 'Services', 'Customers', 'Service Tickets', 'LIR Prefixes' (highlighted), and 'Orchestrator'.
- Top Bar:** Shows 'Workflow Orchestrator' and 'Production' mode. A status indicator shows 'Engine is RUNNING' with 5 alerts.
- Main Content Area:**
 - Start / Lir-prefixes:** A section for managing LIR prefixes. It includes a 'Select root prefix' dropdown (currently set to '195.169.0.0/16') and a search bar. A list of available prefixes is shown, with '195.169.5.0/24' selected.
 - Create IP LIR Prefix:** A form for creating a new LIR prefix. It includes fields for 'Customer *', 'Customer contact persons', 'Jira ticket ID', and 'IP Prefix settings'. The 'IP Prefix' field is set to '195.169.5.0/24'.
 - Subscriptions:** A section for managing subscriptions. It shows a list of subscriptions, with 'SURF prefix LIR 145.98.16.0/24' selected.
 - SURF prefix LIR 145.98.16.0/24:** A detailed view of the selected subscription. It shows various configuration options and a table of attributes.

The 'SURF prefix LIR 145.98.16.0/24' details table is highlighted with a red box:

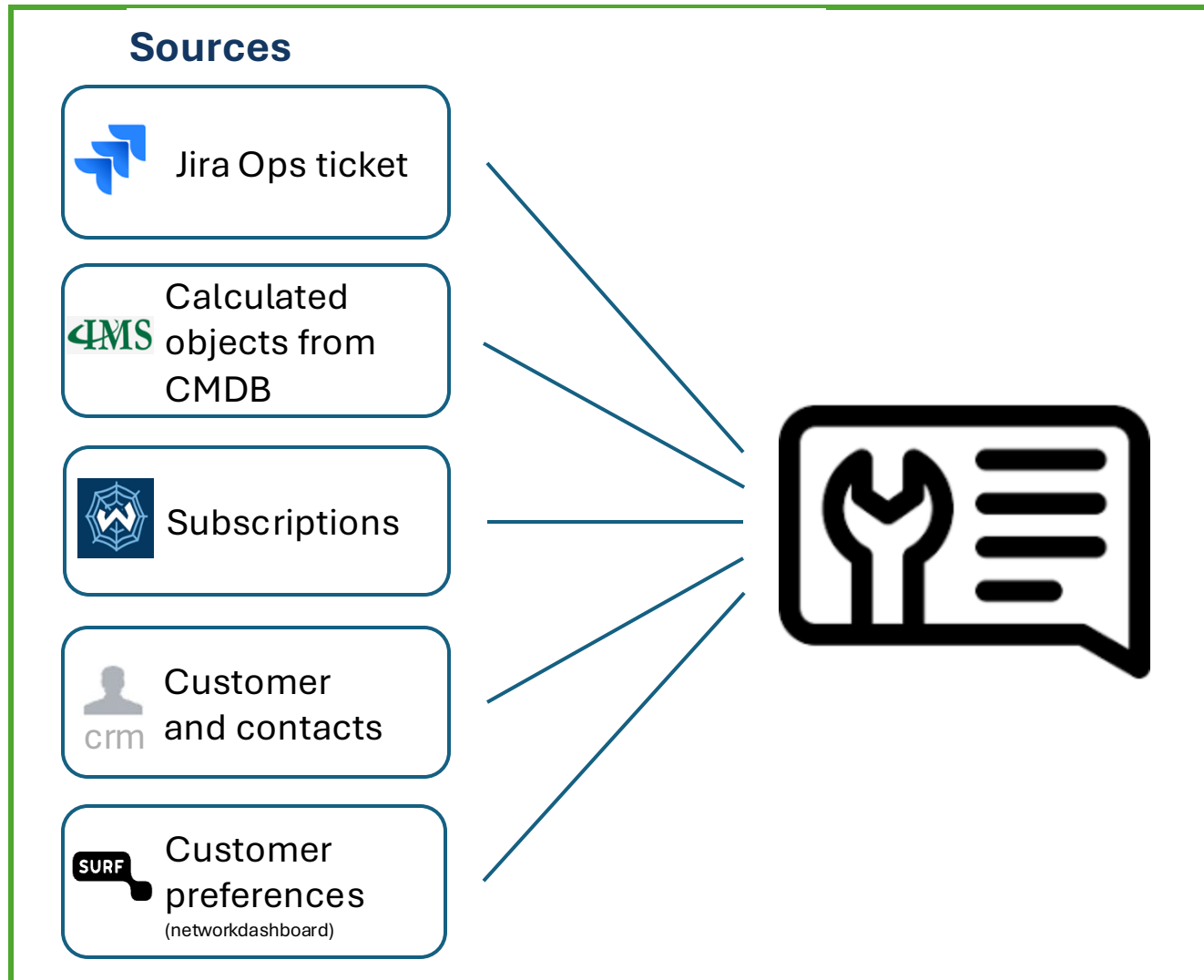
Attribute	Value
inetnum	145.98.16.0 - 145.98.16.255
netname	ANY-NET
country	NL
admin-c	SNS1-RIPE
tech-c	SNS1-RIPE
status	LEGACY
mnt-by	SN-LIR-MNT
created	2025-03-03T13:02:11Z
last-modified	2025-03-03T13:02:11Z
source	RIPE

SURF

Service ticket UI



CIM Service tickets – create & relate function



Creating a service ticket

- 1 Matching Jira ticket with impact analyses in CMDB
- 2 Map subscriptions to impacted objects
- 3 Find customers and contacts
- 4 Apply customer preferences



+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Service-tickets


Service tickets

+ New service ticket

Active Completed

Jira ticket	Priority	Title	State	Opened by	Start time	End time	Created on	Updated on
SNNP-98657		Restpunt filterinstallatie op Zwt001a	open		04/06/2025, 09:00:00	04/06/2025, 17:00:00	28/05/2025	28/05/2025
SNNP-100371		Dag 2: dempingsissues verhelpen tussen Dg	open		05/06/2025, 09:00:00	05/06/2025, 17:00:00	28/05/2025	28/05/2025
SNNP-100179		Fiberwerkzaamheden tussen CRL001A (CH/	updated		06/06/2025, 04:00:00	07/06/2025, 06:00:00	28/05/2025	28/05/2025
SNNP-100300		Fiberwerkzaamheden Eurofiber in Eindhove	open		06/06/2025, 00:00:00	06/06/2025, 05:00:00	28/05/2025	28/05/2025
SNNP-100297		Fiberwerkzaamheden Eurofiber in Amsterda	open		06/06/2025, 00:00:00	06/06/2025, 06:00:00	28/05/2025	28/05/2025
SNNP-98947		Opruimen oude TFT link Dgl001a - Zwt001a	open		04/06/2025, 09:00:00	04/06/2025, 17:00:00	27/05/2025	27/05/2025
SNNP-100492		Fiberwerkzaamheden tussen BD009B (Amp	open		04/06/2025, 08:00:00	04/06/2025, 10:00:00	27/05/2025	27/05/2025
SNNP-98948		Opruimen oude TFT link Zwt001a - Gn012a	open		04/06/2025, 11:00:00	04/06/2025, 17:00:00	27/05/2025	27/05/2025

Rows per page: 15 < 1 >

Workflow Orchestrator

Production

+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Service-tickets

Service tickets

Active Completed

Jira ticket	Priority	Title
SNNP-98657		Restpunt filterinstallatie op Zw
SNNP-100371		Dag 2: dempingsissues verhel
SNNP-100179		Fiberwerkzaamheden tussen C
SNNP-100300		Fiberwerkzaamheden Eurofibe
SNNP-100297		Fiberwerkzaamheden Eurofibe
SNNP-98947		Opruimen oude TFT link Dgl00
SNNP-100492		Fiberwerkzaamheden tussen B
SNNP-98948		Opruimen oude TFT link Zwt00

Rows per page: 15 < 1 >

Start / Service-tickets / 378b91b3-b80a-4612-99f8-eaefb83885fc

Restpunt filterinstallatie op Zwt001a

Abort

Send new e-mail

General Notification log Sent e-mails 1

Service ticket details

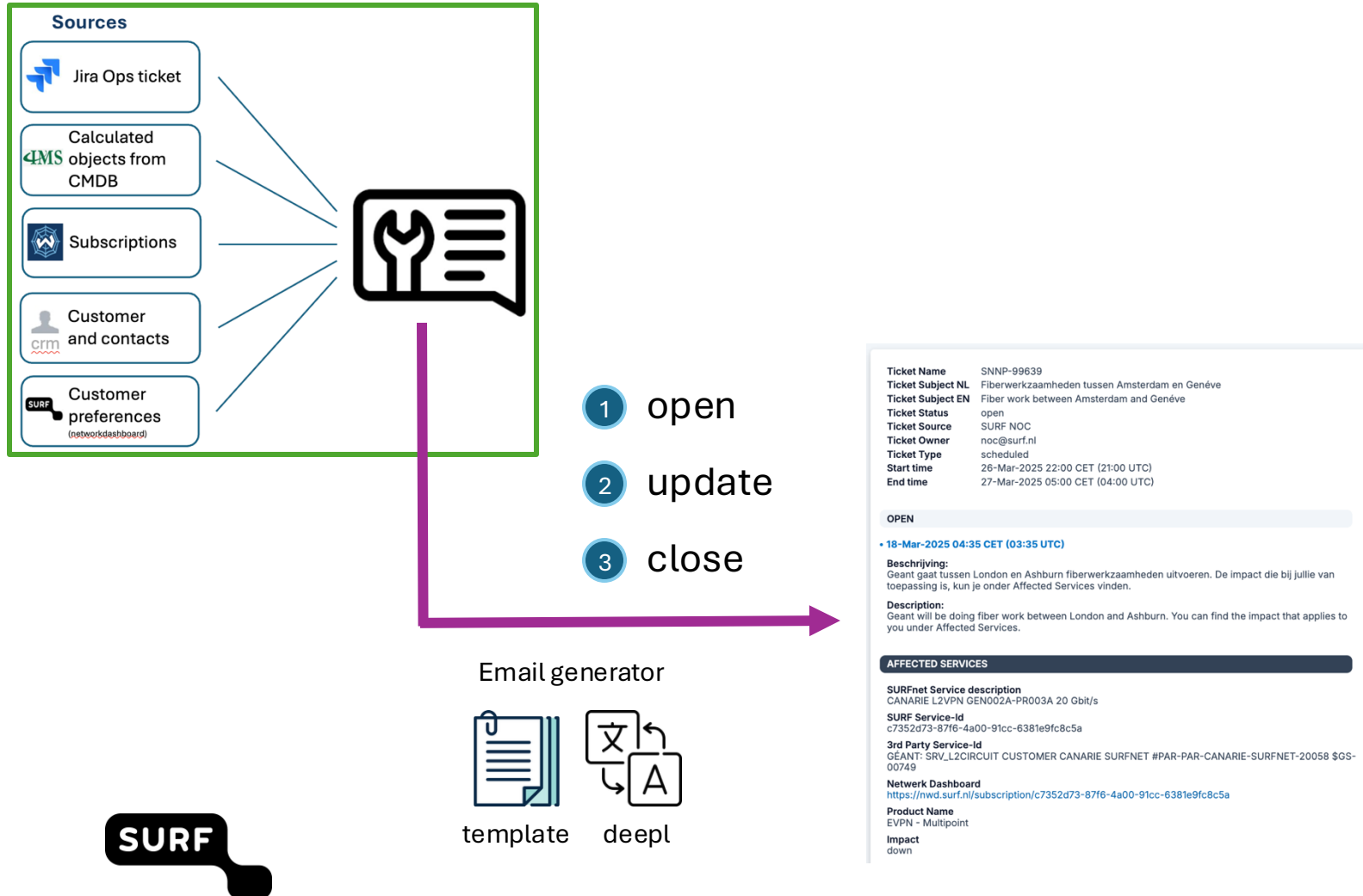
Title	Restpunt filterinstallatie op Zwt001a
Jira ticket	SNNP-98657
IMS Planned work	SNNP-98657
Type	planned work
Start time	04/06/2025, 09:00:00
End time	04/06/2025, 17:00:00
Opened by	
Created on	28/05/2025, 13:32:45
Updated on	28/05/2025, 13:52:26
State	open
Active background jobs	-
Background job logs	5
Default notification level	loss of resiliency
Customers to inform	1

Impact on subscriptions

Accept impact

Subscriptions↑	Number of affected customers	Inform customers	IMS calculated impact	NOC manual impact override
> ASTRON ALIEN_WAVE DGL001A-GN012A 400Gbit/s	1	1	down	-
> ASTRON IP DGL001A 10 Gbit/s	1	0	reduced_redundancy	-
> ASTRON IP DGL001A 10 Gbit/s	1	0	reduced_redundancy	-
> ASTRON L2VPN AAC001A-DGL001A 10 Gbit/s	2	0	reduced_redundancy	-
> ASTRON LP DGL001A-GN001B 10 Gbit/s	1	0	reduced_redundancy	-
> ASTRON LP DGL001A-GN012A 10 Gbit/s	1	0	reduced_redundancy	-
> BELNET LP ASD001B-BRU001A 100 Gbit/s	1	0	reduced_redundancy	-
> BELNET LP ASD002A-BRU001A 20 Gbit/s	1	0	reduced_redundancy	-
> DUMMY IP ASD001B 50 Mbit/s	1	0	reduced_redundancy	-

CIM Service tickets – mailing function



Mailing to customers

- 1 Apply email template
- 2 Translate from NL to EN (DeepL)
- 3 Enrich per customer email:
 - customer alias
 - 3rd party Ids
 - service configuration details
 - link to network dashboard

NMS UI



SURF Orchestrator

Orchestrator
(Opensource)

LIR Prefix

CIM Service
tickets

NMS UI
(Chassis/Service/
Customers)



Orchestrator
(BE/DB)

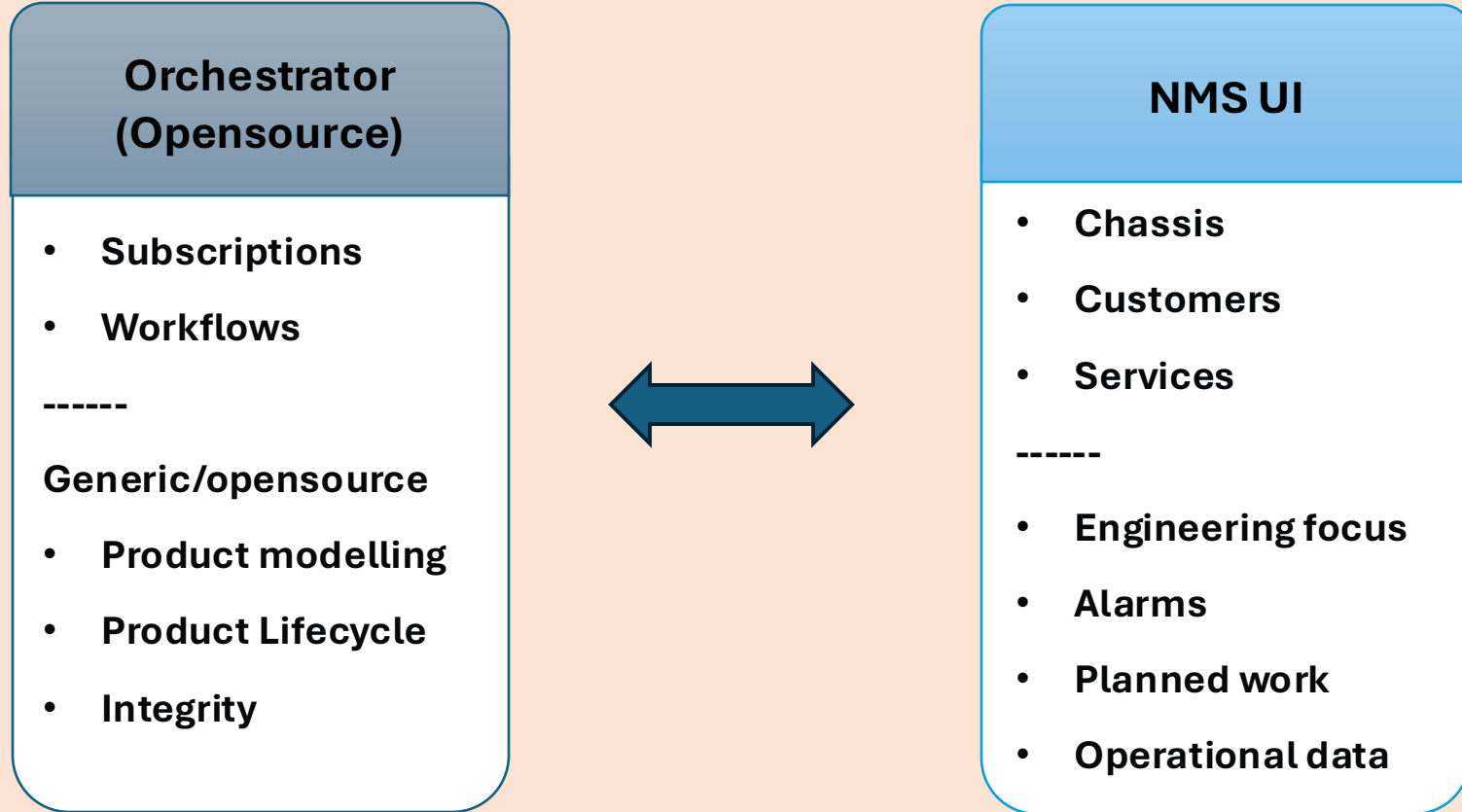
IMS
(CMDB)

Service
Tickets

Zabbix

SURF

| Orchestrator UI versus NMS UI



NMS UI combined with orchestrator

Orchestrator

NMS UI

CIM Service tickets

LIR prefix

Orchestrator (MostlyOpenSource)

+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Subscriptions

Workflows

Tasks

Metadata

Settings

Workflow Orchestrator

Production

























Engine is RUNNING 2

Start / Nms / Chassis

Network Management System

Chassis Services Customers

Q Search...

Chassis Name ↑	Chassis type	Software version	Location	Status	Note
  aac001a-jnx-01	JNP204 [MX204]	22.4R3-S3.3	Aac001a	active	
  ah001a-jnx-01	NA	NA	Ah001A	active	
  ah005a-jnx-01	NA	NA	Ah005A	active	
  ah009a-jnx-01	JNP204 [MX204]	22.4R3-S3.3	Ah009a	active	
  ah009b-jnx-01	JNP204 [MX204]	22.4R3-S3.3	Ah009B	active	
  ah010a-jnx-01	NA	NA	Ah010A	active	
  ah010a-jnx-02	JNP204 [MX204]	22.4R3-S3.3	Ah010A	active	
  ah011a-jnx-01	NA	NA	Ah011A	active	
  ah012a-jnx-01	JNP204 [MX204]	22.4R3-S3.3	Ah012A	active	
  alr003a-jnx-01	JNP204 [MX204]	22.4R3-S3.3	Alr003A	active	
  alr003a-jnx-02	NA	NA	Alr003A	active	
  alr004a-jnx-01	MX240	22.4R3-S3.3	Alr004A	active	

Info

Edit columns



Chassis view - ports

Workflow Orchestrator | Production | Engine is RUNNING 2

+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Nms / Chassis / Ut042a-jnx-03

Chassis – ut042a-jnx-03

Ports (8) General Services (11) Customers (4) Actions

Export

Port	Status	Subscription ID	Description	Speed	Patch	
> 0/1/0	UP UP	6ebe263d	Link member: Corelink ut042a-jnx-03_ae21--ut042a-jnx-02_ae20	10G		...
> 0/1/1	UP UP	64be7880	SURFOC SP TAGGED UT042A 10 Gbit/s	10GBASE-LR	FAKE_SN7-ODF_01/04 (SC/PC)	...
VLAN range	Status	Subscription ID	Description			
10	NA	13d75266	SURFOC L3VPN AH010A-ASD001B-ASD002A 1 Gbit/s			3
124	NA	855d9057	NETHERLIGHTADMIN L2VPN ASD066A-UT042A 100 Mbit/s			
440	NA	9987d268	SURFOC L2VPN ASD001B-ASD002A-UT042A 1 Gbit/s			
> 0/1/2	UP UP	5a5bc880	TESTACCOUNT SP TAGGED UT042A 10 Gbit/s	10GBASE-LR	FAKE_SN7-ODF_01/06 (SC/PC)	...
> 0/1/3	UP UP	0c435b6f	SURFOC SP TAGGED UT042A 10 Gbit/s	10GBASE-LR	FAKE_SN7-ODF_01/05 (SC/PC)	...
> 0/1/6	UP UP	scf25a20	SURFOC SP TAGGED UT042A 1 Gbit/s	1000BASE-SX	FAKE_SN7-ODF_01/07 (SC/PC)	...
> 0/1/7	UP UP	8647eca9	Link member: Corelink ut042a-jnx-03_ae20--ut042a-jnx-04_ae20	10G		5
> AE20	UP UP	8647eca9	Corelink ut042a-jnx-03_ae20--ut042a-jnx-04_ae20	VCG	Enable maintenance mode	...
> AE21	UP UP	6ebe263d	Corelink ut042a-jnx-03_ae21--ut042a-jnx-02_ae20	VCG		...


LIR Prefix page provides

- 1 List of customers
- 2 List of services
- 3 Services per port
- 4 Consumed VLANs
- 5 Quick action menu
- 6 Admin & Operational status

SURF

6

Chassis view - services

 Workflow Orchestrator

Production

Engine is RUNNING 2

+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Nms / Chassis / Ut042a-jnx-03

Chassis – ut042a-jnx-03


Actions

Ports (8) General **Services (11)** Customers (4)

Export Expand



Service type
> Corelink (2)
> L2VPN (2)
> L3VPN (1)
> NSILP (1)
> NSISTP (1)
> Port (4)

Chassis view - services

Workflow Orchestrator

Production

Engine is RUNNING 2



+ New subscription

Start

Chassis


Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Nms / Chassis / Ut042a-jnx-03

Chassis – ut042a-jnx-03

Actions

Ports (8)GeneralServices (11)Customers (4)

Service type

> Corelink (2)


> L2VPN (2)

> L3VPN (1)

> NSILP (1)



> NSISTP (1)

> Port (4)

Workflow Orchestrator

Production

Engine is RUNNING 2



+ New subscription

Start

Chassis


Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Nms / Chassis / Ut042a-jnx-03

Chassis – ut042a-jnx-03

Actions

Ports (8)GeneralServices (11)Customers (4)

ExportCollapse

Service type

Corelink (2)

Service	Status	Subscription ID	Description	Customer	Notes
Corelink	NA	6ebe263d	Corelink ut042a-jnx-03_ae21--ut042a-jnx-02_ae20	SURFnet network	
Corelink	NA	8647eca9	Corelink ut042a-jnx-03_ae20--ut042a-jnx-04_ae20	SURFnet network	

L2VPN (2)

Service	Status	Subscription ID	Description	Customer	Notes
L2VPN	NA	9987d268	SURFOC L2VPN ASD001B-ASD002A-UT042A 1 Gbit/s	SURFonCampus	
L2VPN	NA	855d9057	NETHERLIGHTADMIN L2VPN ASD066A-UT042A 100 Mbit/s	NetherLight Admin	

L3VPN (1)


Service	Status	Subscription ID	Description	Customer	Notes
L3VPN	NA	13d75266	SURFOC L3VPN AH010A-ASD001B-ASD002A 1 Gbit/s	SURFonCampus	In use by SURFwired. MSER s-key (pro

NSILP (1)

Service	Status	Subscription ID	Description	Customer	Notes
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SURF

Chassis view - customers

 Workflow Orchestrator

Production

Engine is RUNNING 2



+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator



Chassis – ut042a-jnx-03

Actions


Ports (8) General Services (11) Customers (4)

Export Expand

Customer
> NetherLight Admin (1)
> SURFnet netwerk (2)
> SURFonCampus (5)
> Testaccount Netwerkdashboard (3)



SURF

Chassis view - customers

Workflow Orchestrator

Production

Engine is RUNNING 2



+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Nms / Chassis / Ut042a-jnx-03

Chassis – ut042a-jnx-03

Actions

Ports (8)GeneralServices (11)Customers (4)

Customer

> NetherLight Admin (1)

> SURFnet network (2)

> SURFonCampus (5)

> Testaccount Netwerkdashboard (3)

Workflow Orchestrator

Production

Engine is RUNNING 2



+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Nms / Chassis / Ut042a-jnx-03

Chassis – ut042a-jnx-03

Actions

Ports (8)GeneralServices (11)Customers (4)

Customer

> NetherLight Admin (1)

> SURFnet network (2)

> SURFonCampus (5)


> Testaccount Netwerkdashboard (3)

ExportCollapse

Service	Status	Subscription ID	Description	Notes
L2VPN	NA	855d9057	NETHERLIGHTADMIN L2VPN ASD066A-UT042A 100 Mbit/s	
Corelink	NA	6ebe263d	Corelink ut042a-jnx-03_ae21--ut042a-jnx-02_ae20	
Corelink	NA	8647eca9	Corelink ut042a-jnx-03_ae20--ut042a-jnx-04_ae20	
L2VPN	NA	9987d268	SURFOC L2VPN ASD001B-ASD002A-UT042A 1 Gbit/s	



SURF

Customer pages

 Workflow Orchestrator

Production

Engine is RUNNING 3



+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start

Nms

Customers

TESTACCOUNT

Customer - Testaccount Networkdashboard (TESTACCOUNT)

Ports

Services

Planned work (WIP)

Port	Chassis	Status	Subscription ID	Description	Customer description	Speed	Patch
0/1/4	ASD001B-JNX-99	NA	1ce6897c	TESTACCOUNT SP LINK_MEMBER ASD001B 10 Gbi	Hello World 123	10GBASE-LR	ASD001B-FAKE-ODF-01/16 (LC/UPC)
> 0/1/1	ASD001B-JNX-99	NA	f512cf62	TESTACCOUNT SP UNTAGGED ASD001B 10 Gbit/s		10GBASE-LR	ASD001B-FAKE-ODF-01/20 (LC/UPC)
> 0/1/0	ASD001B-JNX-99	NA	96aa9b5e	TESTACCOUNT SP UNTAGGED ASD001B 10 Gbit/s	Custom customer description EIGEN ALIAS	10GBASE-LR	ASD001B-FAKE-ODF-01/03 (LC/UPC)
> 0/0/0	ASD001B-JNX-99	NA	6763f0b4	TESTACCOUNT SP TAGGED ASD001B 100 Gbit/s	MINL testen - Loss of Resiliency EDITED [ALWEER]	100GBASE-LR4	ASD001B-FAKE-ODF-01/23 (LC/UPC)
> 0/1/3	ASD001B-JNX-99	NA	060da678	TESTACCOUNT SP LINK_MEMBER ASD001B 10 Gbi	TESTACCOUNThoi	10GBASE-LR	ASD001B-FAKE-ODF-01/07 (LC/UPC)
✓ 0/1/5	UT042A-JNX-02	NA	c32c9ce2	TESTACCOUNT SP TAGGED UT042A 1 Gbit/s	Service port with customer alias	1000BASE-LX	UT042A-ODF-01-S02/01 (SC/SC)
VLAN range	Status	Description	Customer description				
85	NA	TESTACCOUNT L2VPN ASD001B-UT042A 199 Mbit/s	MINL testen - No notification, please show it now!!				
151	NA	TESTACCOUNT L2VPN ASD001B-ASD002A-UT042A 20 Mbit/s	L2VPN cust description				
326	NA	TESTACCOUNT L2VPN ASD001B-ASD002A-UT042A 100 Mbit/s	TESTACCOUNT L2VPN ASD001B-ASD002A-UT042A 100 Mbit/s BLAsas				
55	NA	TESTACCOUNT LP ASD001B-UT042A 44 Mbit/s					
200	NA	TESTACCOUNT LR ASD001B-UT042A UT042A-UT042A 1 Gbit/s	Point-to-point EVPN self service demo				
0/1/2	UT042A-JNX-03	NA	5a5bc880	TESTACCOUNT SP TAGGED UT042A 10 Gbit/s	TESTACCOUNT SP TAGGED 2	10GBASE-LR	FAKE_SN7-ODF_01/06 (SC/PC)
> 0/1/2	UT042A-JNX-01	NA	bff85418	TESTACCOUNT SP TAGGED UT042A 10 Gbit/s	TESTACCOUNT SP UT042A 1 Gbit/s - gebruik	10GBASE-LR	

Customer pages

[illegible]

Customer aliases

Service view

The screenshot displays the 'Service view' in the Workflow Orchestrator. The top navigation bar includes 'Workflow Orchestrator', 'Production', and 'Engine is RUNNING' with 5 alerts. The left sidebar lists navigation options: 'Start', 'Chassis', 'Services' (selected), 'Customers', 'Service Tickets', 'LIR Prefixes', and 'Orchestrator'. The main content area shows a breadcrumb trail: 'Start > Nms > Services > 02e46063-0dff-45bb-873f-dc558394800a'. Below this, the service title is 'OU LP HRL001A-RT025A 250 Mbit/s' with a green lightning bolt icon. A status bar shows 'NA' and 'REAL TIME IN 252,42 Mock REAL TIME OUT 252,42 Mock'. A tabbed interface includes 'Ports' (selected), 'Service configuration', 'General', 'Workflows', 'Related services', and 'Planned Work' (with 8 items). Two service cards are displayed, each with a 'Port 1' tab. The first card is for 'SP 1G untagged (rt025a-jnx-01)' with MAC 'bb61c1f0'. The second card is for 'SP 1G untagged (hrl001a-jnx-01)' with MAC '1aabf3b0'. Both cards show identical metadata: Owner 'OU', Mode 'untagged', and Vlan Id '0'. The 'Port 1' details for both are: Status 'NA', Node 'rt025a-jnx-01' and 'hrl001a-jnx-01' respectively, and Interface, Physical port, Connector, Fiber type, and Patch are all '-'. Blue arrows from external text point to the 'REAL TIME IN/OUT' status and the 'Physical port' field.

Workflow Orchestrator | Production | Engine is RUNNING 5

+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start > Nms > Services > 02e46063-0dff-45bb-873f-dc558394800a

OU LP HRL001A-RT025A 250 Mbit/s ⚡

NA REAL TIME IN 252,42 Mock REAL TIME OUT 252,42 Mock

Ports Service configuration General Workflows Related services Planned Work 8

SP 1G untagged (rt025a-jnx-01)

NA bb61c1f0

Owner OU

Mode untagged

Vlan Id 0

Port 1

Status NA

Node rt025a-jnx-01

Interface -

Physical port -

Connector -

Fiber type -

Patch -

SP 1G untagged (hrl001a-jnx-01)

NA 1aabf3b0

Owner OU

Mode untagged

Vlan Id 0

Port 1

Status NA

Node hrl001a-jnx-01

Interface -

Physical port -

Connector -

Fiber type -

Patch -

Operational port/service status directly from device

Physical port details from CMDB

Service view

Workflow Orchestrator | Production | Engine is RUNNING 5

Start | Nms | Services | 02e46063-0dff-45bb-873f-dc558394800a

OU LP HRL001A-RT025A 250 Mbit/s

NA REAL TIME IN 252,42 Mock REAL TIME OUT 252,42 Mock

Ports | Service configuration | General | Workflows | Related services | Planned Work 8

SP 1G untagged (rt025a-jnx-01)

NA bb61c1f0

Owner	OU
Mode	untagged
Vlan Id	0

Port 1

Status	NA
Node	rt025a-jnx-01
Interface	-
Physical port	-
Connector	-
Fiber type	-
Patch	-

Operational port/service status directly from device

Physical port details from CMDB

Workflow Orchestrator | Production | Engine is RUNNING 5

Start | Nms | Services | 02e46063-0dff-45bb-873f-dc558394800a

OU LP HRL001A-RT025A 250 Mbit/s

NA REAL TIME IN 252,42 Mock REAL TIME OUT 252,42 Mock

Ports | Service configuration | General | Workflows | Related services | **Planned Work 8**


Actual Planned Work or Incidents

Planned work - SNNP-100297 Fiber work Eurofiber in Amsterdam between asd041a (LSOP) and asd070a (Media College)	Impact: reduced_redundancy	Start Time: 06/06/2025, 00:00:00 End Time: 06/06/2025, 06:00:00
Planned work - SNNP-100300 Fiber work Eurofiber in Eindhoven between ehv001b (TUE Windtunnel) and ehv012a (LSOP)	Impact: reduced_redundancy	Start Time: 06/06/2025, 00:00:00 End Time: 06/06/2025, 05:00:00
Planned work - SNNP-100179 Fiber work between CRL001A (CHAROLLES) and BLV001A (BELLEVILLE) (ZAYO).	Impact: reduced_redundancy	Start Time: 06/06/2025, 04:00:00 End Time: 07/06/2025, 06:00:00
Planned work - SNNP-100371 Day 2: fix damping issues between Dgl001a / Zwt001a / Gn012a	Impact: reduced_redundancy	Start Time: 05/06/2025, 09:00:00 End Time: 05/06/2025, 17:00:00

Upcoming 7 days

Planned work - SNNP-98897 INSTALL - EHV010A - Eindhoven - Preventive replacement of sweating Solid-Optics.	Impact: reduced_redundancy	Start Time: 12/06/2025, 19:00:00 End Time: 12/06/2025, 21:00:00
Planned work - SNNP-100563	Impact: reduced_redundancy	Start Time: 13/06/2025, 06:30:00 End Time: 13/06/2025, 08:30:00
Planned work - SNNP-100165	Impact: reduced_redundancy	Start Time: 13/06/2025, 09:00:00 End Time: 13/06/2025, 17:00:00

Work in progress

Workflow Orchestrator

SURF: Development

Engine is RUNNING58520

+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Nms / Chassis / Amr001a-jnx-01-vtb

Chassis – amr001a-jnx-01-vtb

Actions

Ports (24)GeneralServices (20)Customers (7)Alarms (5)

Severity	Acknowledged	Open since	Problem description	Note
	⊖	04/05/2023, 01:33:20	Link down - interface xe-1/0/1 bla bla bla	...
🔔	⊖	04/07/2023, 03:33:20	Link down - interface xe-1/0/2 bla bla bla	...
🔔	⊖	11/06/2024, 01:00:00	Link down - interface xe-1/0/3 bla bla bla	...
	⊖	11/06/2024, 01:00:00	Link down - interface xe-1/0/4 bla bla bla	...
		11/06/2024, 01:00:00	Link down - interface xe-1/0/5 bla bla bla	...
		11/06/2024, 01:00:00	Link down - interface xe-1/0/6 bla bla bla	...
🔔	✅	11/06/2024, 01:00:00	Link down - interface xe-1/2/0 bla bla bla	Auto acknowledged by planned work SNNP-58926
🔔	✅	11/06/2024, 03:46:40	Link down - interface xe-1/2/1 bla bla bla	Auto acknowledged by planned work SNNP-58926
🔔	✅	11/07/2024, 04:46:40	Link down - interface xe-1/2/2 bla bla bla	Auto acknowledged by planned work SNNP-58926
	✅	03/02/2025, 22:33:20	Link down - interface xe-1/2/8 bla bla bla	Waiting for customer - see Jira SNTT-83300

Severity: Disaster

Acknowledged: Yes

Work in progress

Workflow Orchestrator

SURF: Development

Engine is RUNNING 58520

☾ ☰

+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Nms / Chassis / Amr001a-jnx-01-vtb

Chassis – amr001a-jnx-01-vtb

Actions

Ports (24) General Services (20) Customers (7) Alarms (5)

Severity	Acknowledged	Open since	Problem description	Note
	✖	04/05/20		
🔔	✖	04/07/20		
🔔	✖	11/06/20		
	✖	11/06/20		
	✖	11/06/20		
🔔	✔	11/06/20		
🔔	✔	11/06/20		
🔔	✔	11/07/20		
	✔	03/02/20		

Severity: Disaster
Acknowledged: Yes

+ New subscription

Start

Chassis

Services

Customers

Service Tickets

LIR Prefixes

Orchestrator

Start / Nms / Chassis / Amr001a-jnx-01-vtb

Chassis – amr001a-jnx-01-vtb

Actions

Ports (24) General Services (20) Customers (7) Alarms (5)

Port	Alarm	Status	Subscription ID	Description	Speed	Patch	Export
>	1/0/0	UP UP	284c704e	DESIGNACADEMY SP TAGGED AMR001A 10 Gbit/s	10GBASE-LR	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/31 ()	...
>	1/0/1	UP UP	1a497ac5	Link member: Corelink amr001a-jnx-01-vtb_ae22--ar	10G	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/07 ()	...
>	1/0/2	🔔 UP UP	1a497ac5	Link member: Corelink amr001a-jnx-01-vtb_ae22--ar	10G	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/07 ()	🔧 Acknowledge alarm ...
>	1/0/3	🔔 UP UP	a95c8e38	AMPATH SP TAGGED AMR001A 10 Gbit/s	10GBASE-LR	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/32 ()	...
>	1/0/4	UP UP	b055e7e8	AMPATH SP LINK_MEMBER AMR001A 10 Gbit/s	10GBASE-SR	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/24 ()	...
>	1/0/5	UP UP	aaa75426	AMPATH SP TAGGED AMR001A 10 Gbit/s	10GBASE-LR	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/59 ()	...
>	1/0/6	UP UP	003f6739	DANTE SP UNTAGGED AMR001A 10 Gbit/s	10GBASE-SR	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/20 ()	...
>	1/0/7	UP UP	83f20b6e	AMPATH SP LINK_MEMBER AMR001A 10 Gbit/s	10GBASE-LR	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/56 ()	...
>	1/0/8	UP UP	15013e64	AMPATH SP LINK_MEMBER AMR001A 10 Gbit/s	10GBASE-LR	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/30 ()	...
>	1/0/9	UP UP	ff32887e	AMPATH SP LINK_MEMBER AMR001A 10 Gbit/s	10GBASE-LR	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/38 ()	...
>	1/2/0	🔔 UP UP	18ee6b77	ASTRON SPNL TAGGED AMR001A 10 Gbit/s	10GBASE-LR	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/08 ()	...
>	1/2/1	🔔 UP UP	603f72f3	AMPATH SP LINK_MEMBER AMR001A 10 Gbit/s	10GBASE-SR	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/27 ()	...
>	1/2/2	🔔 UP UP	ad8480c4	Link member: Corelink for SURFnetnetwork	10G	DDFODF_AMR001A-JNX-01-VTB_02C4CCC6/21 ()	...

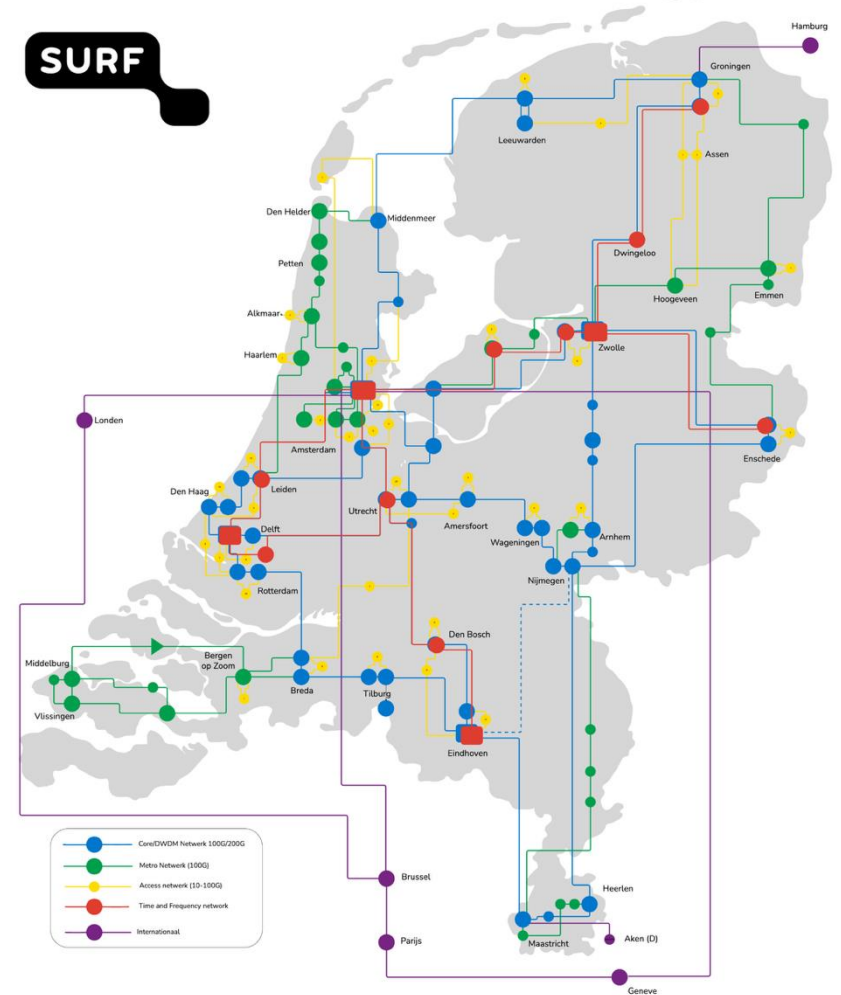
SURF

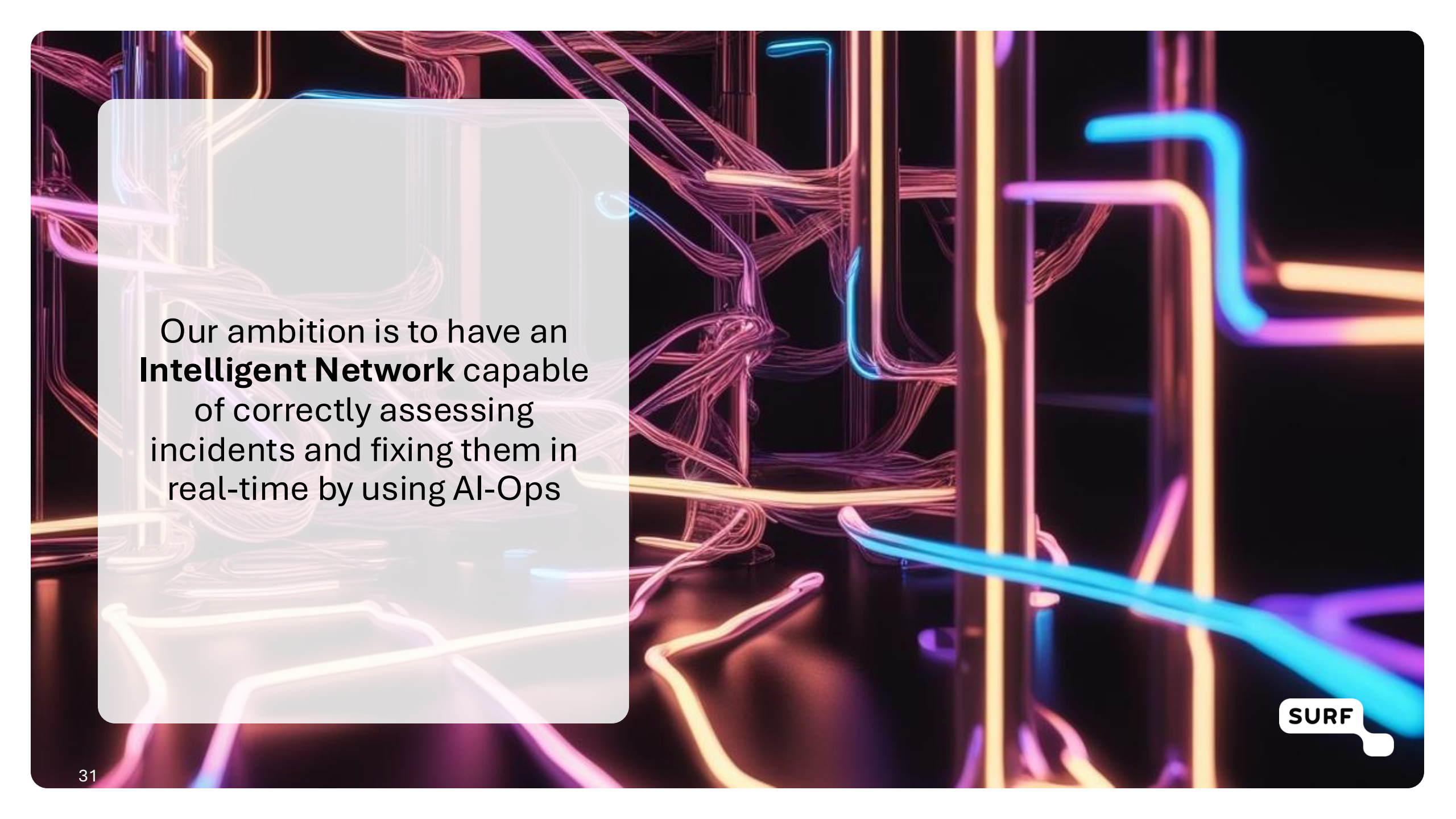
| New ideas for NMS UI

- Notify function to inform customer on a port down event
 - Checks for planned work
 - Get customer contacts
 - Create Jira ticket
 - Generate standard email
 - Acknowledge alarm in Zabbix with Jira link in note
- Alarm suppression during planned maintenance
 - Impact object form planned work use as filter in Zabbix to suppress alarm
- Operations on pluggable DCOs in service layer
 - Monitoring wavelength and power levels

AI-Ops, our version of an Intelligent network

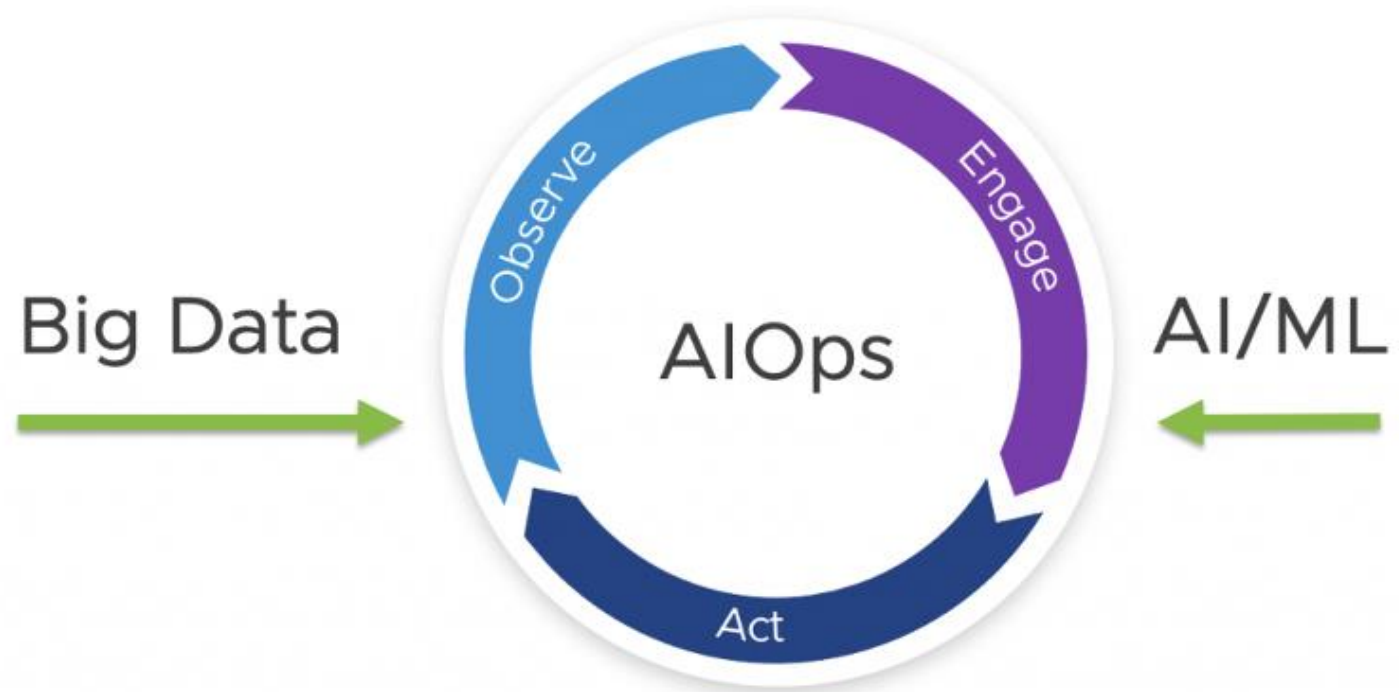
- Our network is evolving
- Multi-vendor/Multi-OS
- Diversity of services is increasing
 - Campus offering
 - TFT network
- Higher level of integration
- **We need help!**





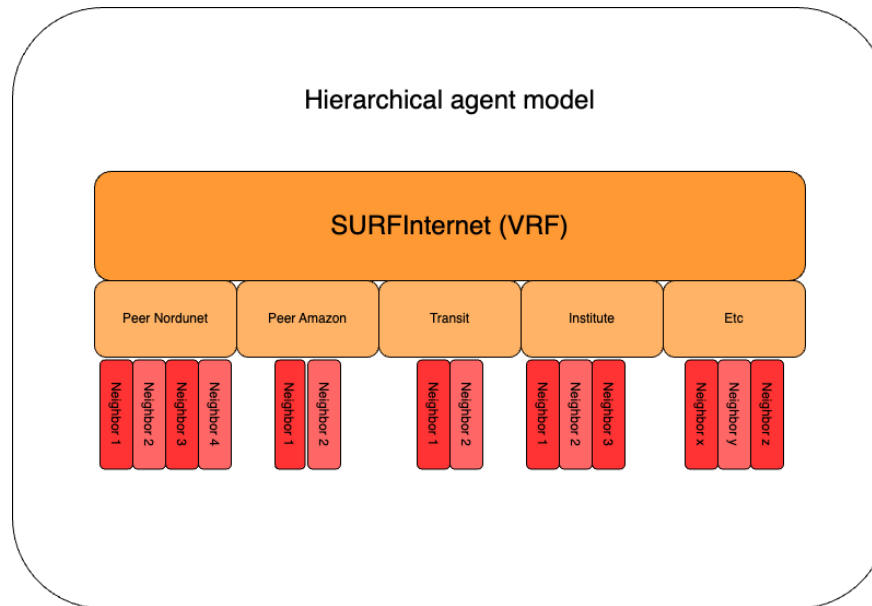
Our ambition is to have an
Intelligent Network capable
of correctly assessing
incidents and fixing them in
real-time by using AI-Ops

| What is AI-Ops?



Implementing AI-Ops - Approach

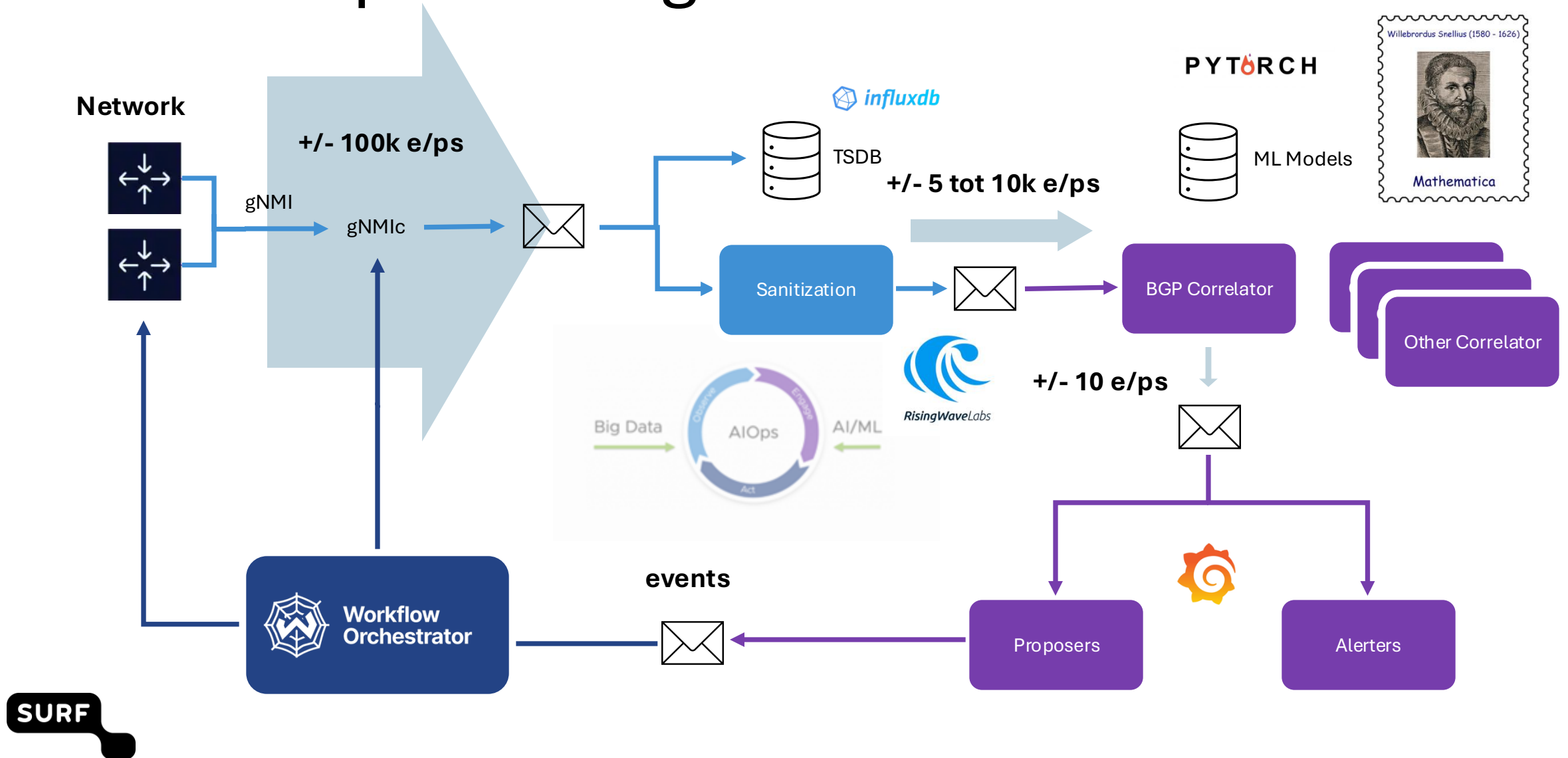
- Data engineering
 - Managing a large volume of telemetry
- Use case modelling
 - BGP neighbour



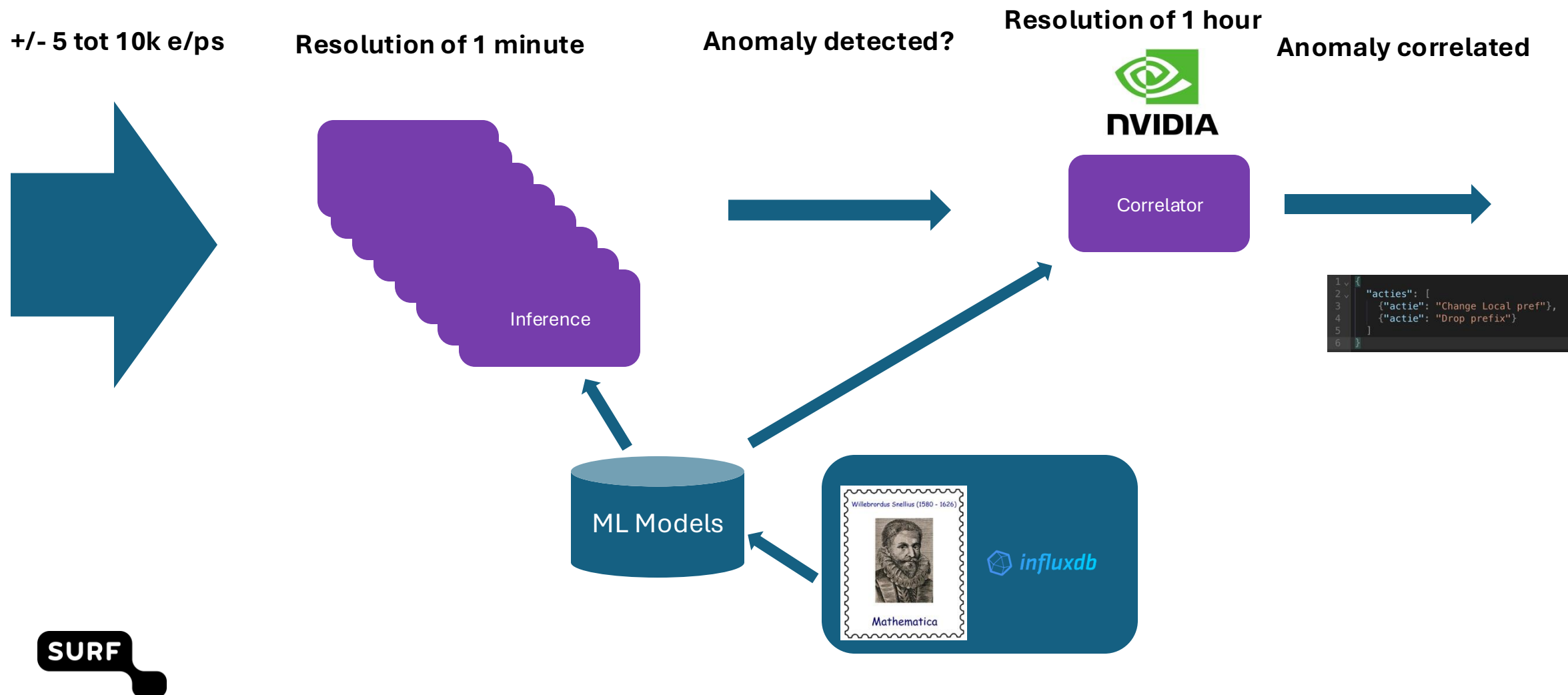
SURF



Real-time processing and correlation



| Correlator Pipeline - anomaly detection

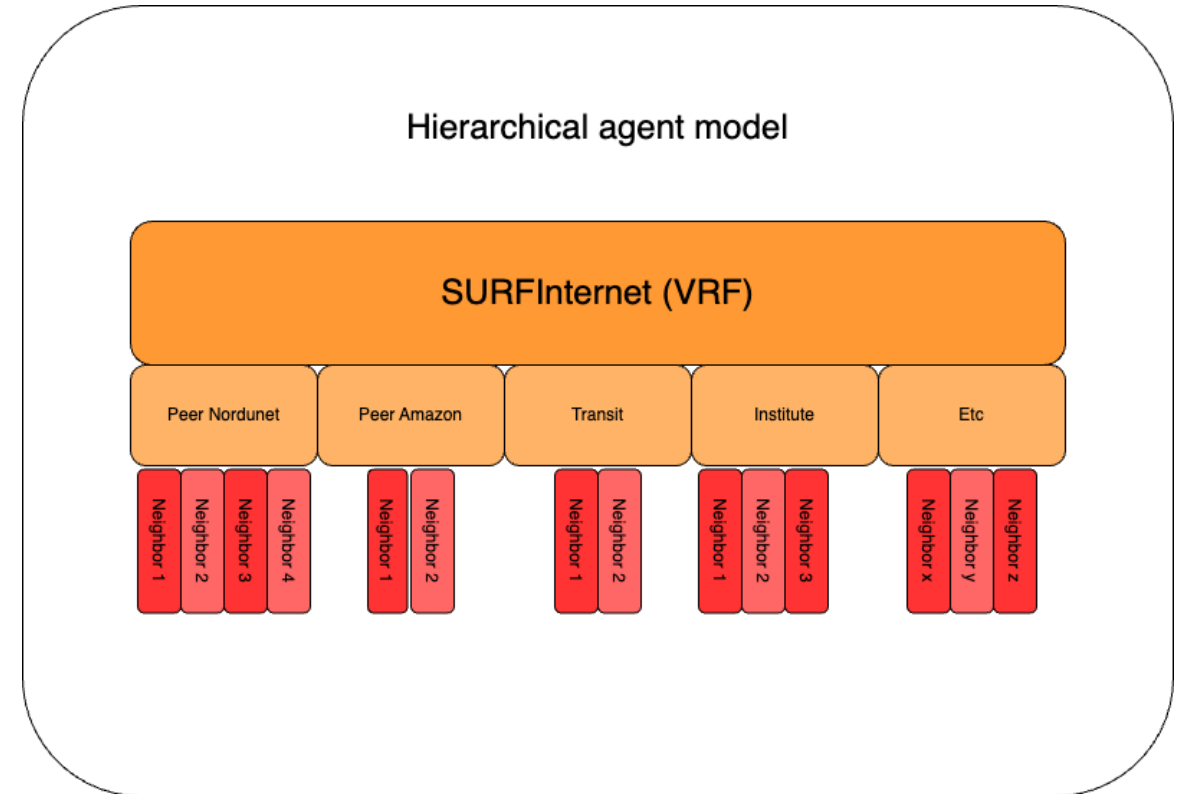


Can we detect this usecase?



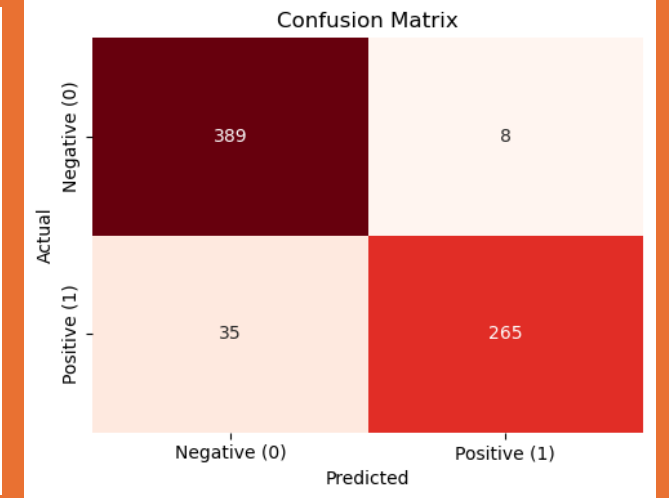
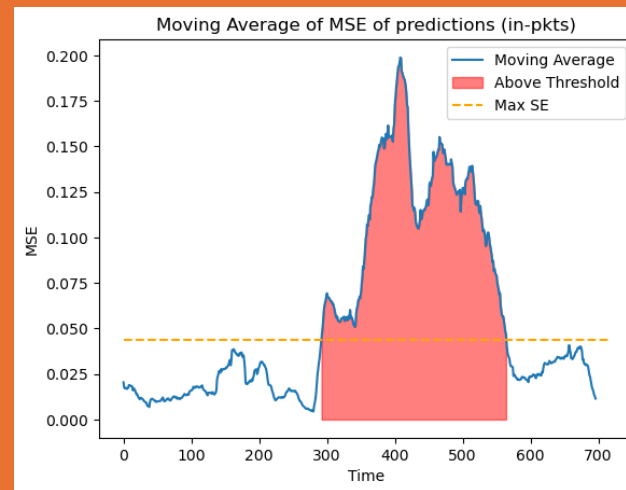
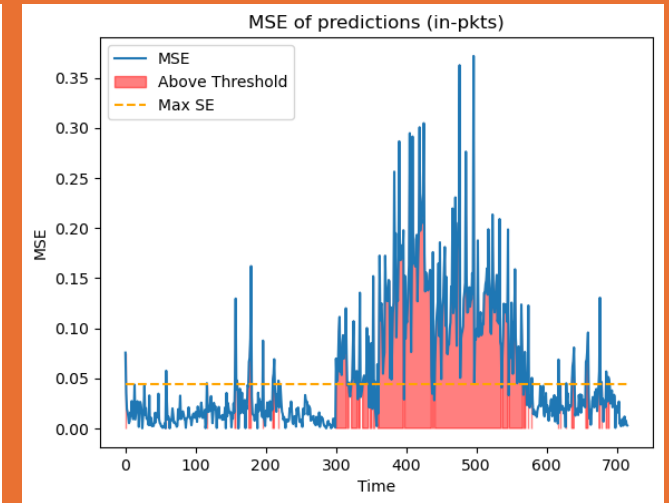
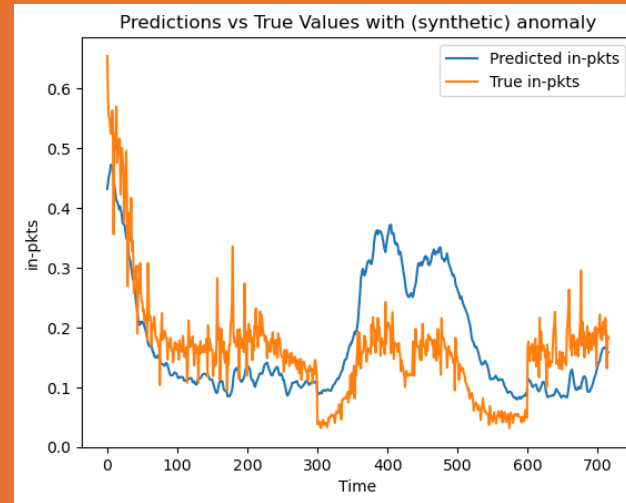
Building a model – Adopting MLOps

- Highly scalable
 - Easy to train
 - Easy to run
- What is the best type of model?
 - LSTM vs Transformers
- Adopting MLOps
 - From model training to application deployment



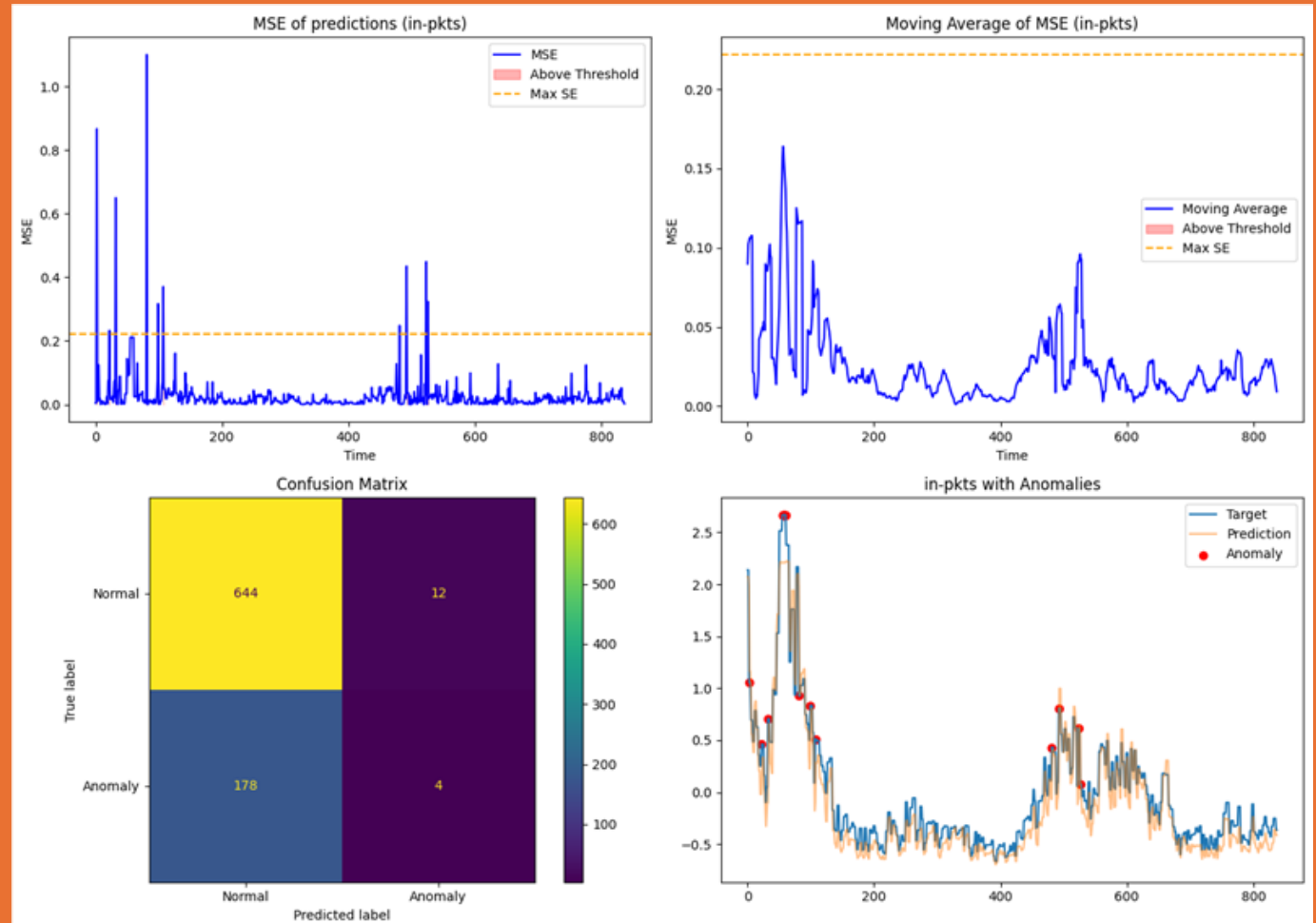
LSTM

- Long Short-Term Memory
- Often used in anomaly detection
- *Example:*
 - “The **cat** sat on the _____”
 - Reads one word at a time and predicts “**mat**” based on context
- Neural network well suited for timeseries prediction
- Trained with context about time of day and day of the week



Transformers

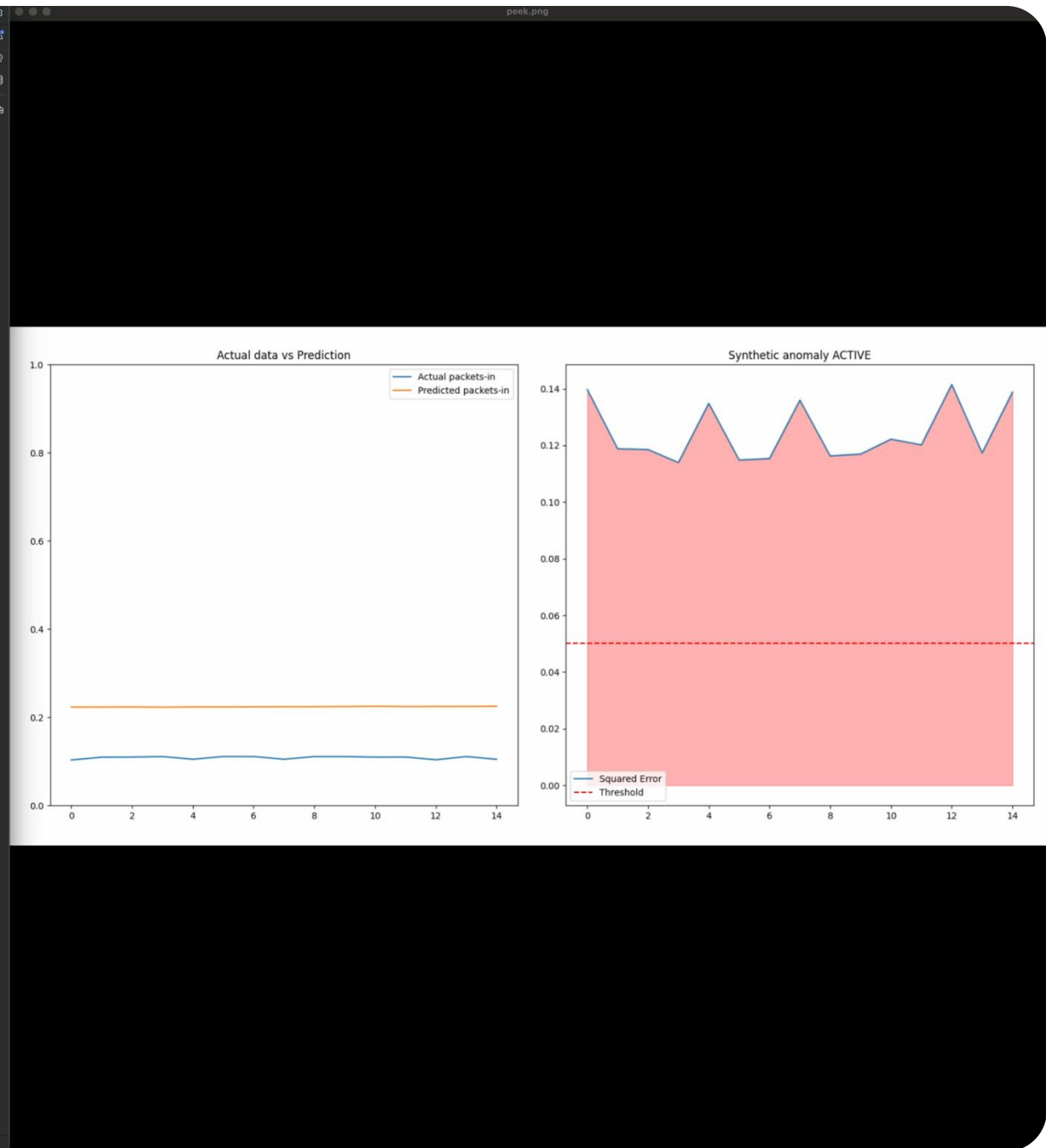
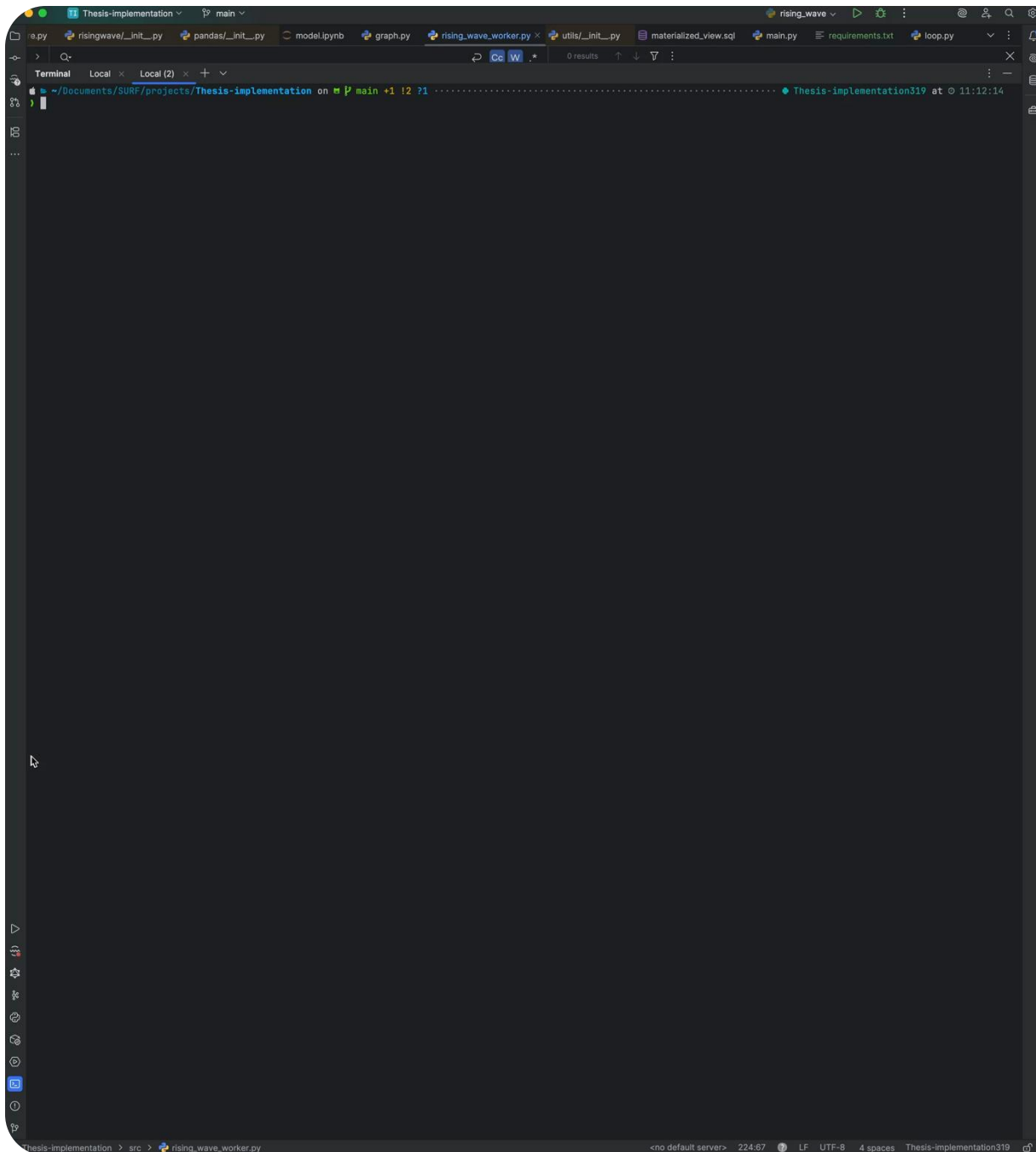
- Reads an **entire** sequence at once and remembers key information
- *Example:*
 - “**The cat** sat on the mat, because **it** was tired.”
 - Knows that “**it**” refers to “**the cat**”
- Faster than LSTM and scales better with large amount of data
- Basis for Chat-GPT and other LLM’s
- **Not as easy to adapt to timeseries data**



| Demo of the LSTM model

- **Real time analysis of a raw data stream**
 - Monitoring a single BGP neighbour
 - Filling of prediction buffer – sliding window
 - Predicting 15 seconds ahead
 - Detecting an induced anomaly when Mean Squared Error is > 99 th percentile
- Shout out: Victor Vlugt and Ducan Kampert





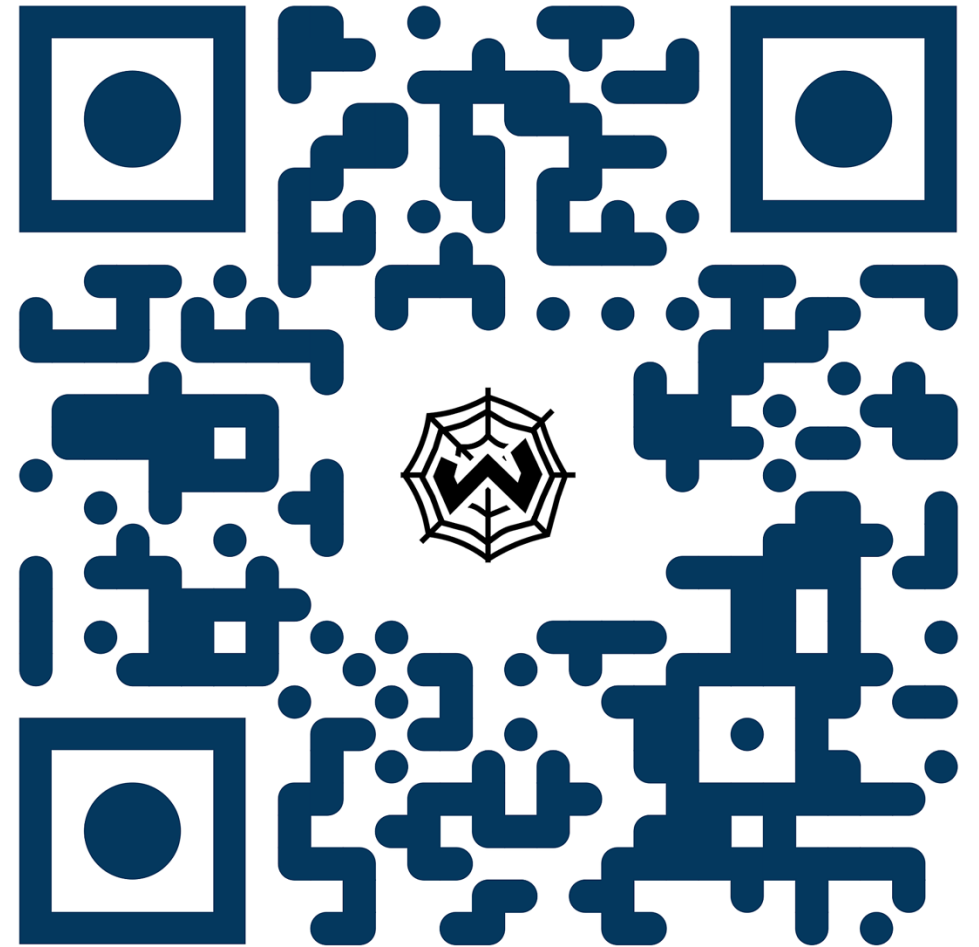
| Next Steps

- Deploy to production and start monitoring our BGP neighbors
- Rinse and repeat for different use cases and incorporate in the model
- Create an agent that can react to network anomalies and correlate the events accross the network
- Integrate with the Workflow Orchestrator and the incubator project in GN5-2 WP6



| Any Questions??

- Scan QR code for Workflow Orchestrator resources





Thank you for your attention!

 Wouter Huisman & Peter Boers

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 Peter.Boers@surf.nl

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