

Campus Network as a Service

Initial production at SUNET

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CNaaS - Campus Network as a Service

By extending the NREN core network to the institutions on both equipment monitoring and change management

Our goal with CNaaS

“Share staff and expertise for campus network and security operations by standardizing network architecture, tools and processes.”

This means more automation with easier replacement of equipment without having to have senior network engineer always on-site.

Initial production at MDH.SE with new contracts signed with others.

Open transparent project on Github, please collaborate on thoughts to improve



General competency challenges

- ❑ Aging staff
- ❑ Retention
- ❑ Schooling
- ❑ Few with exposure to complex networking
- ❑ Not filling the ranks

No one gets fired!

This initiative is thought to help people grow!

Smaller colleges/unis have trouble retaining staff and giving them exposure to enterprise grade equipment.

Being alone puts stress on “planning” sickdays, vacation and conferences like this



Technological shifts

Two major shifts are happening right now, in both past and present context that I acknowledge that it's not new but its gaining momentum for real.

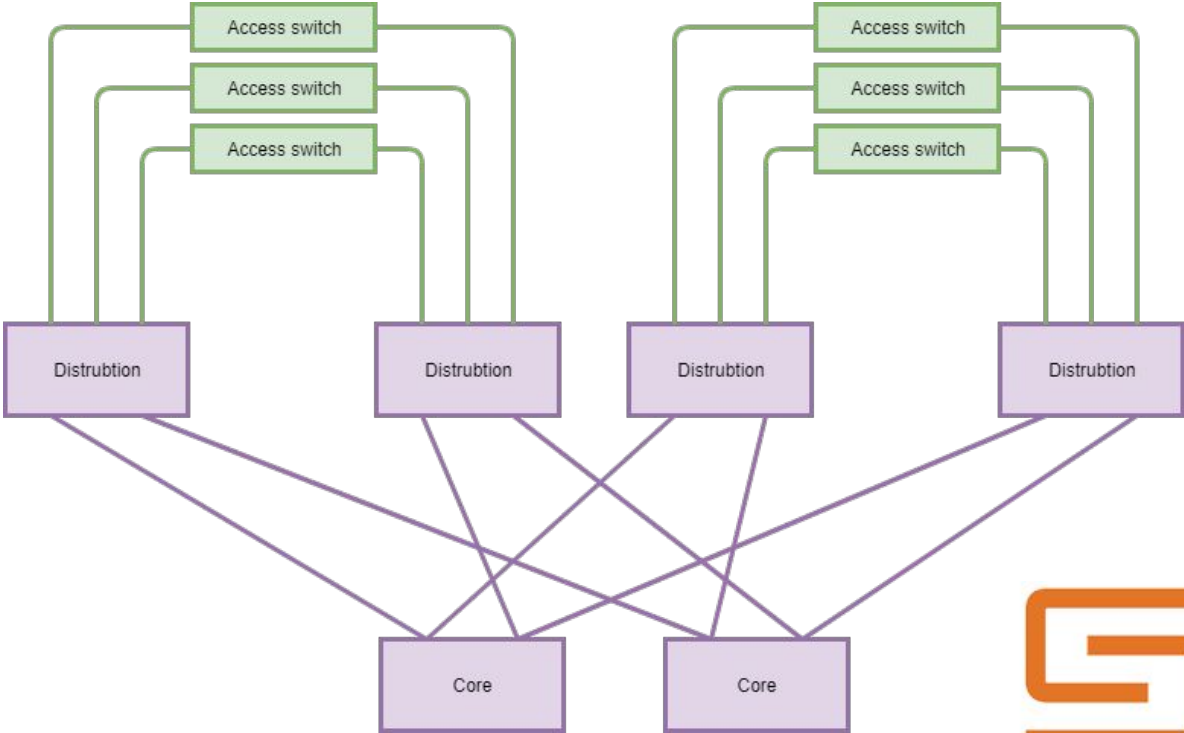
1. Software defined %whatever% even reality nowadays... infrastructure routers, load balancers, firewalls, proxies, networks, interfaces
2. Less local compute, more cloud service and remote access



Reference Network Architecture SUNET CNaas

Utilizing best practise leaf-spine architecture

Redundant except access ports



Partnership on this new service



Together we will share experiences, scripts, configurations and tools.

Active dialogue to improve the service to fit other NRENs needs. Collaborative development to share costs on wider deployment.

Making NAV, Argus and CNaaS NMS work for a NOC and local campuses it could be a reference and example for other European Universities and NRENs.



Business advantages for local Campuses

- ★ Standardised processes tested and improved for multiple Campuses
- ★ Higher security and repeatable quality
- ★ Clear overview of cost and lowering TCO over time with shared procurement and support
- ★ Does not lock local staff and resources, development and integrations is done in parallel



Technological advantages with CNaaS

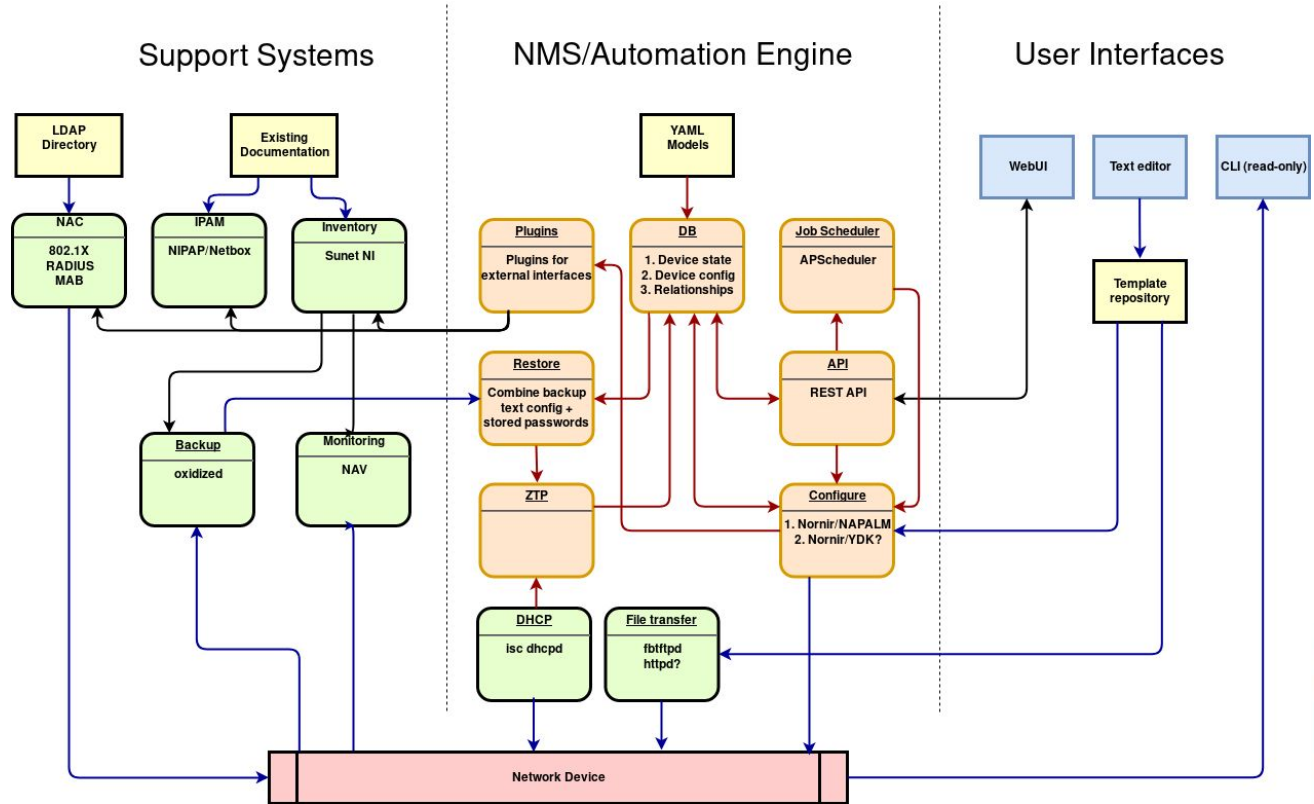
- ❑ Existing NOC monitors and can create tickets 24/7. No need for local staff on call if case handled without hardware replacement
- ❑ Continuity of competence, long term commitment between organisations
- ❑ Spare depot without delays and troublesome change/support requests. Keeping track of warranty.
- ❑ Procurement done in bulk and supplychain centralised. Saves time/money
- ❑ Proactive maintenance and change of equipment even in smaller sites
- ❑ Independent of manufacturer and on the clients side, all resources and work are done for and together with participating Campuses. Every improvement is shared with all

CNaaS - Overview

CNaaS-NMS is open source and everything including source code, documentation etc is available to the public on Github

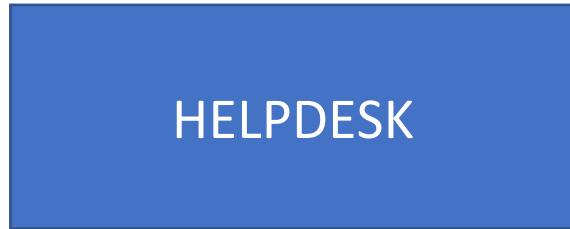
CNaaS-NMS is a hybrid infrastructure-as-code (IaC) and API driven automation system

The components of CNaaS-NMS are executed in separate Docker containers



SUNET

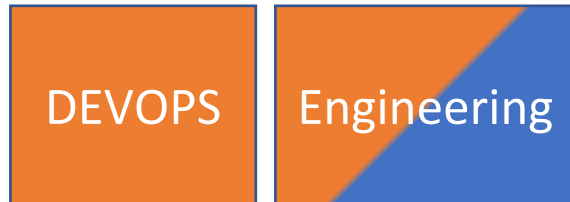
Service delivery - collaborative service



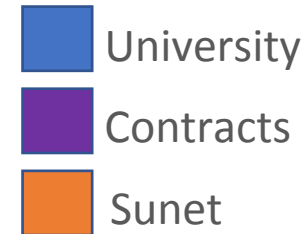
1st Line
End user support
Simple mgmt



2nd Line
Monitoring
Documentation
Incident/Problem Mgmt
Configuration Mgmt
Escalation/(Vendor mgt)



3rd Line
Design
Development
Configuration Mgmt
Escalation/(Vendor mgt)



Service delivery options and add-ons

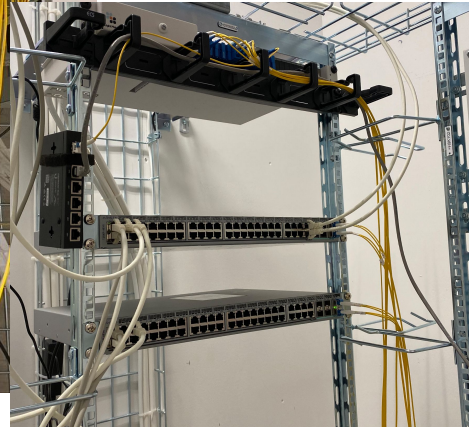
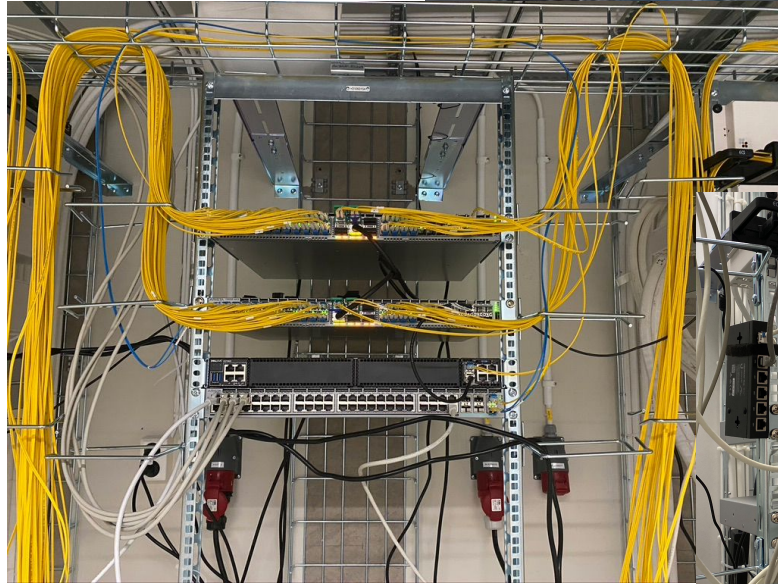
1. Procurement and support
2. Wired & Wireless network configuration updates and management
3. Service extensions for infrastructure, NOC monitoring
4. Consulting and development

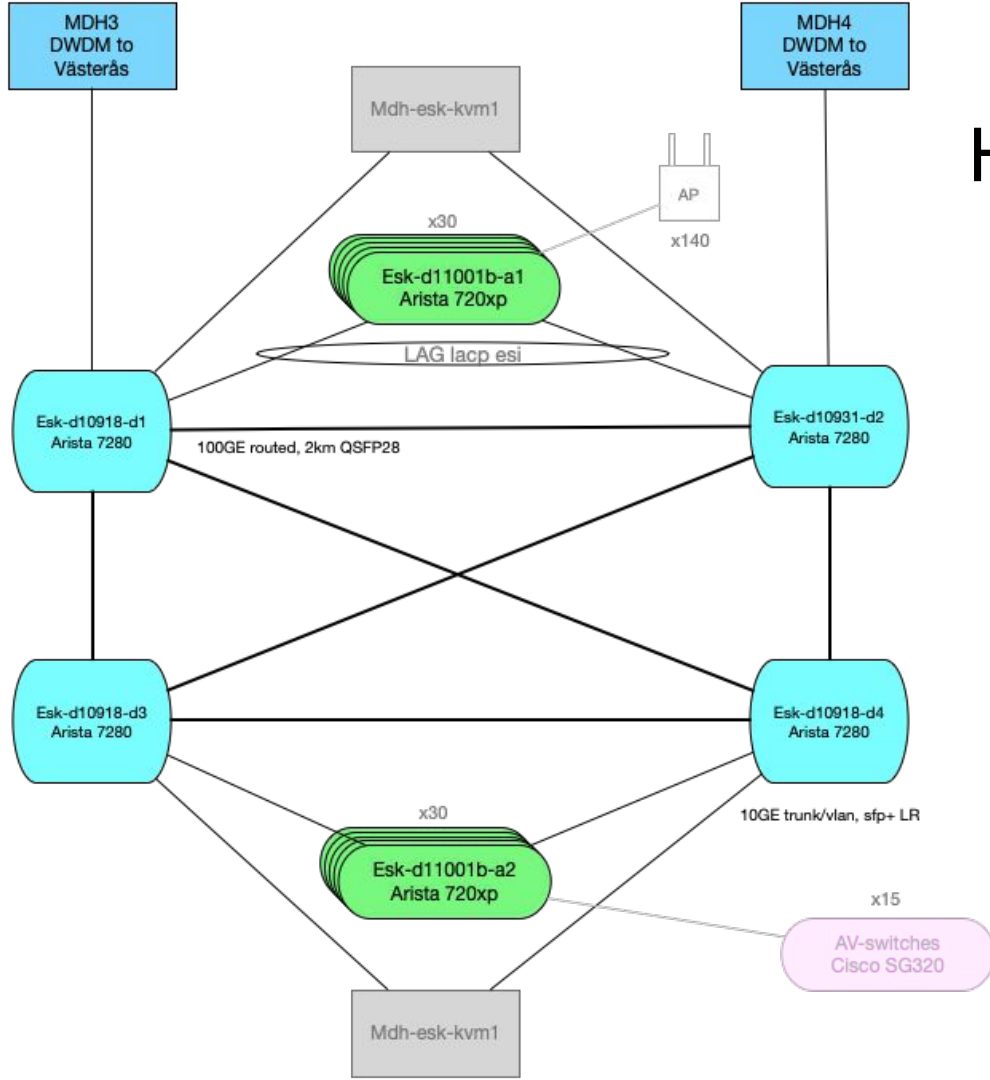
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Local staff handles all physical and end user issues.



Local project together with MDH

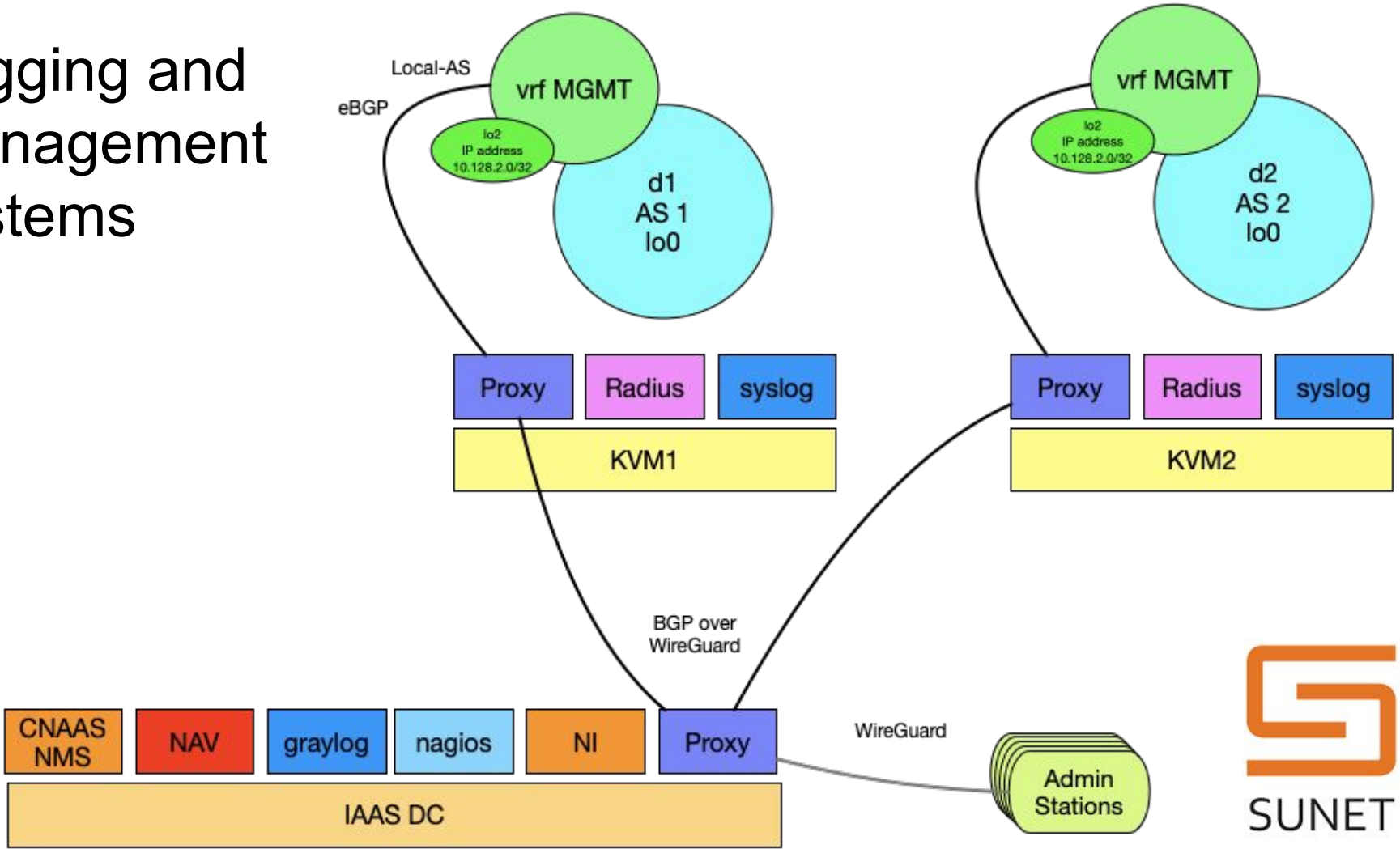




Hardware design

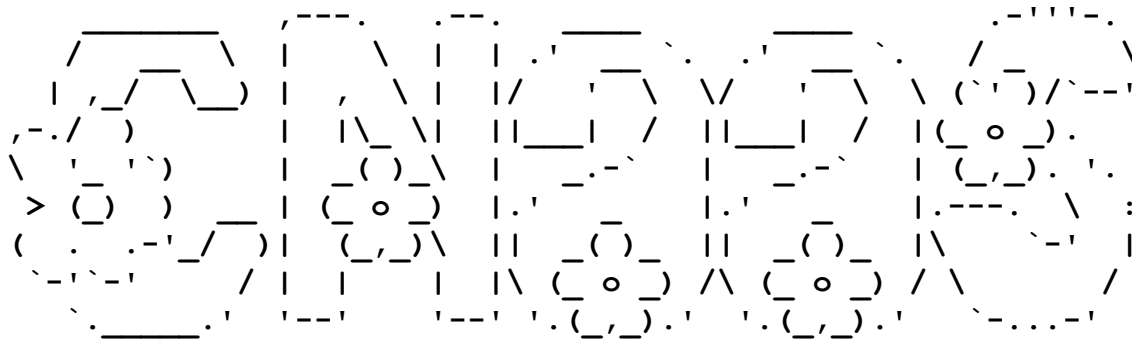
- 4st Arista 7280
- ~60st Arista 720XP poe switchcar
- ~140st Arista AP C130
- 100GE core
- 2 x 10GE to each Access switch.

Logging and management systems



Cnaas API calls via CLI

```
: 18:46 root@mdh-nms: ~ # ./cli.sh
```



CNaaS - Command Line Interface

(C) SUNET (<http://www.sunet.se>), 2020

'Type "help" for help.

CNaaS NMS (mdh-nms) #



Device diffs

Device(s): esk-d10918-d1

Failed: False

Diff:

```
    name cnaas3
!
vlan 101
+!
+vlan 224
+  name uninett
!
vlan 1250
    name staff1
interface Vlan101
    vrf MGMT
    ip address virtual 10.128.4.1/24
+!
+interface Vlan224
+  description uninett
+  vrf STAFF
+  ip helper-address 130.243.76.79
+  ip helper-address 130.243.94.198
+  ip helper-address 130.243.94.199
+  ip address virtual 129.242.1.1/24
!
```

```
interface Vlan1250
    description staff1
    vxlan vlan 98 vni 10098
    vxlan vlan 99 vni 10099
    vxlan vlan 101 vni 2000101
+  vxlan vlan 224 vni 100224
    vxlan vlan 1250 vni 101250
    vxlan vlan 1251 vni 101251
    vxlan vlan 1252 vni 101252
        route-target both 1:1901
        redistribute learned
!
+  vlan 224
+    rd 10.128.0.0:224
+    route-target both 1:224
+    redistribute learned
+  !
vlan 3055
    rd 10.128.0.0:3055
    route-target both 1:3055
```



NI Network inventory



BROWSE TYPES

- Cables
- Nordunet Cables
- ODFs
- Outlets
- Patch Panels
- Ports
- Racks
- Rooms
- Sites
- Switches

REPORTS

- Host reports
- Unique IDs

MAPS

Site map

Search

ODF D10918S2M04

Located in **Esk D10918 D10918S2**

Edit

Connections

Port	Description	Cable	End site	End location	End equipment	End port	Description
1+2	None	MDH-10010	Esk	D10918S3	esk-d10918-d1	Et6	None
		B3W007_1	Esk	D11038S2	D11038S2M04	1+2	None
3+4	None	MDH-10074	Esk	D10918S3	esk-d10918-d3	Et6	None
		B3W007_3	Esk	D11038S2	D11038S2M04	3+4	None
5+6	None	B3W007_5	Esk	D11038S2	D11038S2M04	5+6	None

Modified: D

Created: D



Patch Panel D11204S1M40

Located in [Esk D11204 D11204S1](#)

NI Outlets

Name: D11204S1M40
Modified: Jan. 23, 2020, 6:45 p.m. by [bergroth](#)

Operational State: In service
Created: Jan. 23, 2020, 6:19 p.m. by [bergroth](#)

Description: skdf

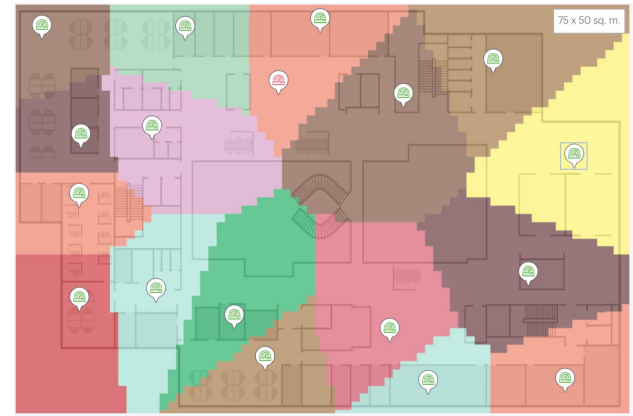
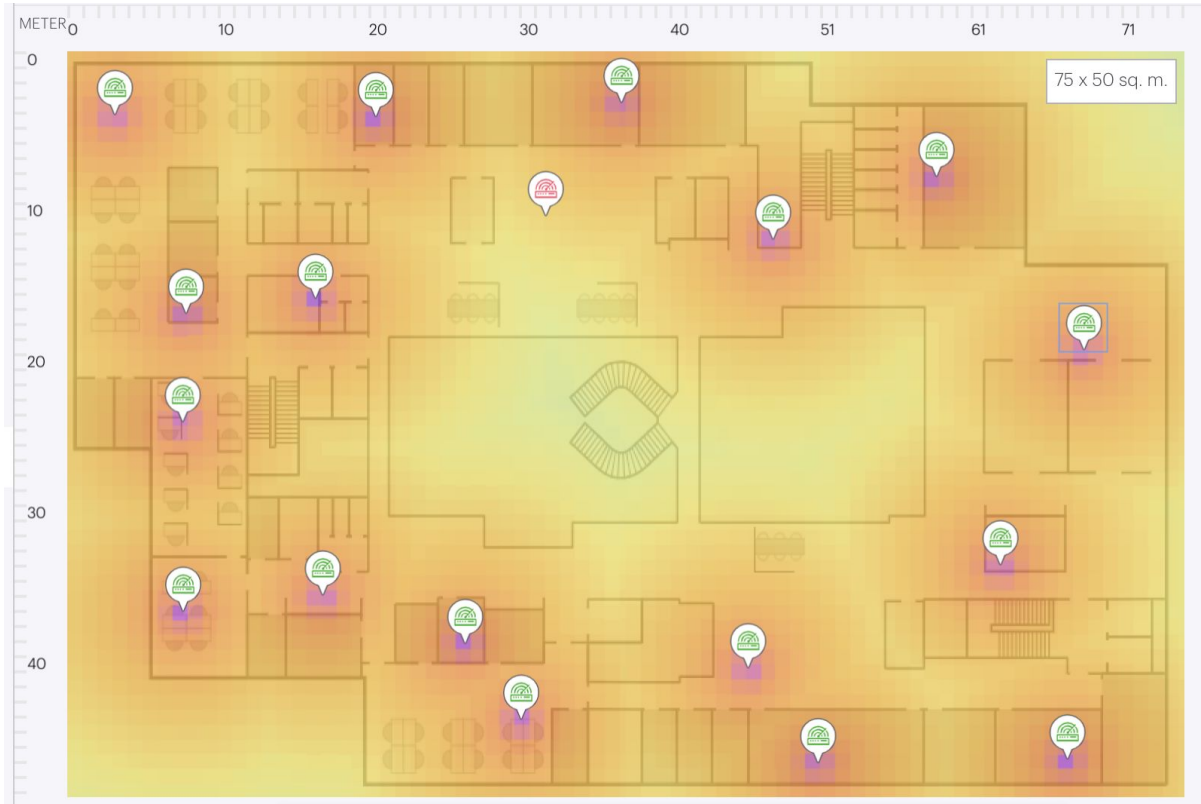
[Edit](#)

Connections

Port	Description	Cable	End site	End location	End equipment	End port	Description
01	None	CAT6A_STP_1	Esk	A3-007	D11204S1M40:01	1	Ovan undertak, A12.07
02	None	CAT6A_STP_2	Esk	A3-007	D11204S1M40:02	1	Ovan undertak, A12.07
03	None	CAT6A_STP_3	Esk	A3-007	D11204S1M40:03	1	I golvbrunn, A12.07
04	None	CAT6A_STP_4	Esk	A3-007	D11204S1M40:04	1	I golvbrunn, A12.07
05	None	CAT6A_STP_5	Esk	A3-007	D11204S1M40:05	1	I golvbrunn, A12.07
06	None	CAT6A_STP_6	Esk	A3-007	D11204S1M40:06	1	I golvbrunn, A12.07
07	None	CAT6A STP 7	Esk	A3-007	D11204S1M40:07	1	I aolvbrunn, A12.07



WiFi connections



Lab setup at Sunet office Stockholm

2x 7050 100GE CORE

2x 7050 25GE DIST

2x 7280 10GE DIST

2x 720XP poe 1GE

2x 720XP poe 2.5GE

4x C130 internal antennas AP

4x C130 external antennas AP

4x C250 AX AP (60W poe)

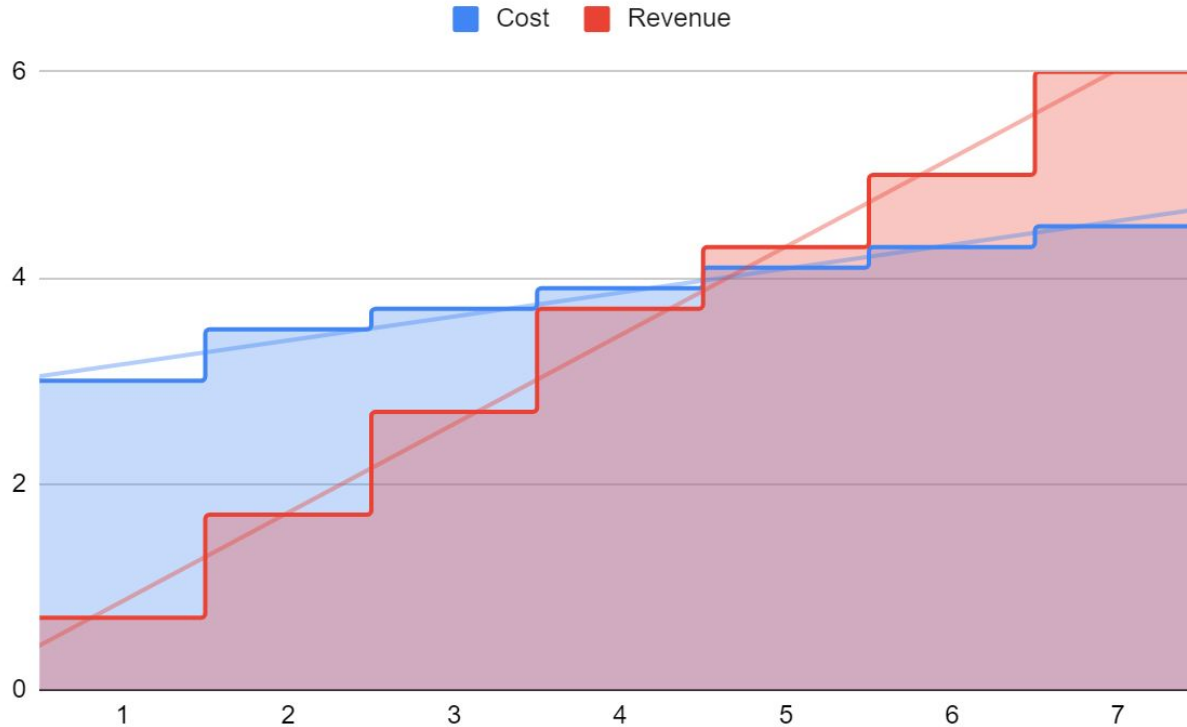


Hardware volumes, procurement and differences

Price and Discounted

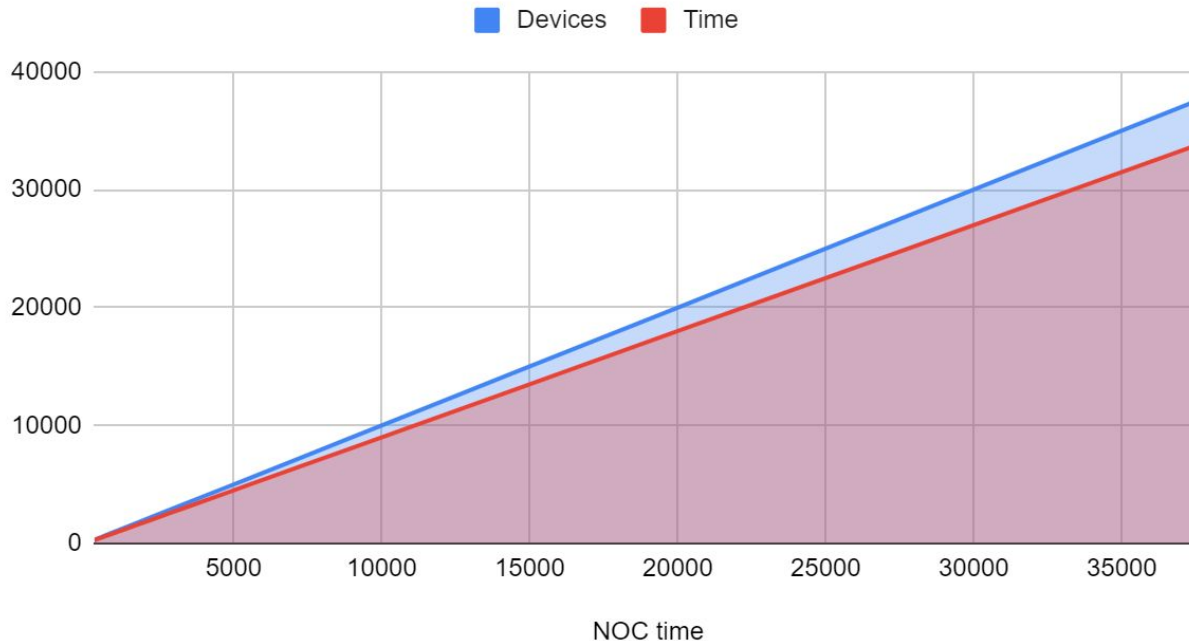


Adding customers will lower prices for CNaaS



Adding devices is assumed pretty linear, not exponential in complexity

NOC scalability



Timeline

2019

- ❑ September - Finalise procurement
- ❑ Oct-Dec - Order and test equipment in lab together with local staff
- ❑ Nov - Test automated deployment at SUNET-office
- ❑ Dec-Jan - Initial deployment of new core infrastructure

2020

- ❑ Feb-Apr - Final testing and changes, monitoring
- ❑ Sep - Delivery report for actual service in production
- ❑ Oct-Dec NMS install project on new contracted campus



Important experiences to validate

Aggregated log and alert views

Inter-organisation escalation of support requests

Actual needed functionality; guesstimates from engineering meets the real world

Firmware upgrading over time

Local changes and central configuration



Components and ongoing development

- ❑ CNaaS NMS with ZTP
- ❑ CNaaS Monitoring NAV/NAGIOS integration
- ❑ CNaaS NAC API
- ❑ CNaaS Web interface
- ❑ CNaaS IPAM
- ❑ CNaaS Backup
- ❑ CNaaS Inventory
- ❑ CNaaS Security
- ❑ Change impact score

References and demos

- <https://wiki.sunet.se/display/CNaaS>
- <https://cnaas-nms.readthedocs.io>
- <https://github.com/SUNET/cnaas-nms>
- <https://wiki.sunet.se/display/CNaaS/Modules>
- <https://github.com/sunet/cnaas-nac>

NMS change demo:

https://play.sunet.se/media/CNaaS+NMS+change+workflow%2C+VScode+%2B+WebUI/0_4a34tciw

NMS ZTP demo:

https://play.sunet.se/media/CNaaS+NMS+WebUI+ZTP+demo/0_ff0l8enk



Questions

