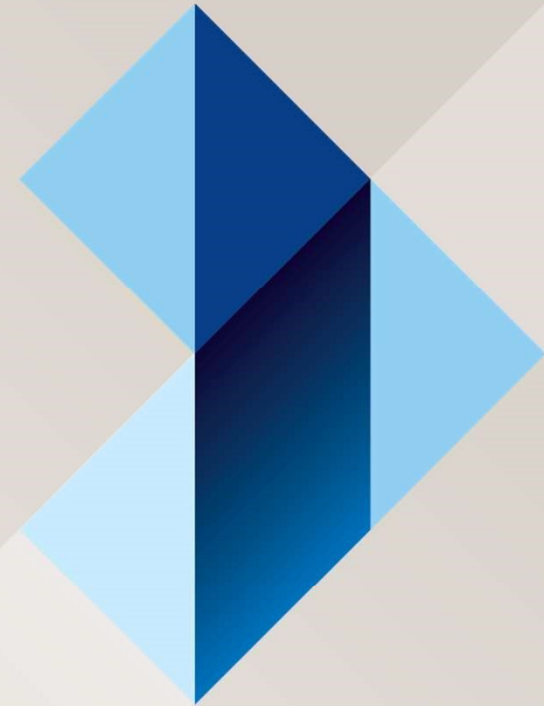


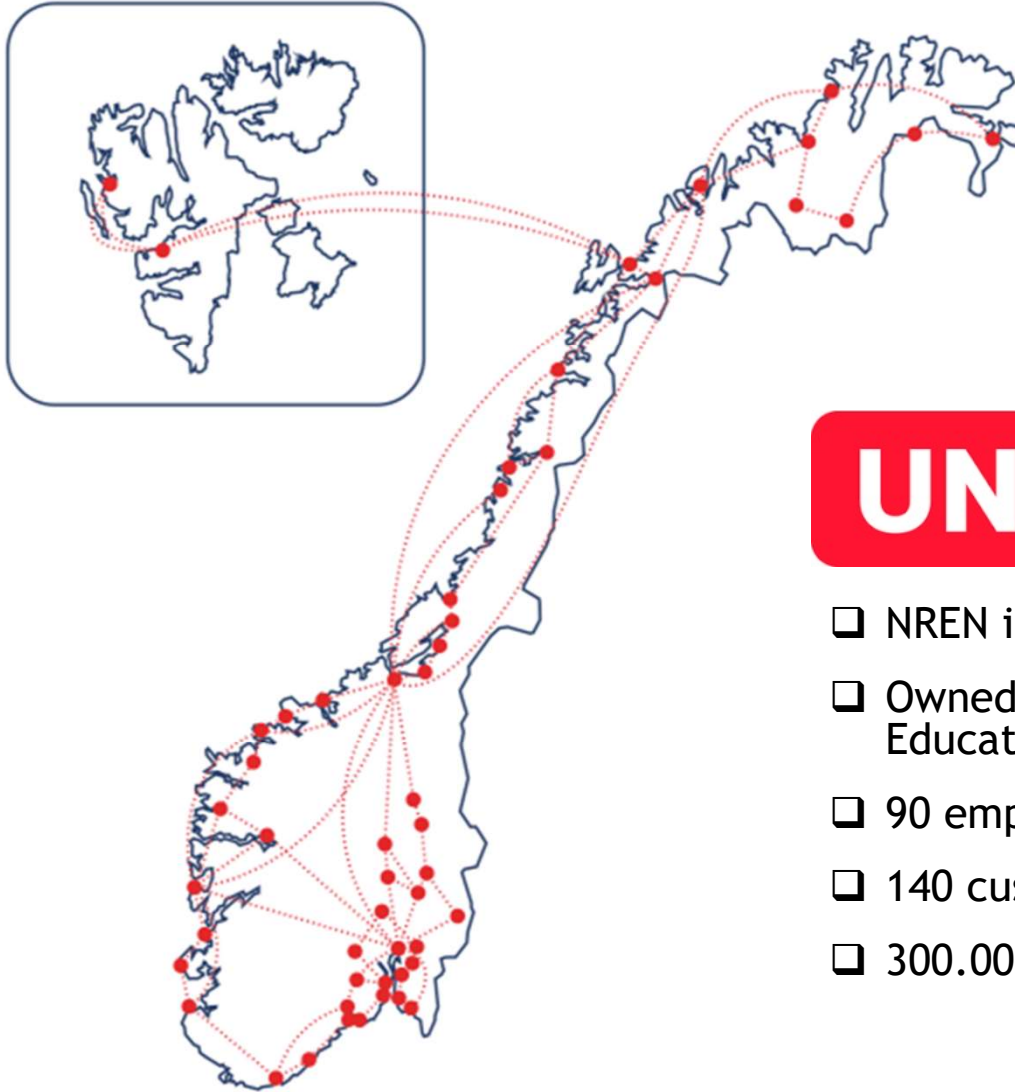
# Campus Network as a Service (CNaaS) in Norway - where are we now?

Vidar Faltinsen, director of department, UNINETT

GÉANT workshop on network management and monitoring  
Copenhagen, October 21 2019

**UNINETT**





# UNINETT

- NREN in Norway
- Owned by the Ministry of Education and Research
- 90 employees
- 140 customers
- 300.000 users

# Norwegian CNaas

Service development and pilot in 2019  
Operational from 2020

Extending the research network to the researcher, student and lecturer

# Why such a service?

- ▶ ICT departments are overloaded with tasks
  - little time to focus on network
- ▶ ICT departments are vulnerable
  - only one person on network in many cases
- ▶ Trend to outsource “bread and butter”
  - In order to strengthen focus on supporting ICT for research and IT for education
- ▶ Improve security
- ▶ Improve overall quality
  - Improvements for ICT for research and education etc



Life on campus

# New digitalization strategy from the Ministry of Education

- ▶ 2017 - 2021
- ▶ Drive for common ICT services in the HE sector when there is a clear benefit



# The CNaaS service package

## Included

- ▶ Operations of wired and wireless network
- ▶ DHCP service
- ▶ NAT 44 service
- ▶ Radius (for eduroam)
- ▶ VPN (eduVPN)
- ▶ 24/7 monitoring of critical components (daytime monitoring for the rest)

## Will / can offer

- ▶ Firewall management
- ▶ DNS firewall
- ▶ IDS

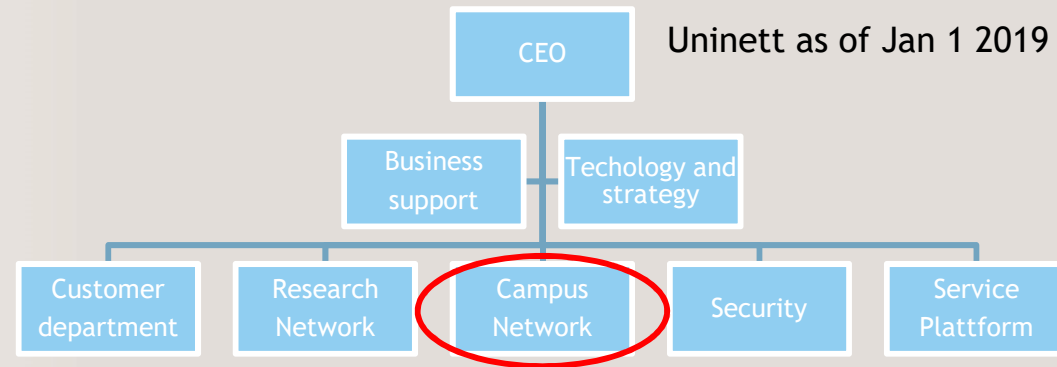


# Number of customers

- 2019: One (pilot)
- 2020: at least two new (moderate ambition)
- 2021 ->: sky is the limit 😊



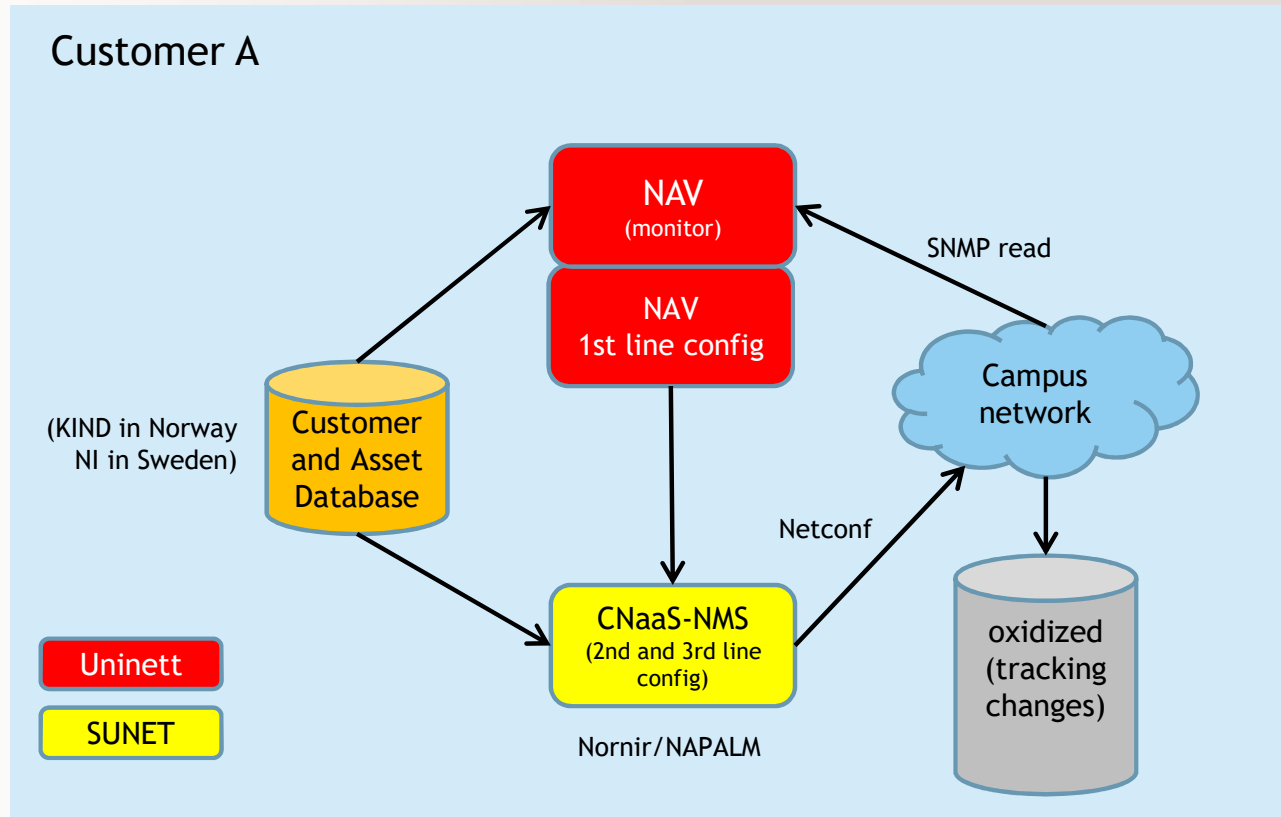
# Organizational setup



- Dedicated department in Uninett for campus network
- We are recruiting more network engineers
- Total MY for CNaaS in 2020 will be 2.7 (service will have a deficit first years)
- Close collaboration with research network department
- Will use our NOC for operations
- Collaboration with Sunet important (next slide)



# Joint Swedish and Norwegian high level CNaaS NMS architecture



# Formal relation

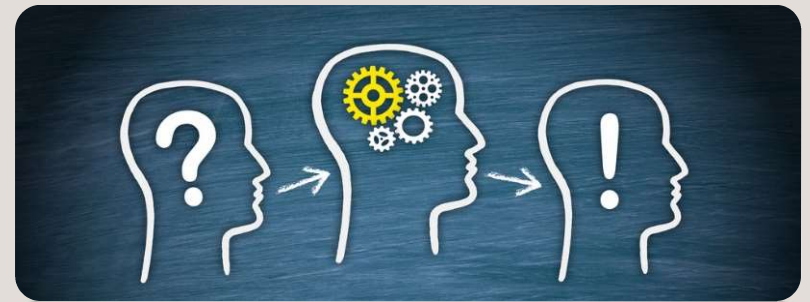
- ▶ We set up a contract that defines:
  - Services that is included (and what is not included)
  - Obligations for the customer
  - Service and support level (SLA)
  - Ownership of equipment (Uninett owns, maintains and reinvests)
  - Price (fixed annual cost)



# Lessons learned so far

## ➤ Close interaction with customer is key

- Technical staff at customer need to work WITH us
- SLA/mutual expectations - both Uninett and customer
- Clear demarcation line - who is responsible for what
- Day to day low level changes must be done by the customer
  - access switch port config
  - firewall detailed rules (need better tools)



## ➤ CNaas reference architecture can influence/change campus design for all campuses

## ➤ Automation is a continuous improvement process.

- Focus on the most repetitive processes first
- 100% automation too expensive (?)



Extra material follows...

# From help-with-self-help to help-with-everything



GigaCampus 2009



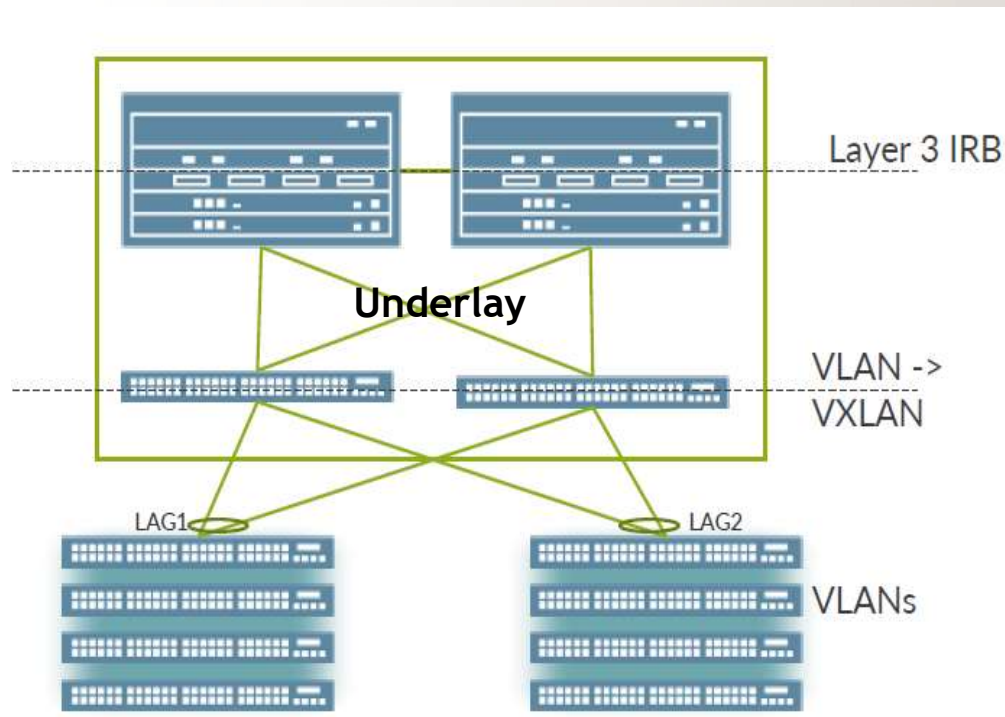
CNaaS 2019

# CNaaS high level objectives



- ▶ No vendor lock-in
- ▶ High availability ( => fully redundant design)
- ▶ Flexible traffic engineering ( routing in underlay beats SPT any day - also easier to debug)
- ▶ Focus on security - must be implemented through a set of initiatives
- ▶ Users & devices should be able to connect from anywhere on campus

# Overlay/underlay architecture with EVPN and VXLAN



- ISIS routing in underlay
- MP-BGP routes mac addresses
- VXLAN encapsulation
- dot1X and MAB authentication
- Map VXLAN to Vlan for access layer
- VXLAN all the way to expensive

# How can we make security management scalable?

- NOC cannot do all change requests
- Local staff can not be given all privileges
- ACL text editor management - RIP
- Are there any good tools out there?

tufin ???     algosec ???





# Why <sup>should</sup> ~~must~~ wired and wifi be well integrated?



## User experience

- User expect same functionality and same level of security
- Multicast, Bonjour, mDNS (BUM)

## Wired and wifi must play well together

- Lab microscope on wire where wireless iPad is used as monitor
- Apple-TV/Chromecast/Miracast on cable and users on wifi
- Hearing aid devices on wired and user on wifi
- Screen sharing equipment for visually impaired in lecture hall - user on wifi

## Same management, monitoring and security

- Not so vulnerable
- Better overview
- Easier to spread knowledge among network admins

## Simpler overall network topology

- Fault monitoring the same for wired and wireless

# Thanks for your attention



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