

> The Deaconesses' Foundation

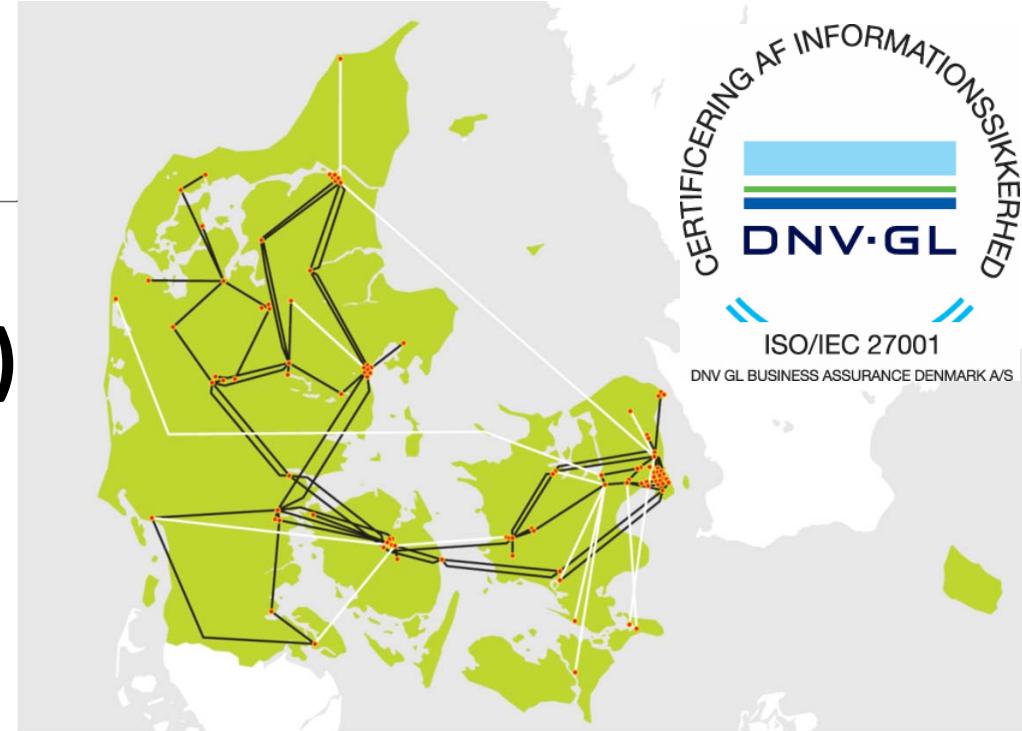


- > A protestant equivalent of nuns working in healthcare
- > Established in 1863 (These buildings were ready from 1876)
- > Bachelor of Science in Nursing
- > Bachelor of Christianity, Culture and Communication
- > Social and Health Care Education (SOSU)
- > Produce sacramental bread for the whole of Denmark (and for export)



> DeiC NREN (Forskningsnettet)

- Short overview
- Priorities 2024



SIG-MSP, Copenhagen

13th March 2024
Head of NREN Martin Bech
martin.bech@deic.dk

> DeiC as a whole

- > DeiC = Danish e-Infrastructure Consortium
- Four main areas of infrastructure
- > HPC
- > Data Management
- > Quantum initiatives
- > NREN and services





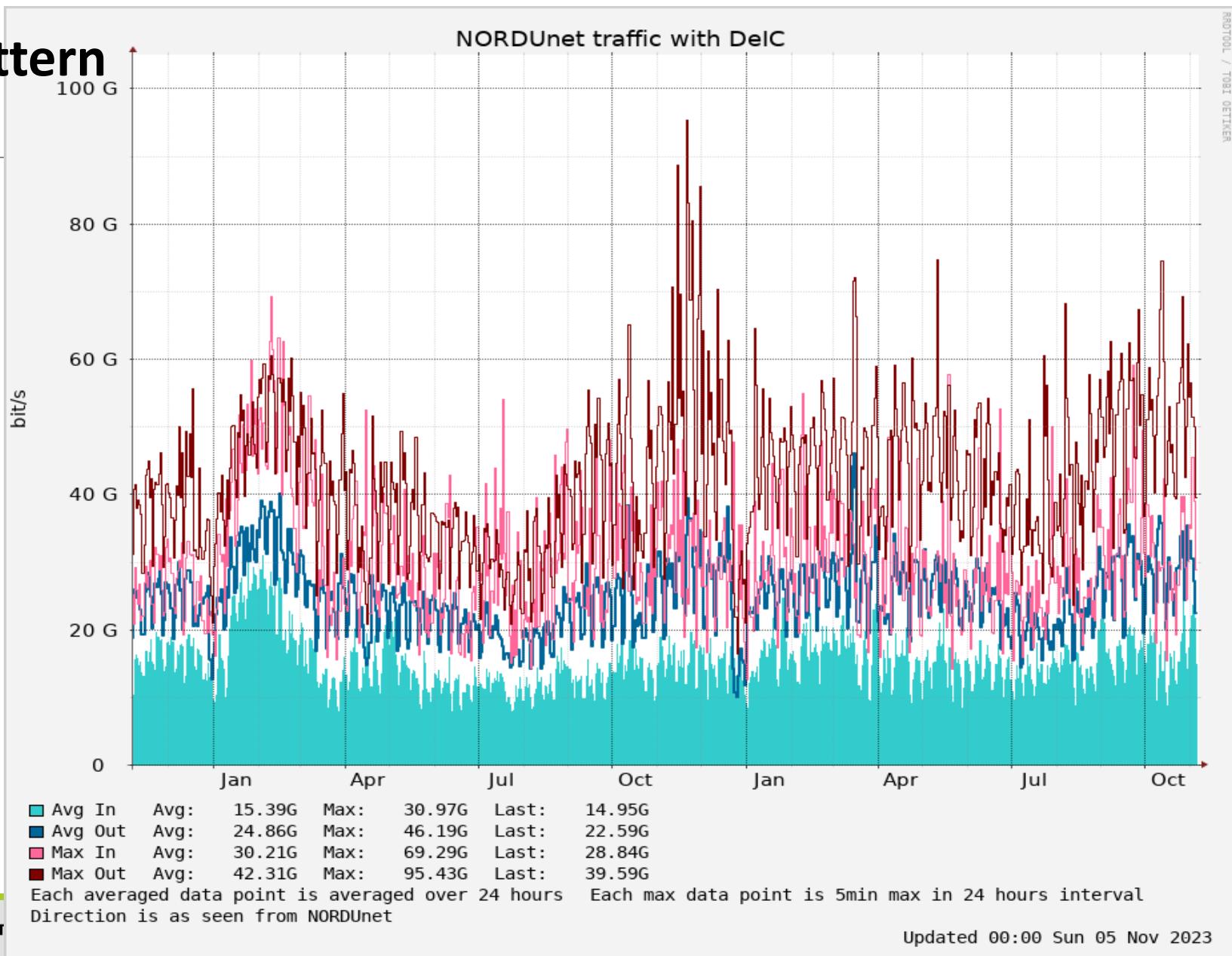
> Forskningsnettet: National backbone network

- > 354 locations
- > 4371 km dark fiber
- > 327 dark fiber connections
- > 31 telco MPLS connections
- > 24 ECI ROADM nodes
- > 17 PanDacom sites
- > + passive WDM
- > 106 routers/switches
- > Cost (incl. depreciation):
2023: 3,5 M€ 2024: 3,8 M€

Type	n/a	0.1 G	0.5 G	1 G	2 G	10 G	40 G	100 G	200 G	Total
Core	2	8	0	12	0	62	6	12	0	102
Cust	3	0	0	64	0	109	0	4	0	180
Intern	21	0	1	30	1	122	0	13	1	189
n/a	0	0	0	6	0	4	0	0	0	10
	1	0	0	1	0	1	0	0	0	3
Total	27	8	1	113	1	298	6	29	1	484

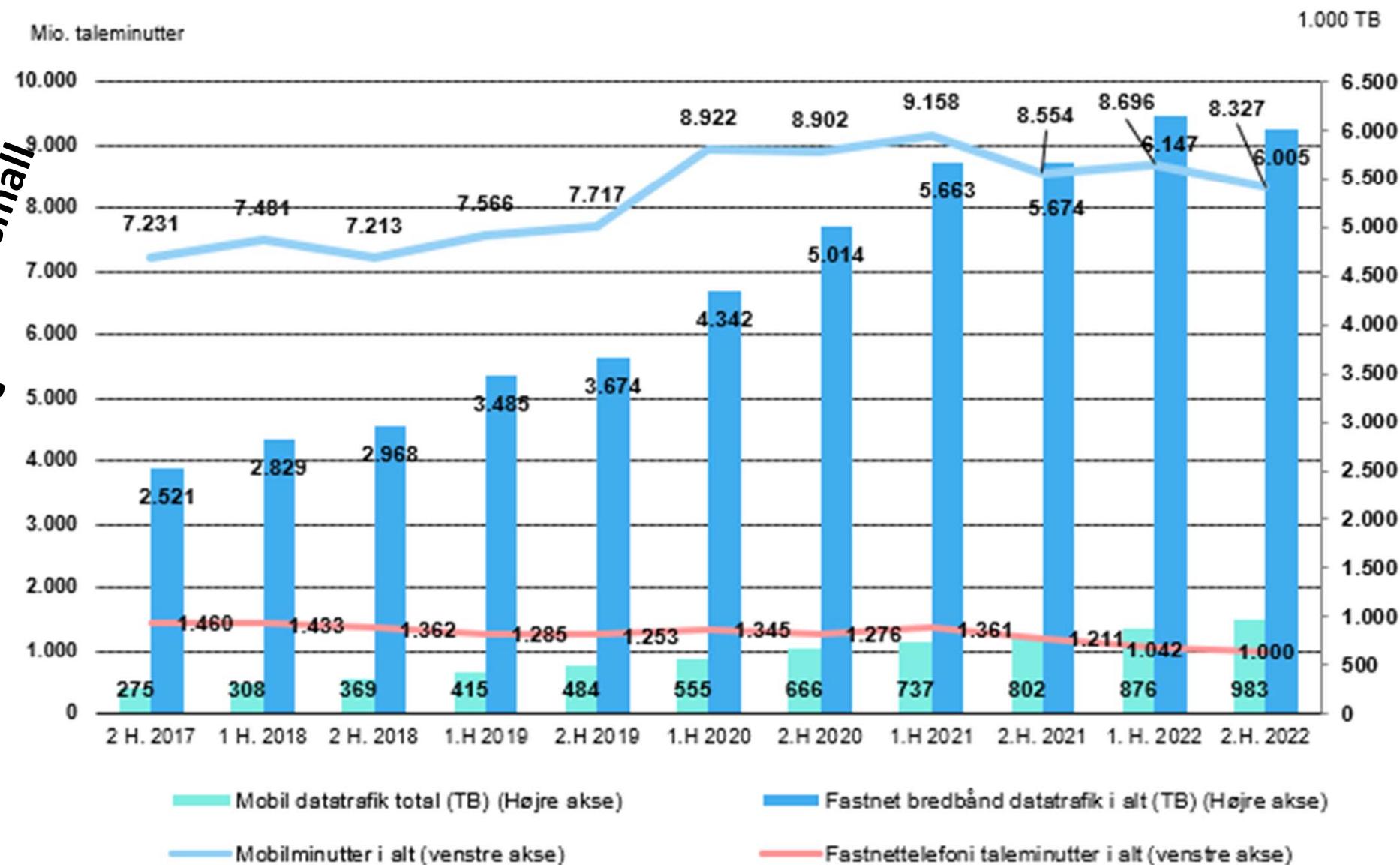
> New traffic pattern after Covid

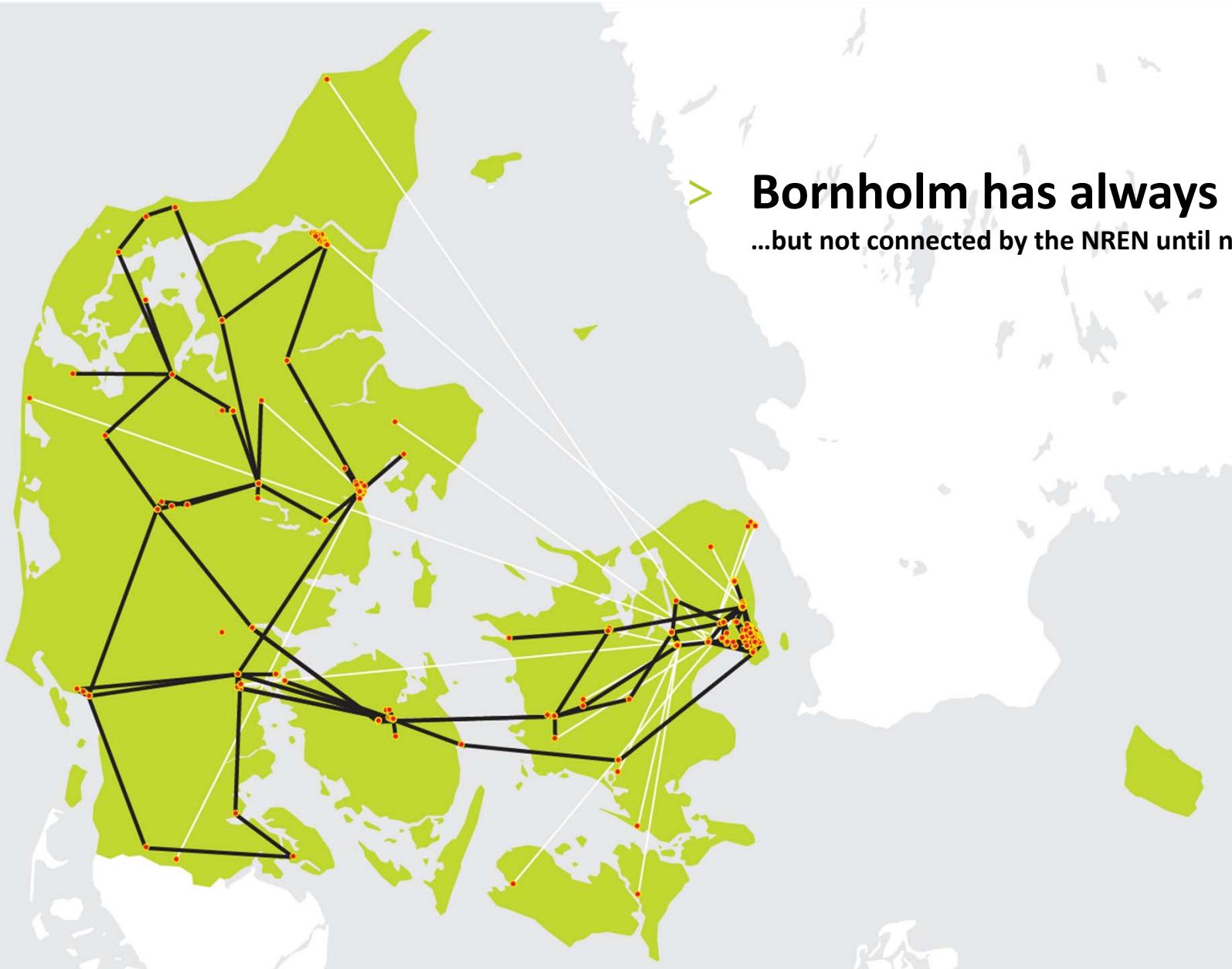
> But still a growing tendency



Afgående taleminutter og bredbåndsdatatrafik

As opposed to commercial telcos that experience a small decrease in traffic





> **Bornholm has always been on the map**
...but not connected by the NREN until now

DeiC

> Bornholm is ready for service some time in 2024

- > Sweden-Rønne-Sassnitz
- > (Partly) thanks to GN3-5N



> Foto: GC

Nu bliver Bornholm tilsluttet nyt hurtigt internet



Foto: TV 2/Bornholm

En specialfartøj er begyndt nedlægningen af over 500 kilometer kabel, der skal koble Bornholm til en ny højhastighedsforbindelse, som virksomheden bag, Global Connect, selv kalder for Nordeuropas nye digitale motorvej.

Af: Martin Poul Gangelhoff Hansen

Besøgende på Galløkken i Rønne har hele onsdagen kunnet se et 87 meter langt skib med hejst kran.

- Vi trækker et fiberoptisk kabel fra Bornholm til Sassnitz i Tyskland, fortæller Tony Petterson, der er projektleder i Baltic Offshore, som ejer skibet Pleijel, der er specialdesignet til netop nedlægning af fiberoptiske kabler.

Det svenske firma Baltic Offshore er hyret af virksomheden Global Connect, som også er svensk og en af Nordeuropas førende virksomheder indenfor datakommunikation.

Global Connect står i spidsen for at lægge højhastighedsinternet i form af fiberoptiske kabler mellem Berlin og det nordlige Sverige, hvor der ligger en del store datacentre. Og undervejs lægger Global Connect også afdistikere til andre dele af Østersøen - og det er disse kabler, som nu bliver koblet til Bornholm via en landtilslutning.

Udgivet: 13.07.2022

kl: 18:38

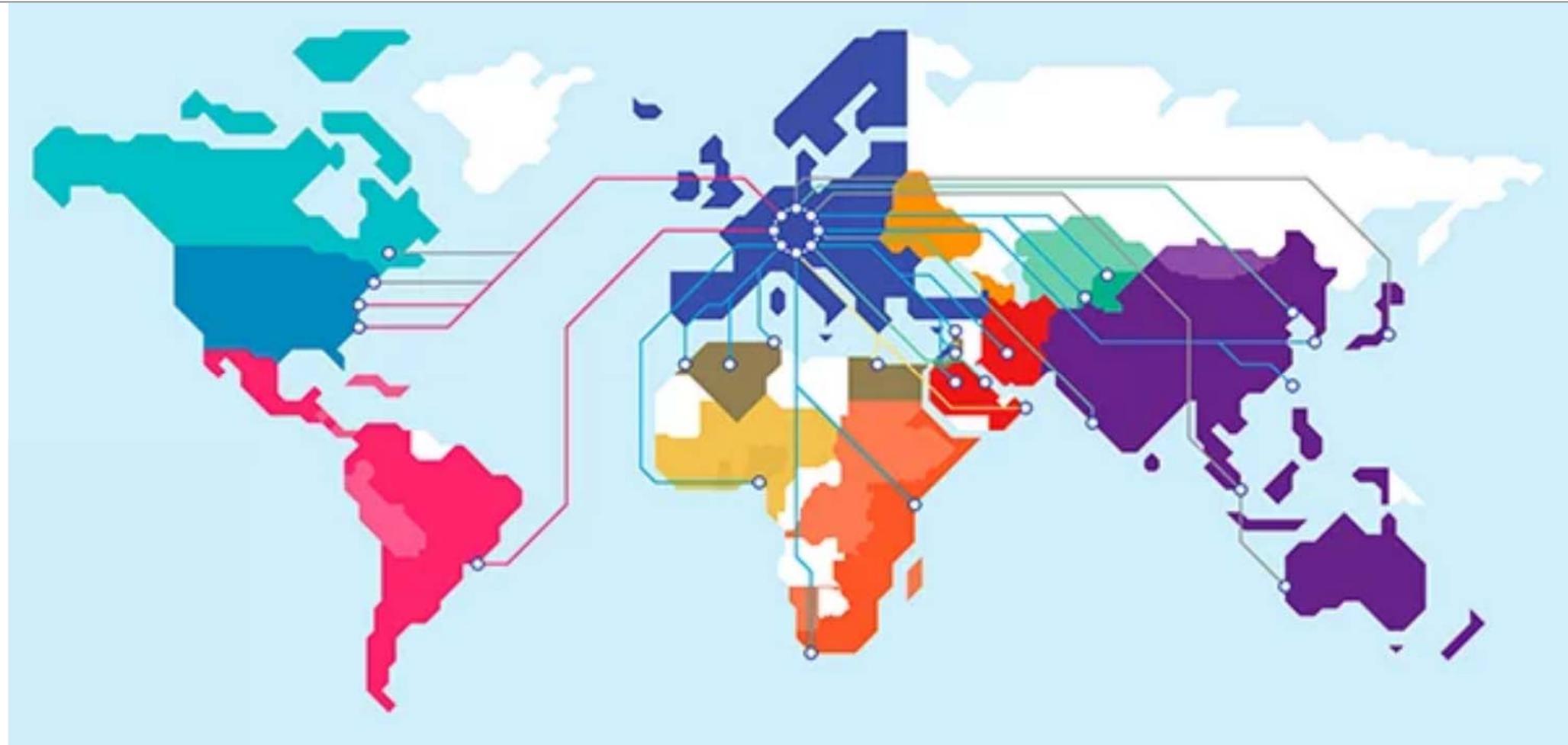


> Greenland has a telco monopoly infrastructure today

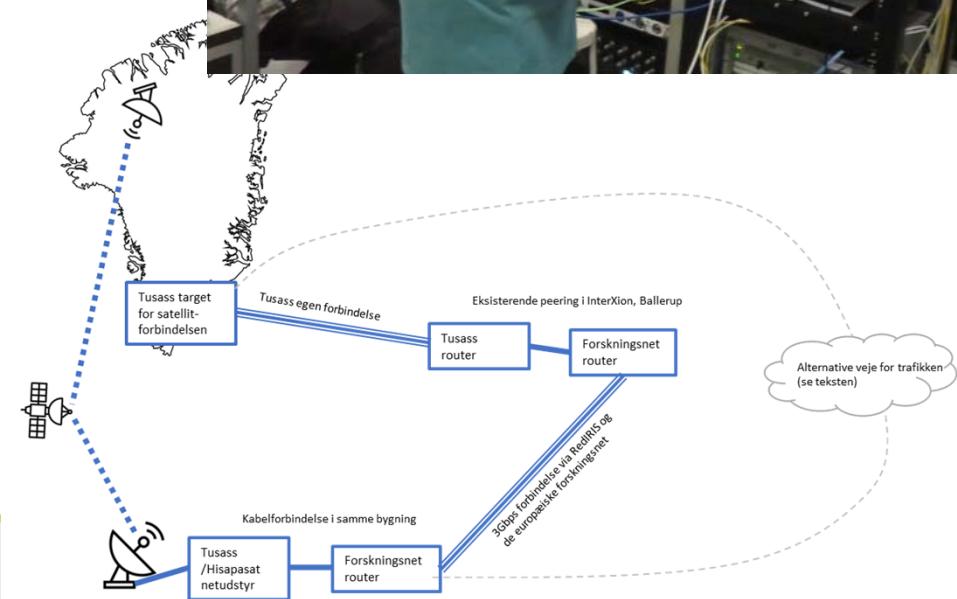
- > Tusass offers a GSM service
- > ADSL is gradually phased out
- > WiMax/WiFi coverage of cities/settlements



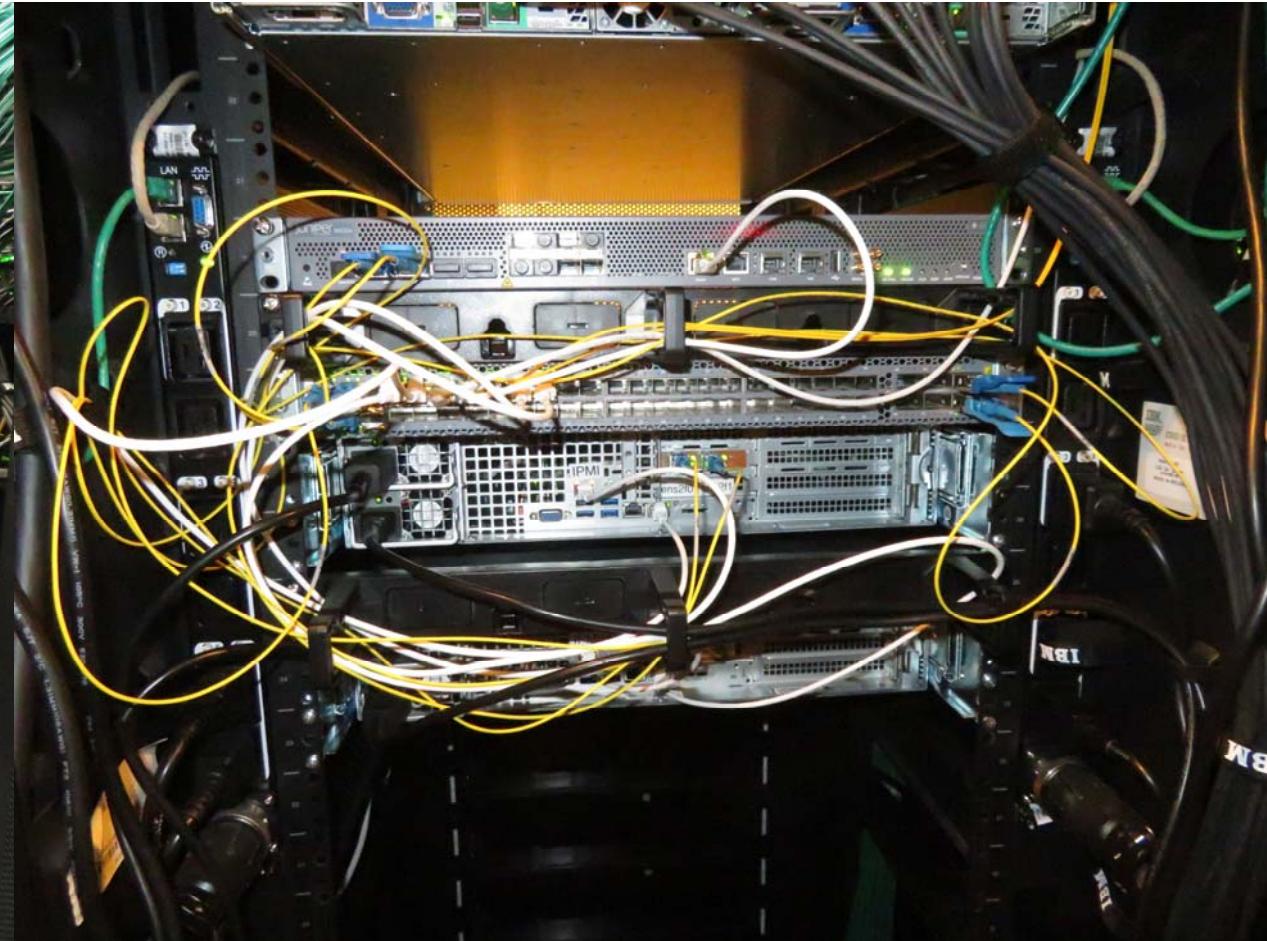
- > Greenland was one of the last countries in the world without NREN services



> Satellite backhaul for Greenland



> Installation of our PoP in Nuuk



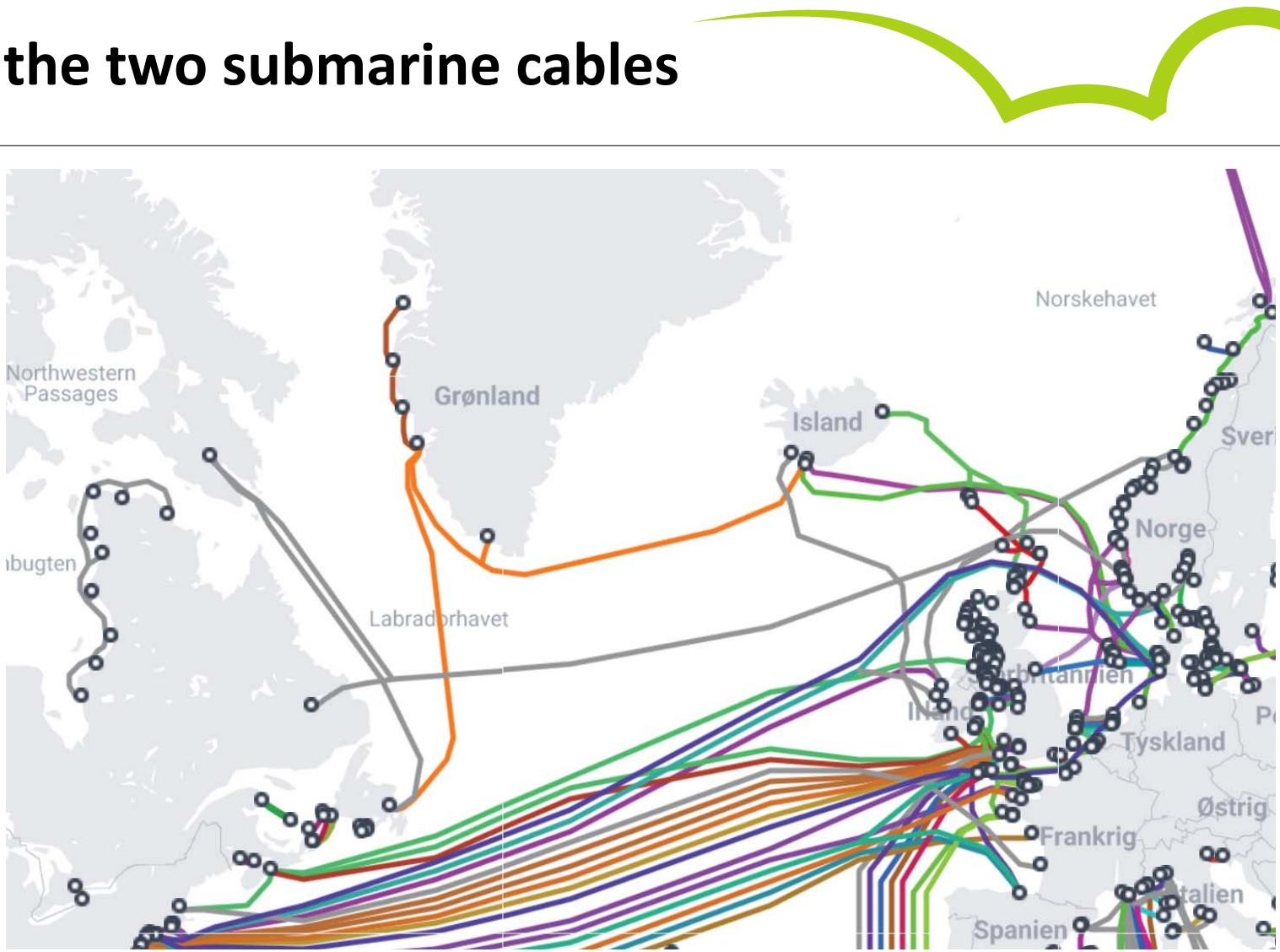
> With Tusass in Nuuk



DeiC

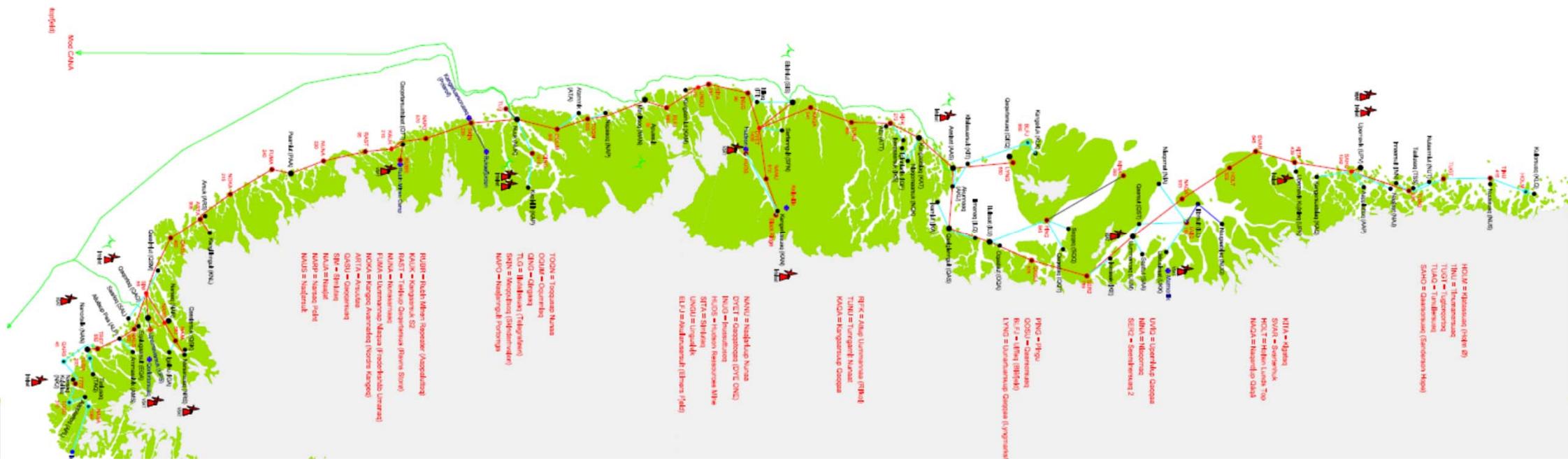
> Connection via the two submarine cables

- > Connections to Ballerup and Secaucus, NY
- > Landfall in 5 places: Qaqortoq, Nuuk, Maniitsoq, Sisimiut, Aasiaat
- > Every landfall is expensive and difficult as it requires drilling a tunnel inside the bedrock that emerges on the sea floor at 450 meters of depth



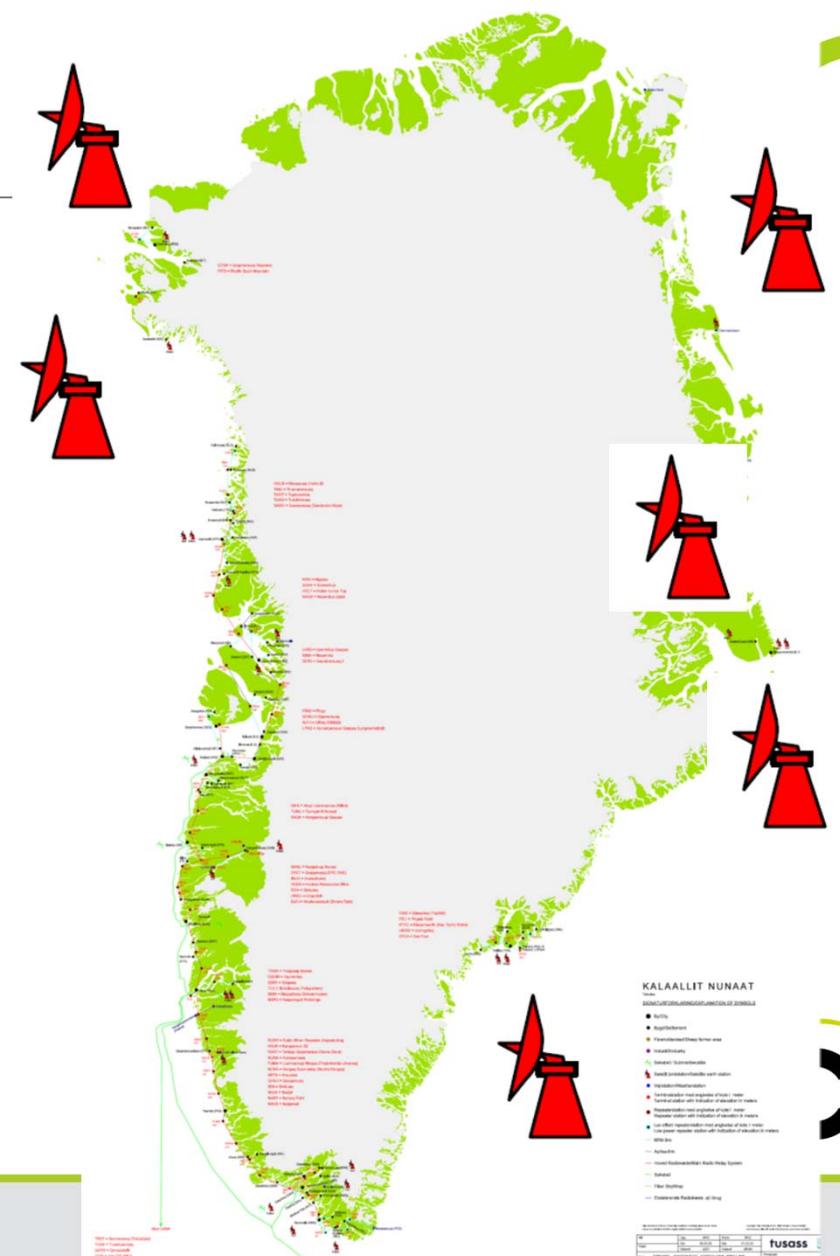
> Grønland today: A long radio chain on the west coast

- > All other cities/settlements on the west coast are served by a long structure of radio links 300Mbps -> 10Gbps
 - > (Mostly) double antennas, but essentially only one chain



> Greenland today: Satellite coverage

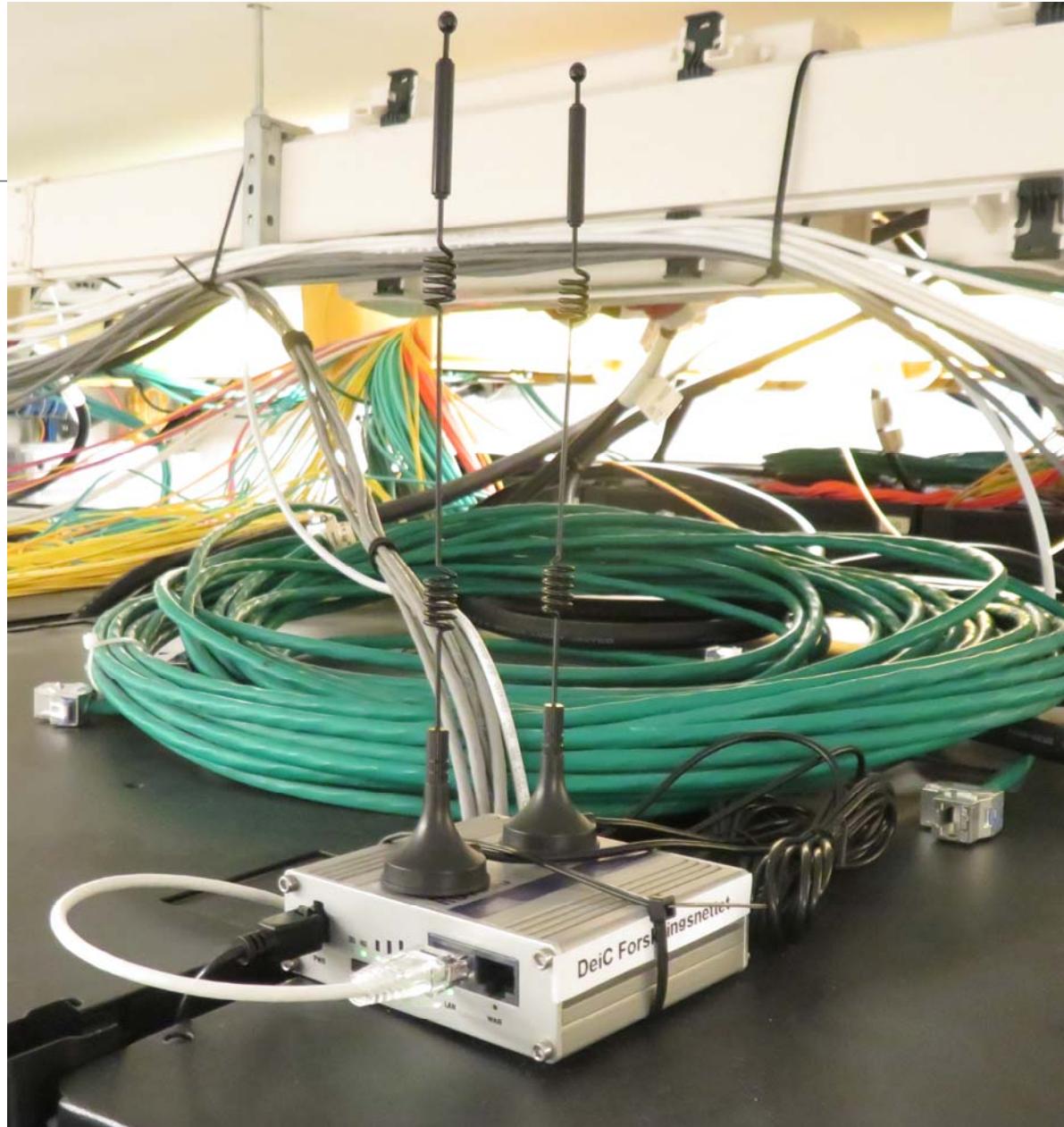
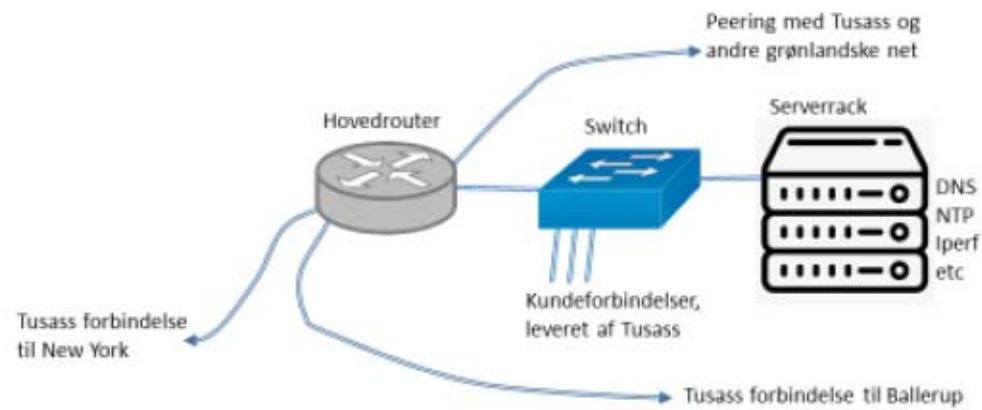
- > Many ground stations
- > Only connection for North and East Greenland
- > Serves as a last resort in the radio chain area
- > VSAT renewed in 2023



> What did we install?

- > Double connection to Denmark – normally 62ms away
- > Central router (192.38.3.255)
- > A /22 pool of IP-addresses (AS 212543)
- > A Switch
- > Servers with basic services (DNS, NTP, iperf, speedtest, web, etc)

- > ...and when the main connection is down, we have a 3G modem as back door



> **What do we offer:**



- > A 100Mbit/s connection (shared among all Greenland NREN users) from around 6800 €/år
- > (Even) smaller bandwidths at lower prices
- > Everywhere in the Tusass coverage area
- > Connection to the world's NREN are significantly better than those of Tusass
- > Enabling institutions to have IT-support "like in Danmark"
- > Guaranteed service levels and quality for Zoom, data transfer etc.

- > This also includes the other bundled NREN services (like in Denmark): WAYF, FileSender, eduroam, DKCERT m.fl



> Who are the possible users?

- > Institutions with buildings: Sisimiut, Disko Island, Nuuk
- > Field stations
- > Automatic measuring equipment
- > Satellite downlinks

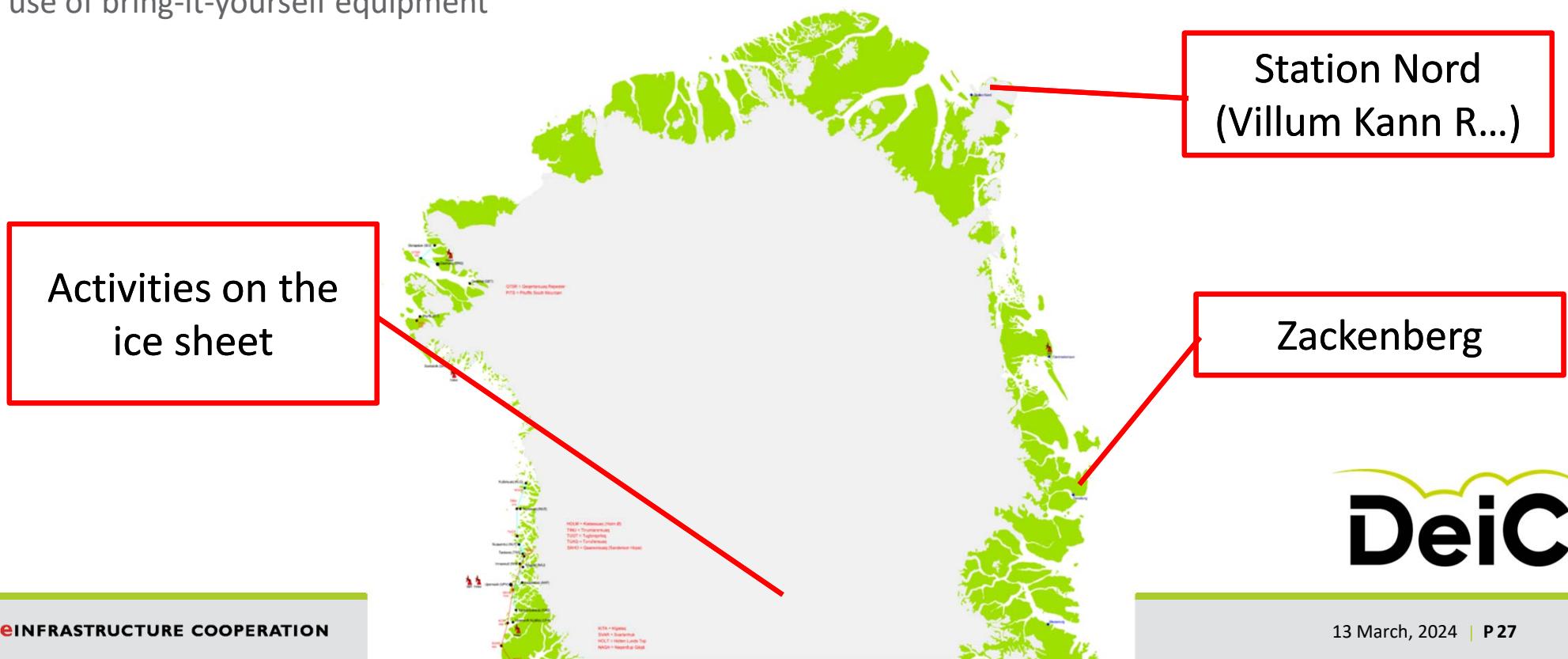
Such as:

- KU, DTU, AU, SDU
- Ilisimatusarfik (Grønlands Universitet)
- Pinngortitaleriffik (Grønlands Naturinstitut)
- GEUS og ASIAQ (Greenland Survey)
- DMI (med mange stationer)
- EUMETSAT, ESA og CNES
- Nunatta Katersugaasivia Allagaateqarfialu (Grønlands Nationalmuseum & Arkiv)
- Den arktiske forskningshub



> Some remote locations/projects can *not* benefit

- > Tusass only covers populated areas. Otherwise you need to use Irdium and the new LEOsat services (OneWeb, Starlink etc)
- > In principle, all services are to be procured through Tusass, but we are working on a scheme to authorise use of bring-it-yourself equipment



> Joint procurement for satellite services

We try to invite all NRENs interested in this, to have a joint procurement for satellite services:

- > LEOsat operators (Starlink, Oneweb, Telesat)
- > Iridium
- > Maybe VSAT services

Do your institutions have activities that could use this?



> Services today (beyond the network itself)



Tjenester

- > Netnære tjenester: NTP, DNS, DNSSEC, dnsadm, Mail-Relay, måling, fejlfinding, statistik
- > DDPS – DDoS beskyttelse
- > eduroam – wifi-opkobling overalt
- > eduVPN – open-source VPN til Forskningsnettet og til din institution
- > WAYF
- > FileSender
- > Serviceinfo
- > Medie- og samarbejdstjenester - Zoom, Kaltura, Panopto
- > Amberscript

DKCERT tjenesterne

- > Incident Response
- > Fælles MISP
- > Nyheder & advarsler
- > Scanninger – også interne
- > DPO-tjenesten

Projekter

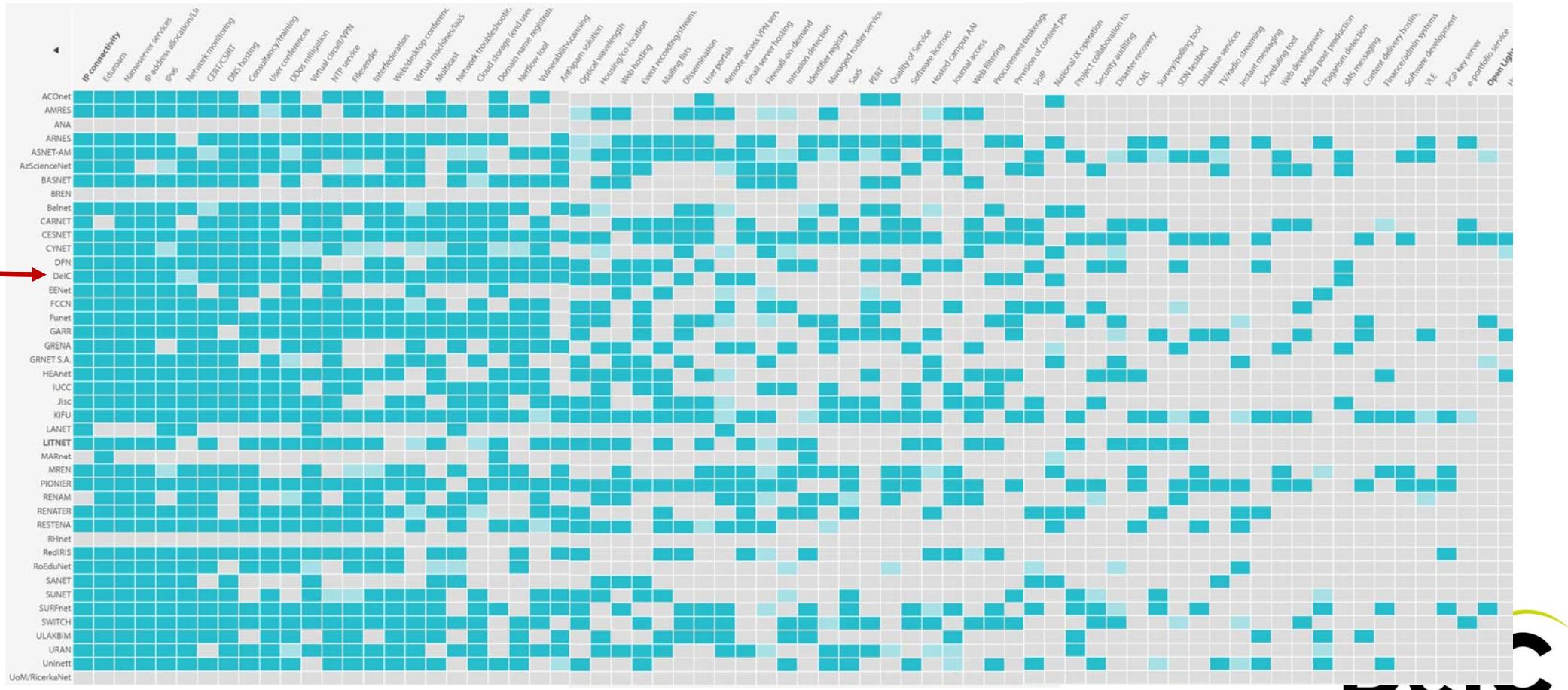
- > GÉANT
- > Fælles projekter i NORDUnet
- > eduVPN udvikling
- > EuroQCI
- > PolarConnect
- > (Satellittrafik)

Fælles indkøb

- > Certifikater
- > OCIRE - Cloud Rammeaftaler
- > LMS-rammeaftale



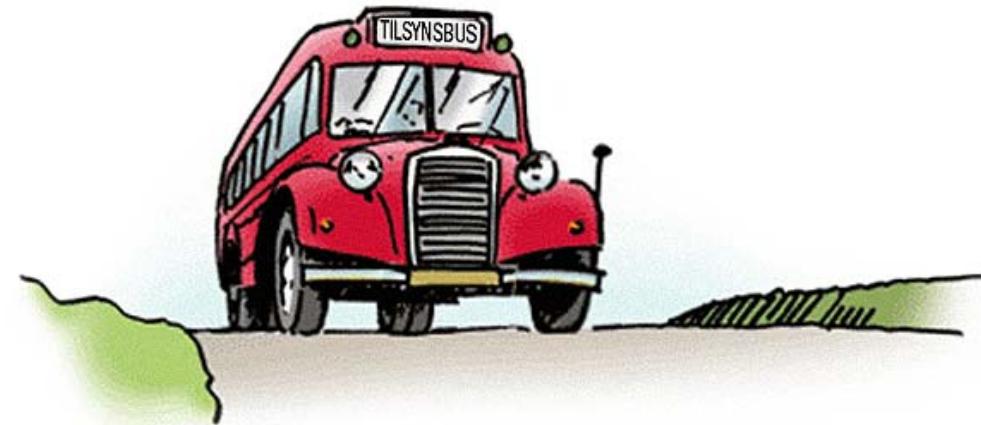
- Pretty standard – compared to other NRENs



Kilde: compendium.geant.org

> The Audit Bus

- > We have DPAs for many services
- > Institutions demand audits/inspections individually
- > Needs considerable resources
- > We found a way to rationalize this:
- > One common audit per service for everyone
- > Based on questions/themes collected in a survey among the institutions
- > Like an "omnibus" survey
- > Good experiences so far



> eduSign in pilot test

Signing of PDF documents

- > Baseret på institutionernes eget login (med WAYF)
- > Licens- og reklamefri
- > Open source
- > Uden betaling
- > Med dansk infrastruktur og dansk databehandleraftale
- > Eksterne parter som ikke har WAYF kan inviteres via e-mail
- > (Integreret med MitID – kommer senere)

Tjenesten tænkes – lige som FileSender – at være uden særskilt betaling, men kræver selvsagt at brugerne har et WAYF-login

The screenshot shows the 'eduSign - Sikker digital signeringstjeneste' interface. At the top, there's a file upload section with a green 'Overfør' button. Below it, a 'Mine dokumenter' section lists two PDF files: 'DeiC konferenceprogram 2023 dag 1 (7.11.23).pdf' (sent to 0, 0 signed) and 'høringsmail.pdf' (sent to 1, 1 signed). Each document has 'Vis', 'Signér', and 'Inviter' buttons. A red note at the bottom states: 'EduSign is currently in prelaunch testing phase. Please read Terms and Conditions for DeiC edusign. If you would like to contact edusign team for feedback, suggestion or for any general question feel free to email us at edusignsupport@deic.dk'.

> Current priorities



- > First of all: Most resources and attention goes to the daily operations of everything

Development goals:

- > Greenland, Bornholm and other **extentions**
- > A new **measurement** regime for operational efficiency
- > New initiatives in **cyber security**
- > Hardening the infrastructure in light of the **new threats**
- > **Quantum and T&F** initiatives
- > Expand the scope of our **ISO27001** certification
- > Renewal of our portfolio of **media services**
- > **Green accounting**



> Operational efficiency (SLA) – how to measure

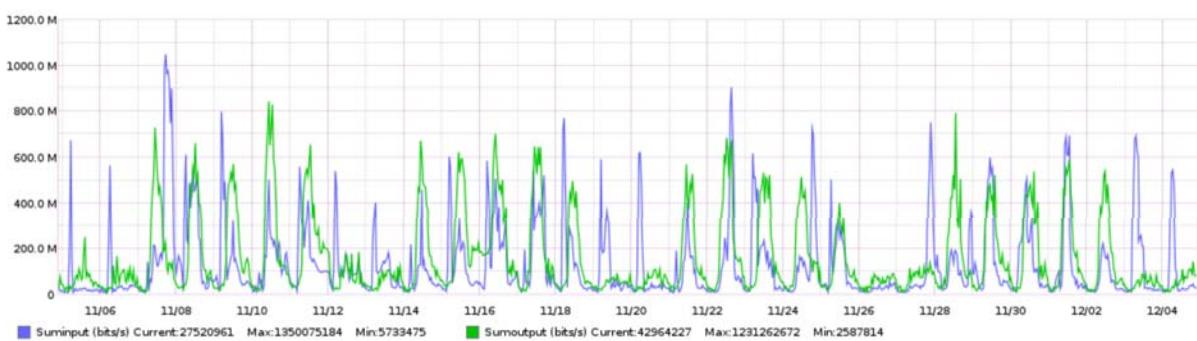
- > We offer our user an SLA and thereby promise minimum operational efficiency (uptime) for all service. Generally, we meet those targets.
- > Historically, however, we have not measured this exactly for all circuits we provide.

The aim is to be able to answer questions like:

- > Where do we "bother" the user most?
- > Which fibre or telco link performs worst?

The idea is that we can use this in a more data-driven and quality management of our network and services

Latest month



130.226.136.182	99.993000	oppe i seneste år
130.226.214.166	99.997000	oppe i seneste år
172.22.150.1	99.868000	oppe i seneste år
172.22.150.216	100.000000	oppe i seneste år
172.22.150.4	100.000000	oppe i seneste år
172.22.150.8	99.932000	oppe i seneste år
172.22.199.37	99.924000	oppe i seneste år
172.22.199.68	99.924000	oppe i seneste år
172.22.199.69	99.922000	oppe i seneste år
172.22.2.60	100.000000	oppe i seneste år
172.22.2.61	100.000000	oppe i seneste år
172.22.2.62	100.000000	oppe i seneste år

Performance vs. SLA

- > Our SLA is calculated for each calendar quarter
- > Just like it is in the contracts we have with our suppliers
- > We give ourselves a margin of one measurement (10 minutes)
- > Calculation of one single number doesn't make sense
- > But we can find the most problematic connections

	2022Q1	2022Q2	2022Q3	2022Q4	2023Q1	2023Q2
abacus	100	99,9984	99,9975	99,9984	99,9992	100
au-sn3	100	100	99,9927	100	99,9992	100
ly2	99,9992	100	99,9926	100	97,9623	100
Nordunet	100	99,9992	99,9984	100	99,9984	100
nordunet-lgb	100	99,9956	97,8554	100	100	100
nordunet-ore	100	99,9854	99,9992	99,9942	100	100
or2	100	99,9978	99,9952	100	100	100
ore	100	100	99,9984	99,9955	100	100
RH	100	99,9855	99,9921	99,9961	99,995	100
riso	99,9992	100	99,9907	99,9992	100	100
RUC	99,9992	99,9935	99,993	99,9976	99,9898	100
ruc-sn1	99,9967	100	100	100	100	100
ruc-sn2	100	100	99,9984	100	100	100
sit-vpn-kvl	100	100	99,9975	99,9992	100	100
Statsbiblioteket	99,9992	99,496	99,9862	99,9631	99,9967	99,9692
USG	100	100	99,9975	100	99,9815	100
AAMS	99,9992	99,9144	99,9984	100	100	100
Aarhus_Supercomputer	100	100	99,9984	100	100	100
AAU	99,9976	99,9958	99,9959	99,9984	99,9992	99,9727
aau-sn1	100	100	99,9937	99,9992	100	100
aau-sn2	100	100	99,9937	99,9976	100	100

	2022Q1	2022Q2	2022Q3	2022Q4	2023Q1	2023Q2
abacus	100	99,9984	99,9979	99,9984	99,9992	100
au-sn3	100	100	99,9927	100	99,9992	100
carlsberg	100	99,9994	99,9959	99,9992	99,9952	99,9992
dk02	100	100	99,9912	99,9947	99,9992	99,9975
dkdm	100	99,9984	99,9119	99,9916	99,9927	99,9982
dkdm-lola	100	100	99,9984	99,9916	100	99,9924
dkdm-skg	100	100	99,9992	99,9992	99,9992	99,9982
dkdm-skg2	100	100	99,9984	99,9992	100	99,9982
dm1-skg3	100	100	100	100	100	100
dotrc	99,9992	99,9937	99,9471	99,9959	99,9899	100
dpds	100	99,9352	99,9709	99,9976	97,9584	99,9992
DRCMR	100	99,9571	99,9869	99,9831	99,992	97,9241
DTU	99,9992	99,9968	99,9981	99,9978	99,9985	100
DTU_Softwarelab	99,9992	99,9968	99,9981	99,9978	99,9985	100
erh01	100	99,9948	99,9637	99,9843	99,9972	99,9984
erh03	100	100	99,9987	99,9987	99,9985	100
esk01	100	100	99,9987	99,9987	99,9985	100
Griseengnom	100	100	99,9984	99,9976	99,9983	100
IKAS_Aarhus	99,9972	99,9984	99,9609	99,9967	99,9845	99,9992
ITU	99,9918	100	99,9979	100	99,998	100
kabil	100	99,9972	100	100	100	100
kb1	100	99,9972	100	100	100	100
kbhg	100	100	99,9975	100	100	100
kbh-kua	100	100	99,9984	100	100	100
kbh-kvl	100	100	99,9987	100	100	100
kbh-pas	100	100	99,9986	99,9985	100	100
KOL-AIK	99,9992	100	99,9979	99,9943	99,9783	100
KOL-AMAGER	100	100	99,9984	99,9982	99,9982	100
KOL-ARBEJD	99,9802	99,9959	99,9442	99,9704	99,9641	99,9502
KOL-ASA	100	99,9499	99,9952	99,9952	99,9543	100
KOL-BIKUBEN-ALB	100	100	99,9991	100	99,9992	100
KOL-BLEKGILDE	100	100	100	100	100	100
KOL-DOT	100	99,9984	100	99,9984	100	100
KOL-GAUGEN	100	100	99,9987	100	100	100
KOL-ETERNITNET	100	99,9954	99,9954	99,9954	99,9818	100
KOL-GODSAEMEN	100	100	99,9987	99,9987	100	100
KOL-GRUNDFOSS	100	99,9958	99,999	99,9958	99,9949	99,9992
KOL-HARALDSLUND	100	100	99,9984	99,9982	100	100
KOL-HENIUS	100	99,9984	99,9956	99,9711	99,9575	100
KOL-HIMAS	100	99,9992	99,9559	99,9594	99,9859	100
KOL-HORRHUS	100	100	99,9986	99,9993	99,9993	100
KOL-IDRAETSBYEN	100	99,9573	99,9941	99,9965	99,9702	100
KOL-KELLERUPGADE	100	99,9992	99,9826	99,987	99,9943	99,9992
KOL-KENDY	100	100	99,9777	100	99,9777	100
KOL-KØGEDET	100	100	99,9928	100	99,9928	100
KOL-KVANTUM	100	100	99,9987	99,9987	99,9987	100
KOL-LANGAGER	99,9984	100	99,9979	99,9954	99,9777	99,9993
KOL-LIMFJORD	99,9654	99,9594	99,9594	99,9582	99,9548	99,9506
KOL-NETODENSE	100	99,9104	99,9992	99,9992	99,9992	100
KOL-NORDYSK	99,992	99,9786	99,9559	99,9992	99,9716	99,9992
KOL-PARK	99,9998	99,9484	99,9555	99,9955	99,9955	99,9967
KOL-RAMBLEN	100	99,9987	99,9987	99,9987	99,9987	99,9985
KOL-REBESOPARKE	100	99,9581	99,9963	99,9976	99,9988	99,9988
KOL-RYES	100	99,9998	99,9959	99,9959	99,9959	99,9988
KOL-SCHMIDT	100	99,9986	99,9986	99,9986	99,9986	99,9986
KOL-SCHMIDTBÆKEN	100	100	99,9989	99,9976	99,9976	100
KOL-SIGNALVEJ	100	100	99,9987	99,9987	99,9987	100
KOL-SKOGENPARKEN	100	99,9963	99,9982	99,9982	99,9982	99,9982
KOL-SPARNORD	100	100	99,9519	99,9535	99,9577	100
KOL-STUD	100	99,958	99,9987	100	99,9987	100
KOL-THEWALL	100	100	99,9987	100	100	100
KOL-TIETGEN	99,993	99,9998	99,9979	99,9984	99,9972	100
KOL-UNI	99,9967	99,9546	99,9911	99,9988	99,9668	99,9959
KOL-VENDIA	100	99,9946	99,9543	99,9939	99,9986	100
KOL-WATERFRONT	99,9984	99,9998	99,9974	99,9974	99,9977	99,9984
KU	99,9992	100	99,9979	100	99,992	99,9984
Kyststakademiet	100	99,9982	99,9982	99,9982	99,9982	100
lbg	100	100	99,9947	100	100	100
lbg-arr1	100	100	100	100	100	100
lbg-sn1	100	100	100	100	100	100
localhoofd	99,9705	100	100	100	100	100
ly2	100	99,9992	99,9984	100	99,9984	100
Nordunet	100	99,9992	99,9984	100	99,9984	100
orc-sn1	100	99,9956	99,9554	100	99,9984	100
orc-sn2	100	100	99,9984	100	100	100
orc-sn3	100	100	99,9984	100	100	100
orc-sn4	100	100	99,9984	100	100	100
orc-sn5	100	100	99,9984	100	100	100
orc-sn6	100	100	99,9984	100	100	100
orc-sn7	100	100	99,9984	100	100	100
orc-sn8	100	100	99,9984	100	100	100
orc-sn9	100	100	99,9984	100	100	100
orc-sn10	100	100	99,9984	100	100	100
orc-sn11	100	100	99,9984	100	100	100
orc-sn12	100	100	99,9984	100	100	100
orc-sn13	100	100	99,9984	100	100	100
orc-sn14	100	100	99,9984	100	100	100
orc-sn15	100	100	99,9984	100	100	100
orc-sn16	100	100	99,9984	100	100	100
orc-sn17	100	100	99,9984	100	100	100
orc-sn18	100	100	99,9984	100	100	100
orc-sn19	100	100	99,9984	100	100	100
orc-sn20	100	100	99,9984	100	100	100
orc-sn21	100	100	99,9984	100	100	100
orc-sn22	100	100	99,9984	100	100	100
orc-sn23	100	100	99,9984	100	100	100
orc-sn24	100	100	99,9984	100	100	100
orc-sn25	100	100	99,9984	100	100	100
orc-sn26	100	100	99,9984	100	100	100
orc-sn27	100	100	99,9984	100	100	100
orc-sn28	100	100	99,9984	100	100	100
orc-sn29	100	100	99,9984	100	100	100
orc-sn30	100	100	99,9984	100	100	100
orc-sn31	100	100	99,9984	100	100	100
orc-sn32	100	100	99,9984	100	100	100
orc-sn33	100	100	99,9984	100	100	100
orc-sn34	100	100	99,9984	100	100	100
orc-sn35	100	100	99,9984	100	100	100
orc-sn36	100	100	99,9984	100	100	100
orc-sn37	100	100	99,9984	100	100	100
orc-sn38	100	100	99,9984	100	100	100
orc-sn39	100	100	99,9984	100	100	100
orc-sn40	100	100	99,9984	100	100	100
orc-sn41	100	100	99,9984	100	100	100
orc-sn42	100	100	99,9984	100	100	100
orc-sn43	100	100	99,9984	100	100	100
orc-sn44	100	100	99,9984	100	100	100
orc-sn45	100	100	99,9984	100	100	100
orc-sn46	100	100	99,9984	100	100	100
orc-sn47	100	100	99,9984	100	100	100
orc-sn48	100	100	99,9984	100	100	100
orc-sn49	100	100	99,9984	100	100	100
orc-sn50	100	100	99,9984	100	100	100

> New initiatives in cybersecurity

- > Security is of strategic importance to our NREN (and to DeiC in general)
- > Expansion of the scope of our ISO27001 certification
- > Considering ISO27701
- > What does NIS2 compliance entail?
- > Trying to gather all universities in a common initiative to have a SOC/SAC operating 24/7



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> New physical threats to the infrastructure

- > Beyond the "normal" cybersecurity threats, we now have to consider a range of physical threats to the infrastructure:
 - > "Brownouts" and sabotage to the power grid
 - > Targeted sabotage to submarine cables – and all cables and installations

Readyness analysis:

- > Vulnerability assessment regarding these threats are now a part of regular operation
 - > Improvement of the weak spots uncovered by the analyses



Free 1337 · 19 oct. 2022
@Free_1337 · Suivre
En réponse à @Free_1337
2/2 Des suites judiciaires seront données.

Free 1337 · 19 oct. 2022
@Free_1337 · Suivre

Les actes de vandalisme ont eu lieu en divers points éloignés simultanément. Photo d'un autre point, près de

Le Parisien

> New uses of the fiber infrastructure

Such as

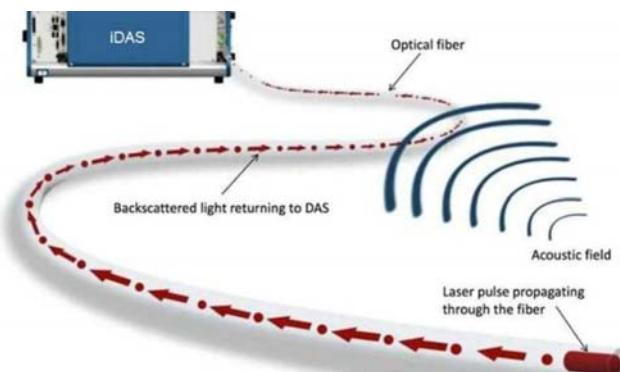
- > Quantum Key Distribution
- > Time and frequency distribution
- > Distributed Acoustic Sensing



**DECLARATION ON A
QUANTUM COMMUNICATION
INFRASTRUCTURE
FOR THE EU**

All 27 EU Member States

have signed a declaration agreeing to work together to explore how to build a quantum communication infrastructure (QCI) across Europe, boosting European capabilities in quantum technologies, cybersecurity and industrial competitiveness.



DeiC

> **Media hosting**



- > Now, we have the media services Kaltura and Panopto in an on-premise installation operated by NORDUnet
- > Both vendors are abandoning their on-prem version and only supporting the cloud in the future
- > Are we and our users ready for the compliance implications of this?
- > Should we create our own service, self hosted and based on license free software?



> Thank you

> Questions and comments

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