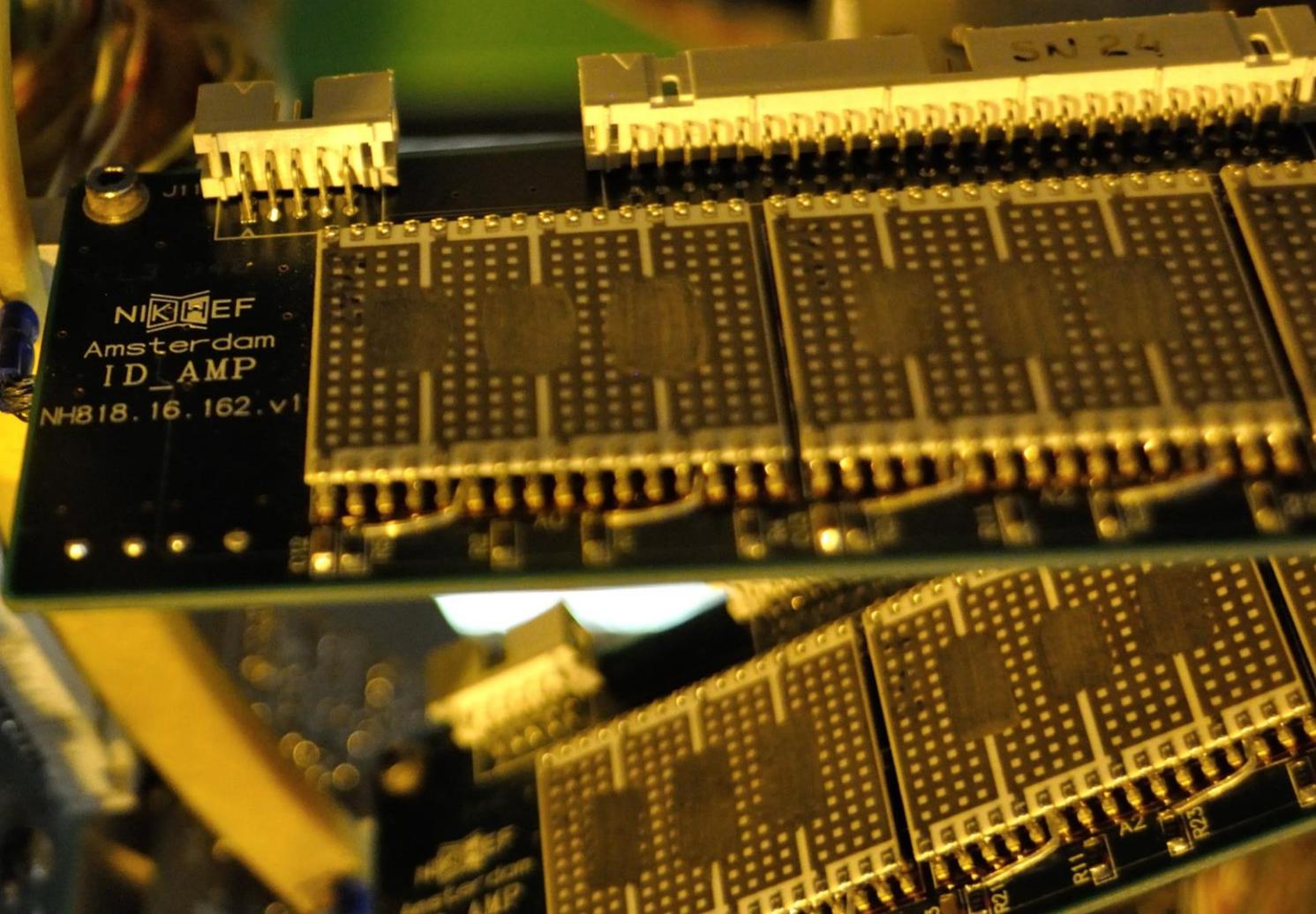SURF

Update NIKHEF-SURF NL-T1
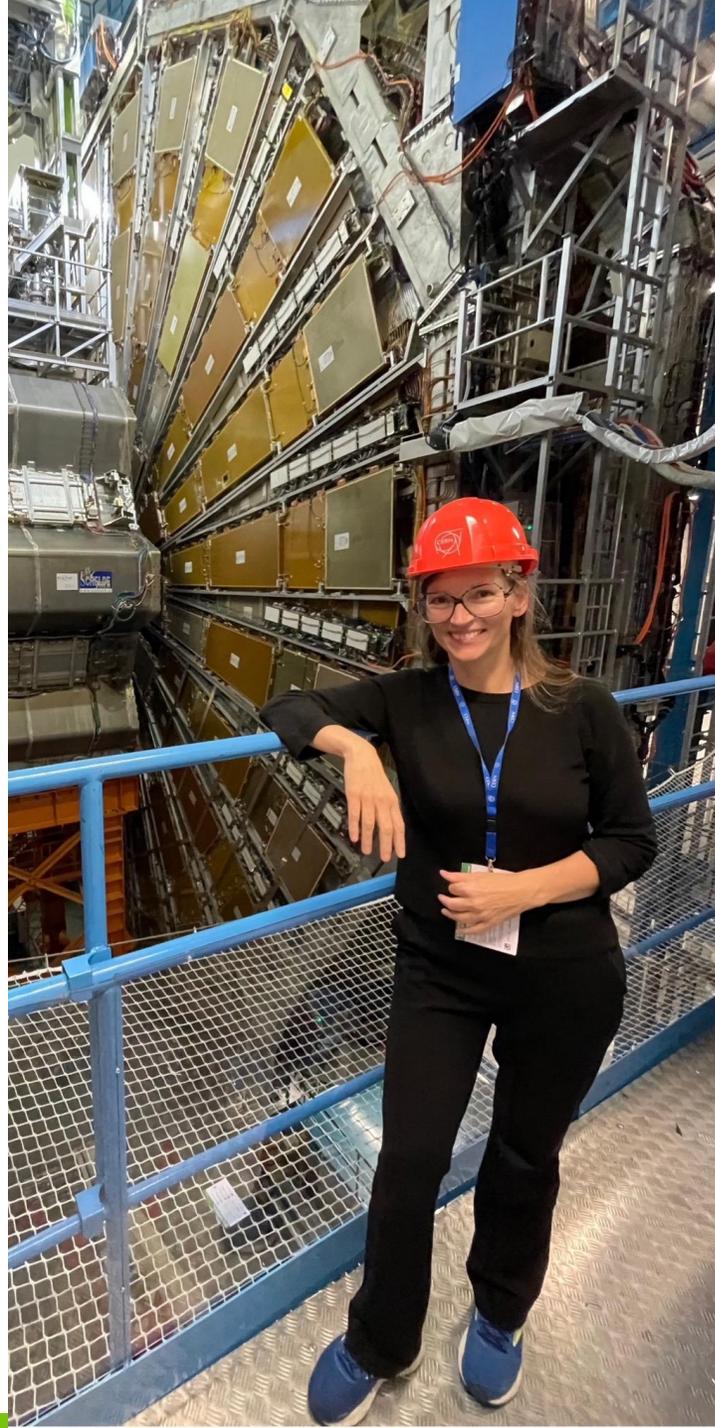
Arno Bakker, Karin Wessel
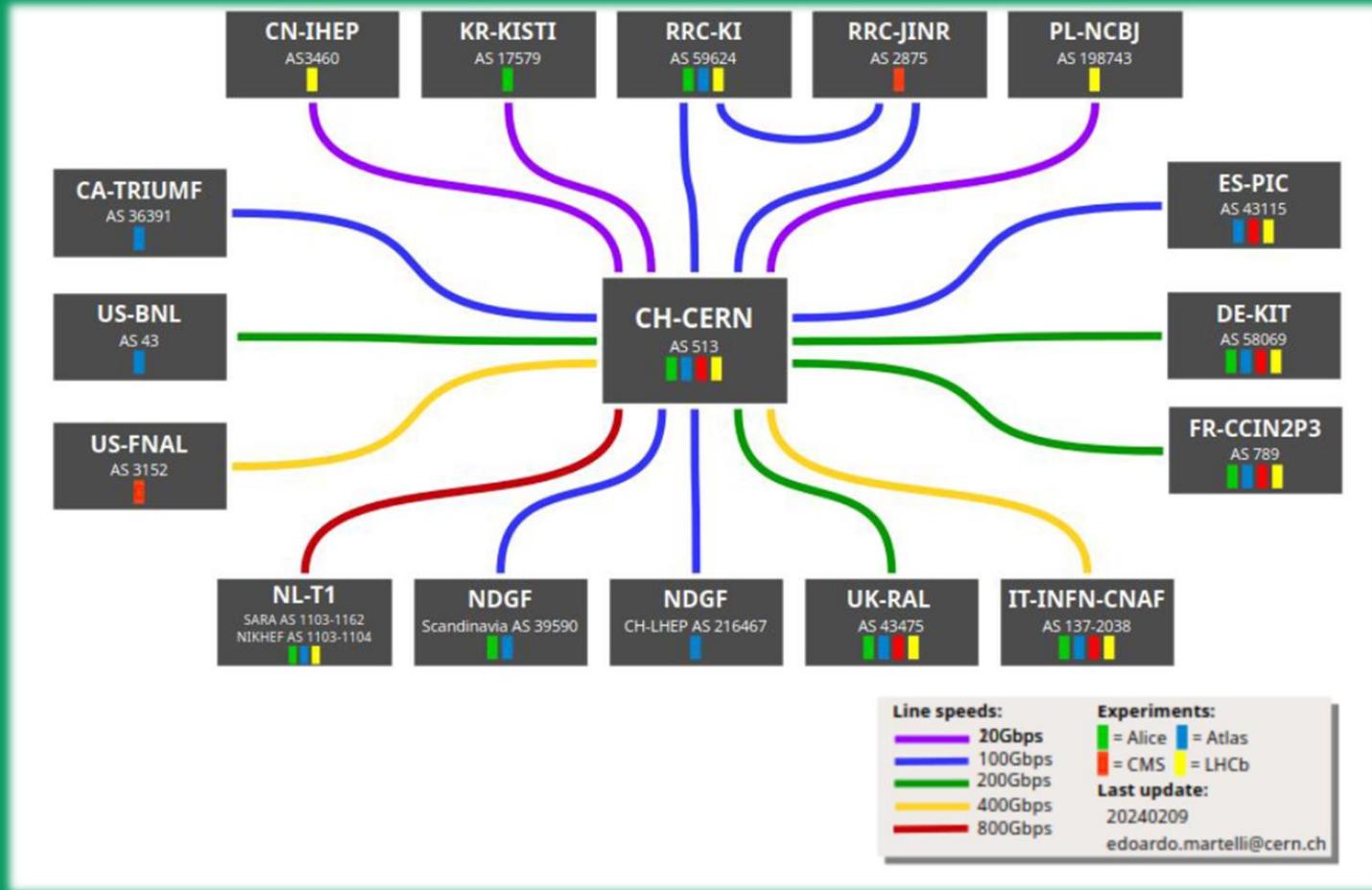
October 7th, 2025

Who are we?

- Karin Wessel & Arno Bakker
- Network Development Team @ SURF
- PM & TPM
- NetherLight GXP Amsterdam
- International Connectivity
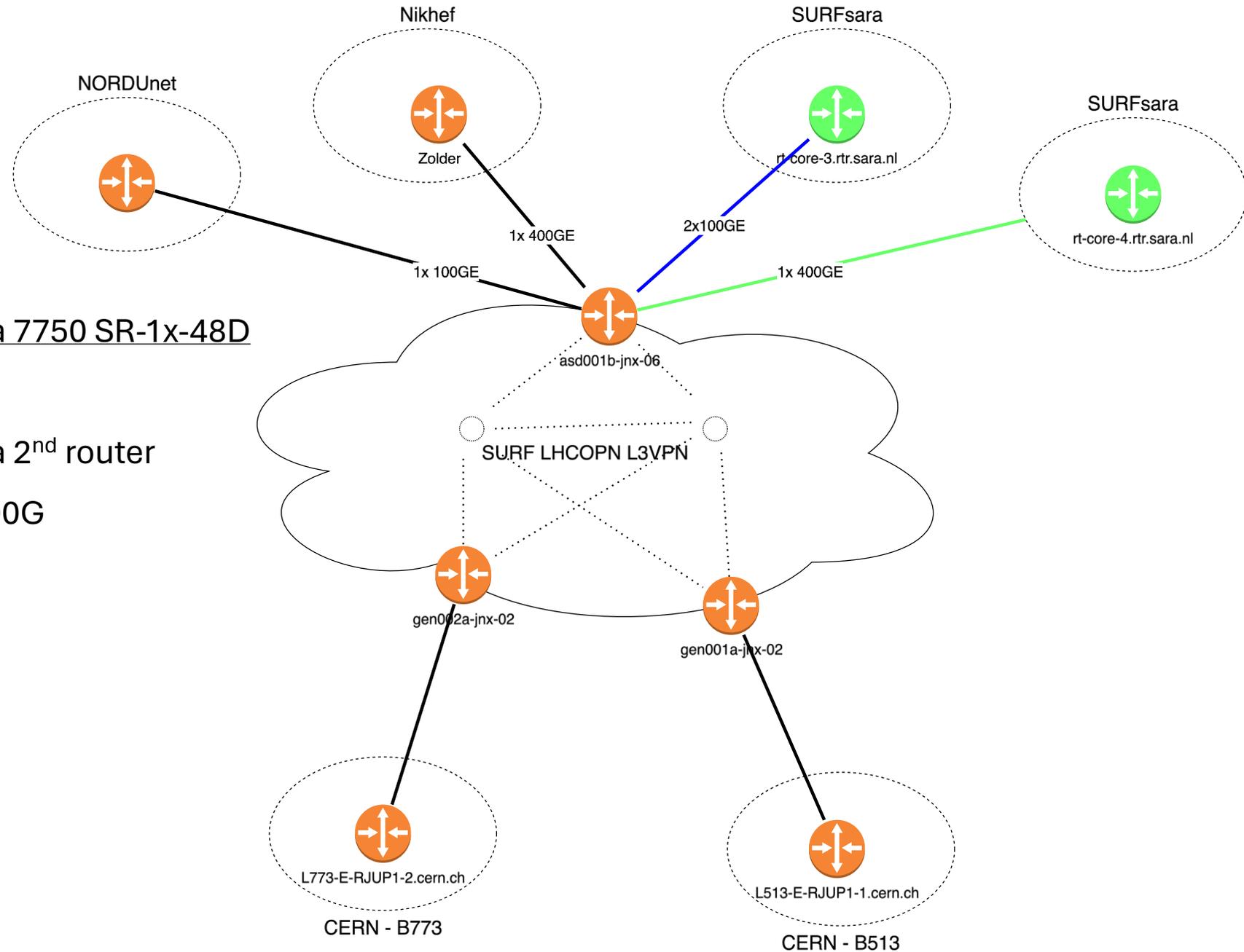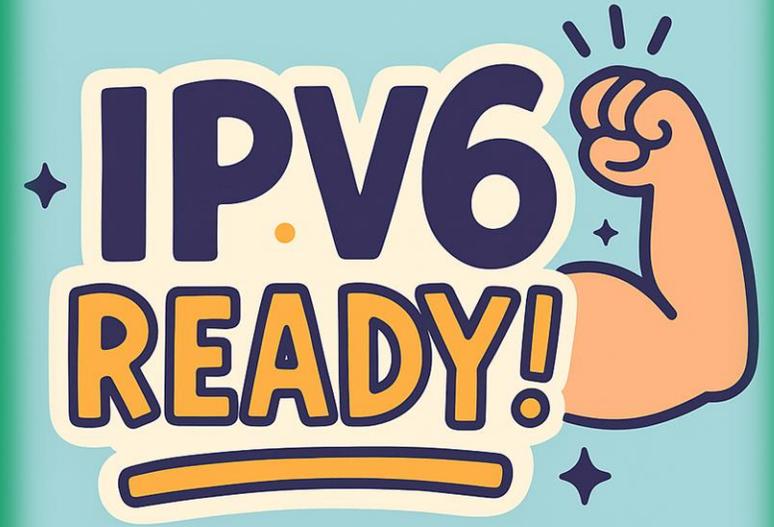- Science Engagement

NL-T1 UPDATE

NL-T1 DC Update

- Junipers replaced with two Nokia 7750 SR-1x-48D
- 800G capable
- Additional 400G link to SURFsara 2nd router
- Plans to upgrade 2x100G to 2x400G

Status IPv6 at NL-T1

- Previous IPv6 issue: **Neighbor Discovery table limit**

- Fix: **dCache cluster** moved to separate network

- First tests successful

- NL-T1 remains dual stack, **IPv6 now preferred**

SURF

Next Generation SURF Network

What is it, and why did we need it?

- Supports **L2 & L3 services**, with integrated orchestration
- Standardized, secure, and **future-proof service delivery**
- **Integration** with campus services, data center, wireless, quantum, and cloud

Tailored performance for diverse needs of the diverse member base:
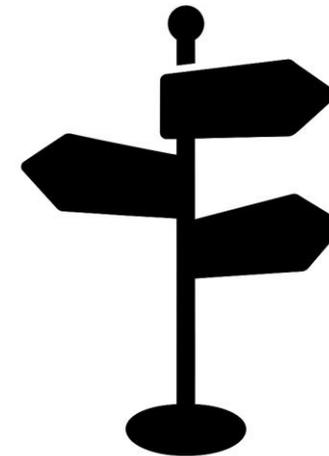
- Research groups → high bandwidth, ultra-low latency
- Institutions → high availability, strong security

To support a broad range of requirements, sometimes the only or best solution can be using **hardware from different suppliers**

New Procurement Model: Flexibility by Design

A broker-based approach to remain agile

- SURF must comply with the **European Procurement Act**
- Current contract ends **Q4 2025**
- Instead of a fixed hardware contract → **broker model**
- Enables:
  - **Mini-competitions** for new hardware
  - Faster reselection of suppliers
  - Flexibility to adopt best-in-class equipment when needed
- Result: agile, cost-efficient, **no lengthy procurement cycles**

The Reveal

And the winner is...

SURFnet INFINITY

- **Vendor Proof Of Concept completed** today

- **> 250 knockout criteria**

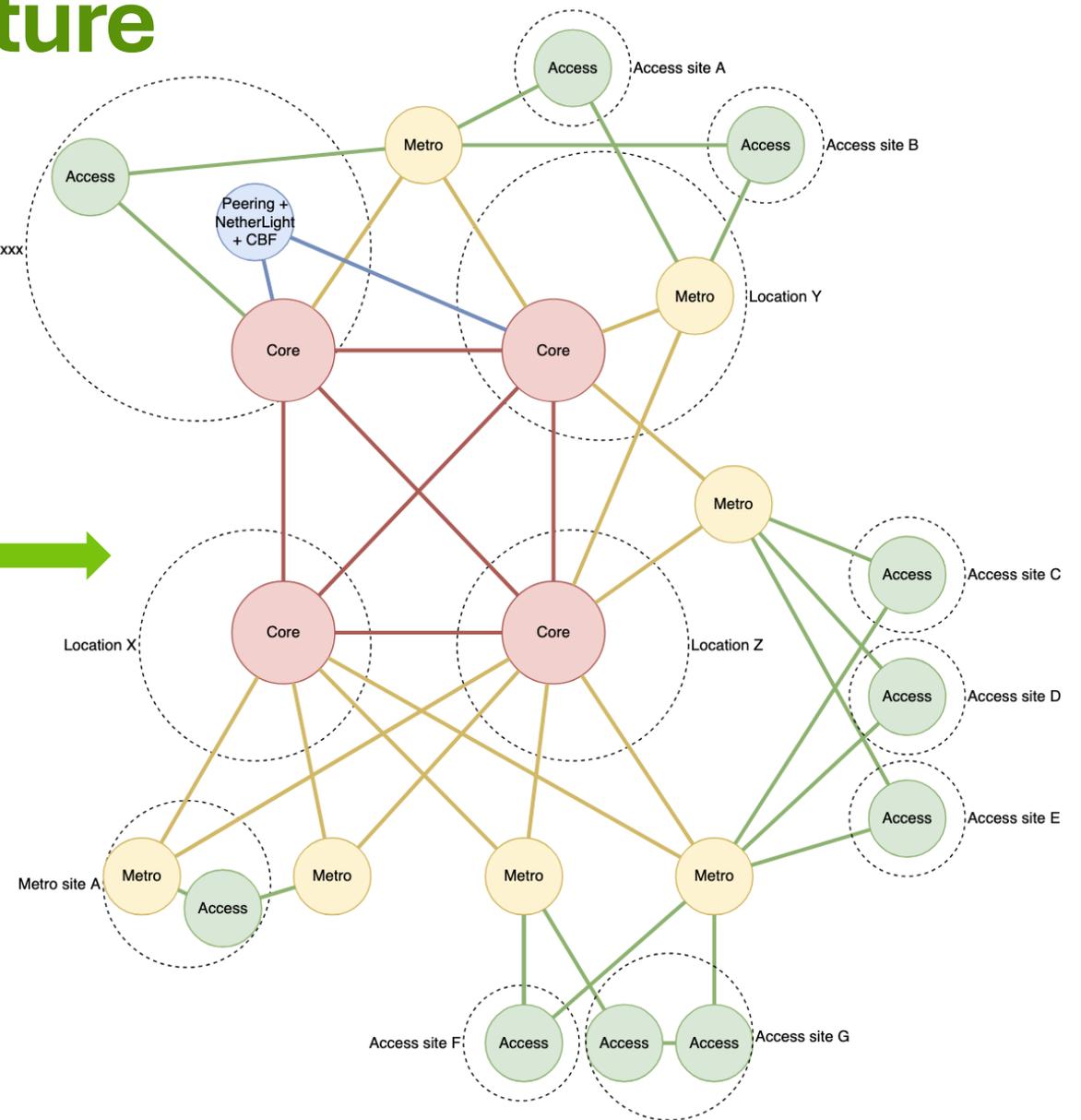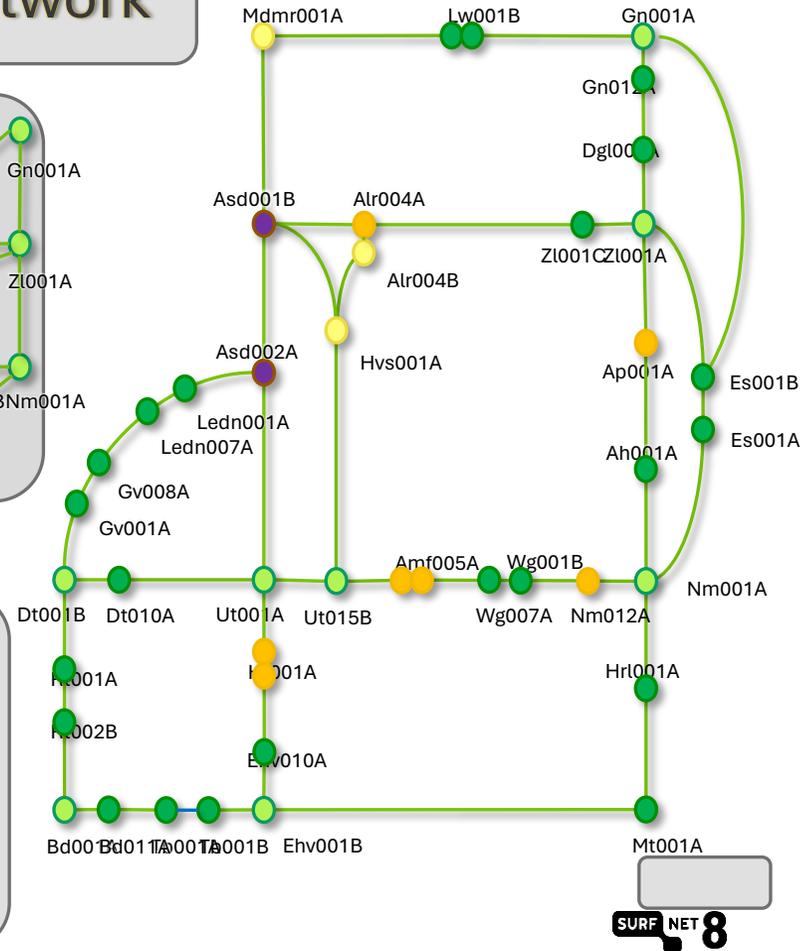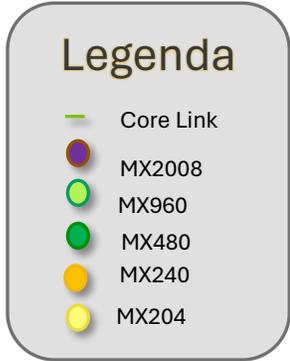- ...and the winning vendor of the first mini-competition for SURFnet Infinity is...
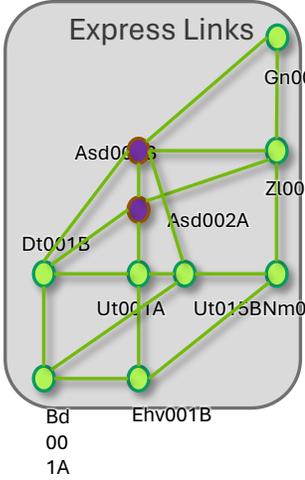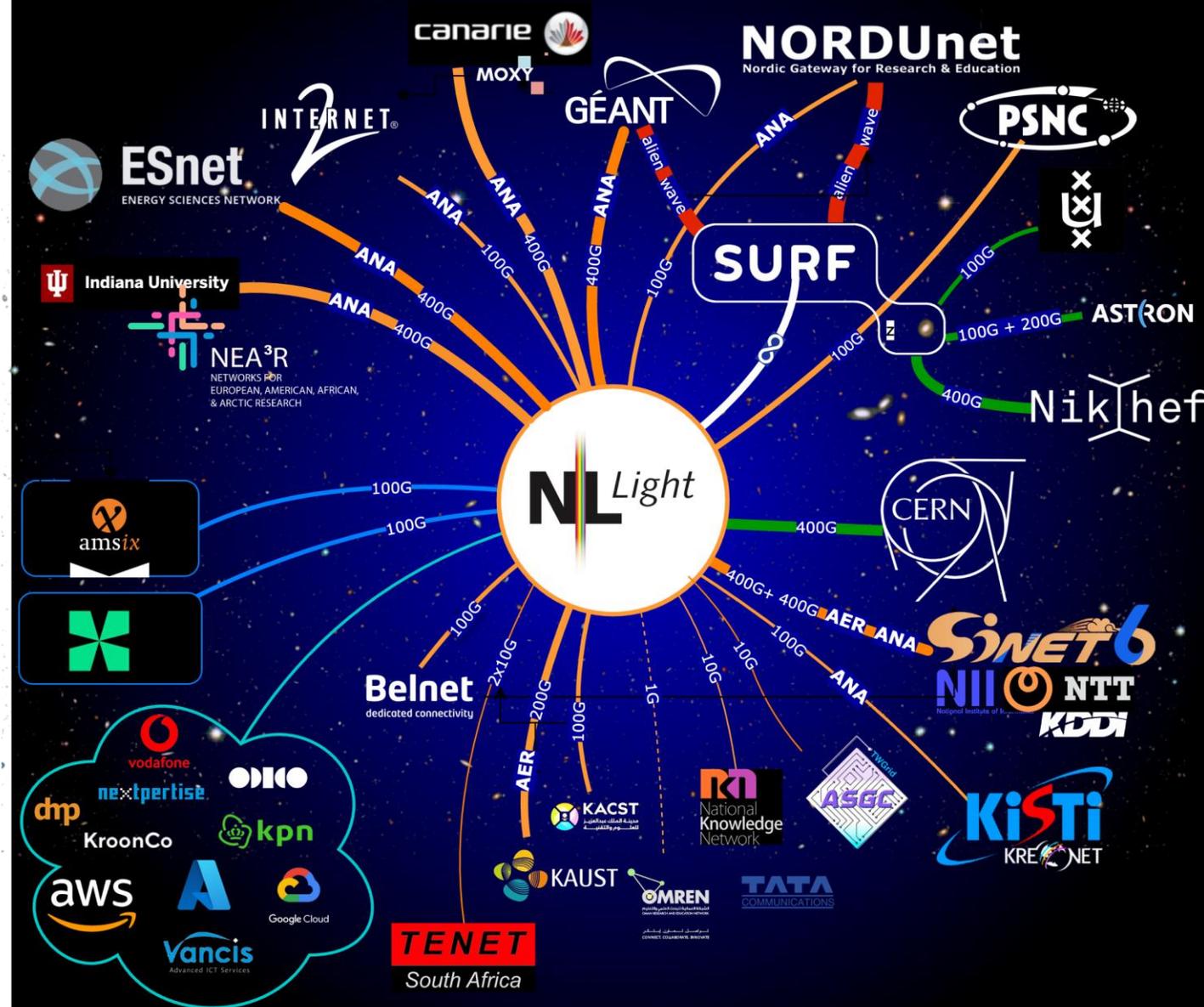
SURF

New Service Layer Architecture

NetherLight GXP update

NetherLight

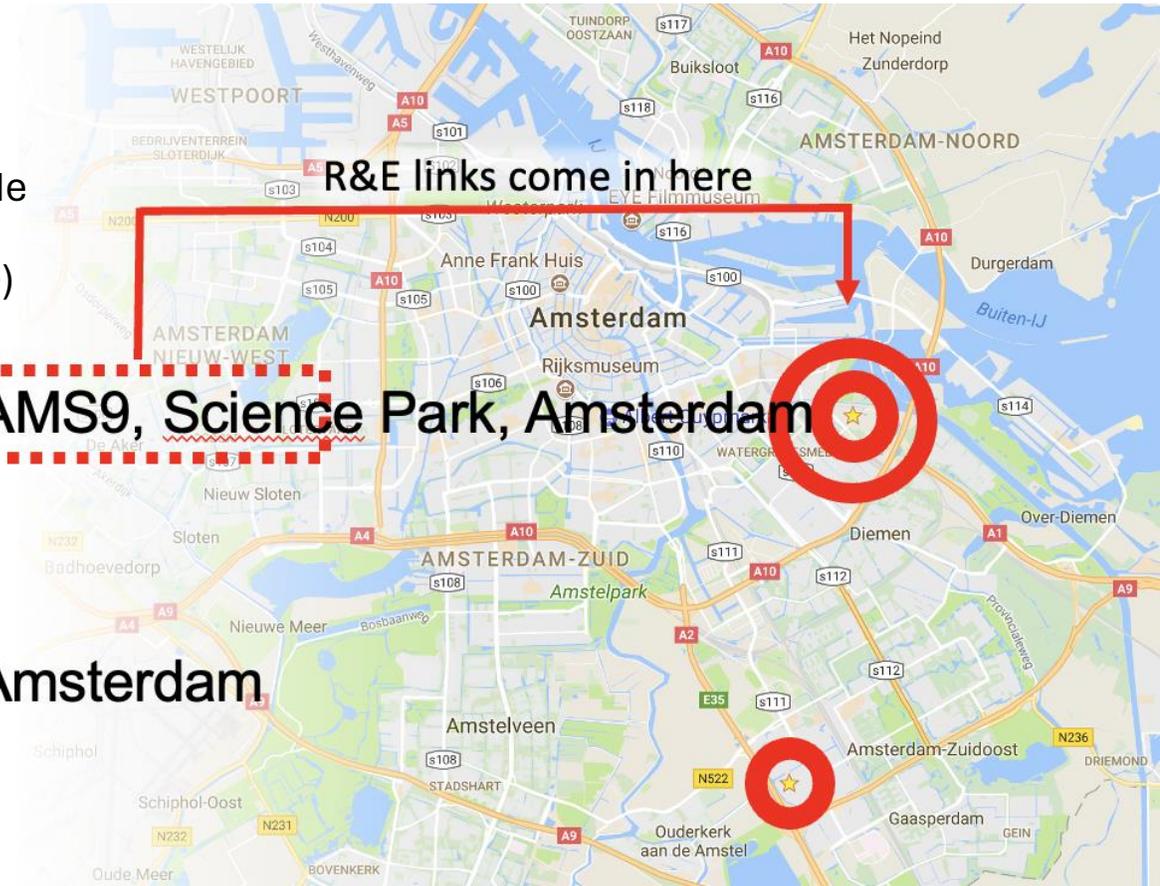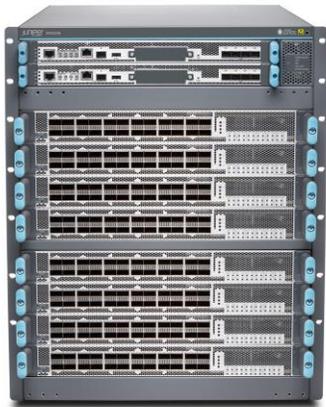Facilitates high-speed connectivity for research purposes up to 400 Gbit/s per interface

Offers interconnections via Ethernet VPN (multipoint & point to point)

Access for members to services from connected parties, such as NREN & Research Facility services worldwide, but also from various cloud providers.

NetherLight GXP update

- Two locations in Amsterdam
  - ASD001B (Digital Realty AMS9, Science Park – formerly known as InterXion AMS9)
    - **Juniper MX10008**
      - Up to 9.6T connectivity available (100G and 400G)
    - **Juniper MX480**
      - For < 100G connectors (1GE and 10GE)
      - Uplinks with n*100G to the MX10008
  - ASD002A (Equinix AM7)
    - **Juniper MX480**
      - Mainly for cloud connectors that would like to provide redundancy
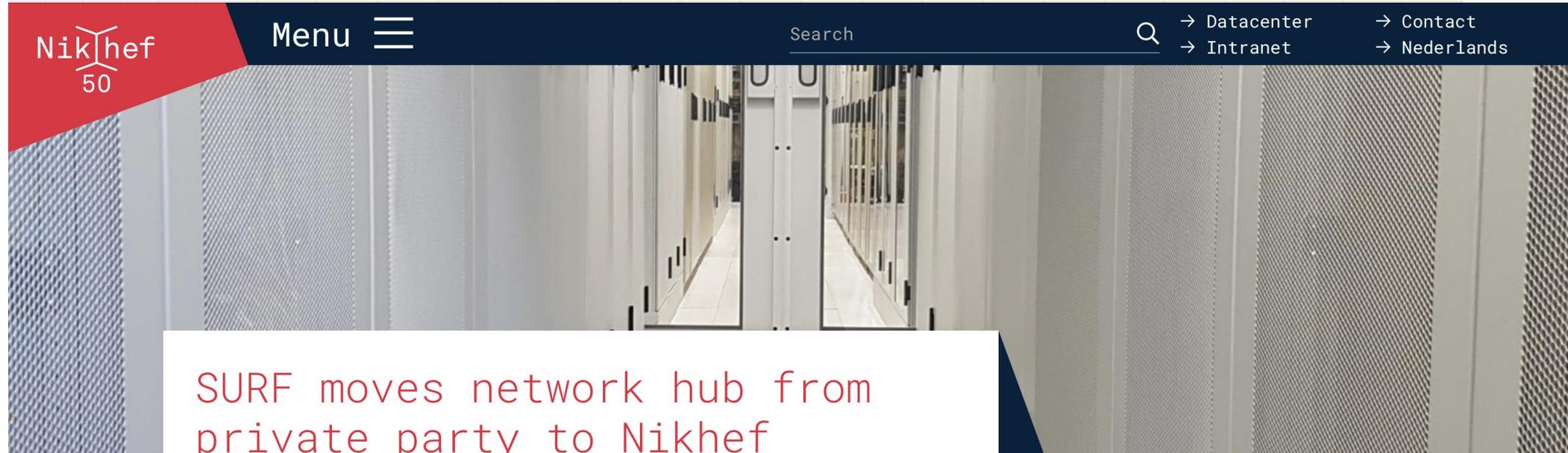   - Facilitates up to 100GE connections (1G, 10G, 100G)

- Digital Realty AMS9, Science Park, Amsterdam

-- 11 km fiber in between --

- Equinix AM7, Amsterdam

R&E links come in here

NetherLight GXP moving to [Nikhef](#) in 2026

Nikhef 50

Menu ☰

Search 🔍

→ Datacenter
→ Intranet
→ Contact
→ Nederlands

SURF moves network hub from private party to Nikhef
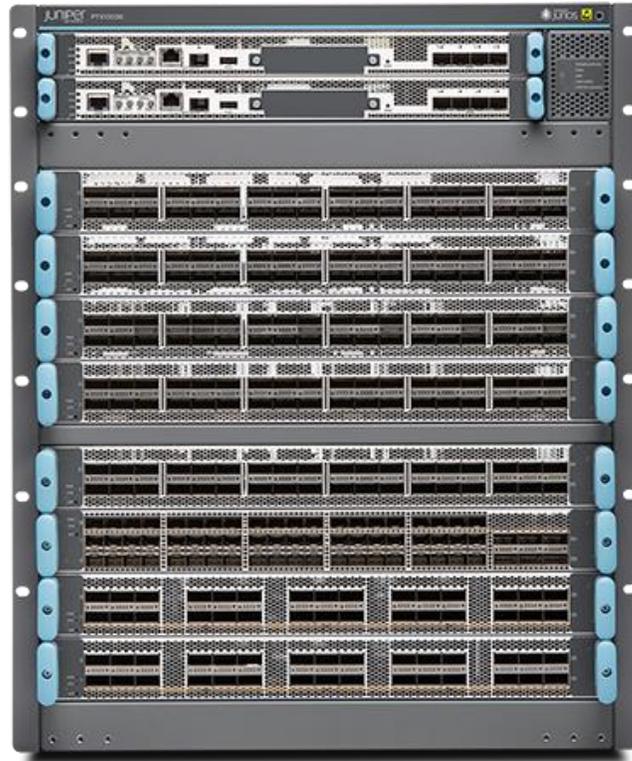
HOME NEWS → SURF MOVES NETWORK…

9 July 2025

SURF is moving a significant part of its network from a commercial data center to the data center of Nikhef, one of its cooperative members and scientific partners. The move is in line with the cooperation's aim to achieve greater independence, sustainability, and collaboration.

SURF

From MX to PTX: NetherLight's Next-Gen Core

Scaling NetherLight for Future Science Traffic
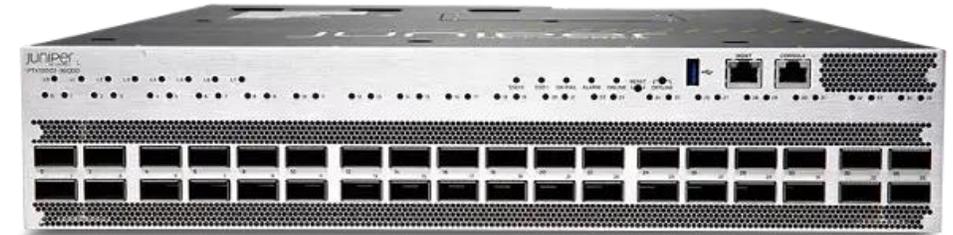
NetherLight PTX10008
- modular chassis with up to 8 LC1301 line cards
- each line card provides 36 x 800G QSFP-DD800 interfaces
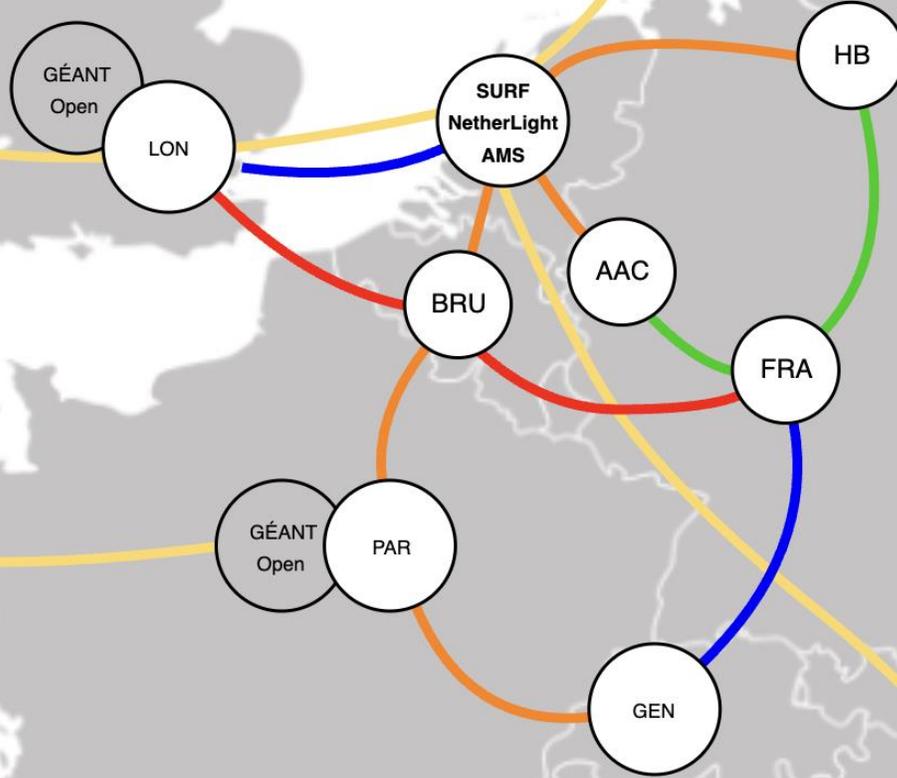- total capacity: up to 230.4 Tbps (28.8 Tbps per line card)

CBF/Peering nodes PTX10002-36QDD
- fixed configuration router
- provides 36x800G QSFP-DD800 interfaces directly, without modular line cards
- capacity up to 28.8 Tbps per node

SURF's Cross Border Fiber system

Cross Border Fiber system (CBF)

- Production traffic from/to CERN

- Well-connected to the four Open Exchange Points in Europe

  - NetherLight @ Amsterdam
  - GÉANT Open @ Londen
  - GÉANT Open @ Paris
  - CERNLight @ Genève

- Perform cutting-edge trials (800G, 1+ Tbps)

Ciena Terabit Trial

- Goal: Test multiple 1 Tbit/s or higher connections over brownfield fiber

- Trajectory: Amsterdam to CERN, site Prevessin, 1648 km

- Equipment under test:
  - Ciena WaveLogic6 Extreme
  - 1.6T Transponder Module is a multi-rate, single-carrier coherent transponder capable of transmitting and receiving up to 1,600 Gbit/s of client payload on a single wavelength.

SURF's line system on a map

Amsterdam – Geneva

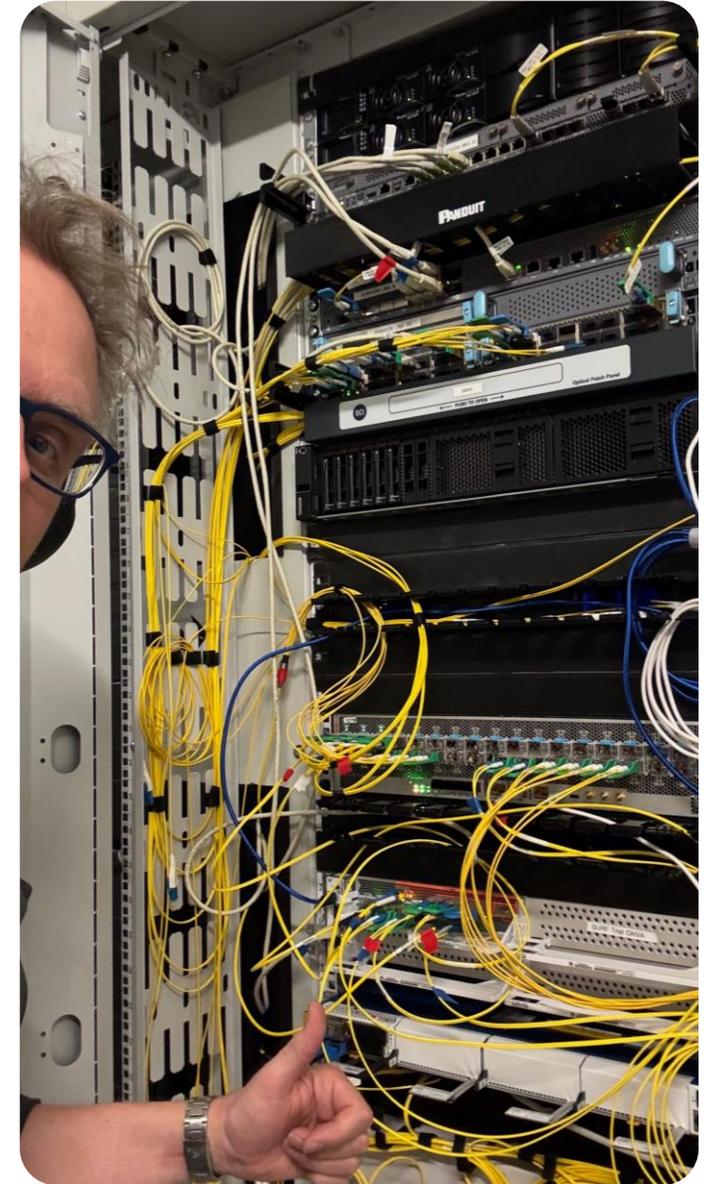- Total fiber distance (one-way) is 1648 km.

- Mostly G.655 fiber (not ideal)

AMS   ROADM site

Amplifier site
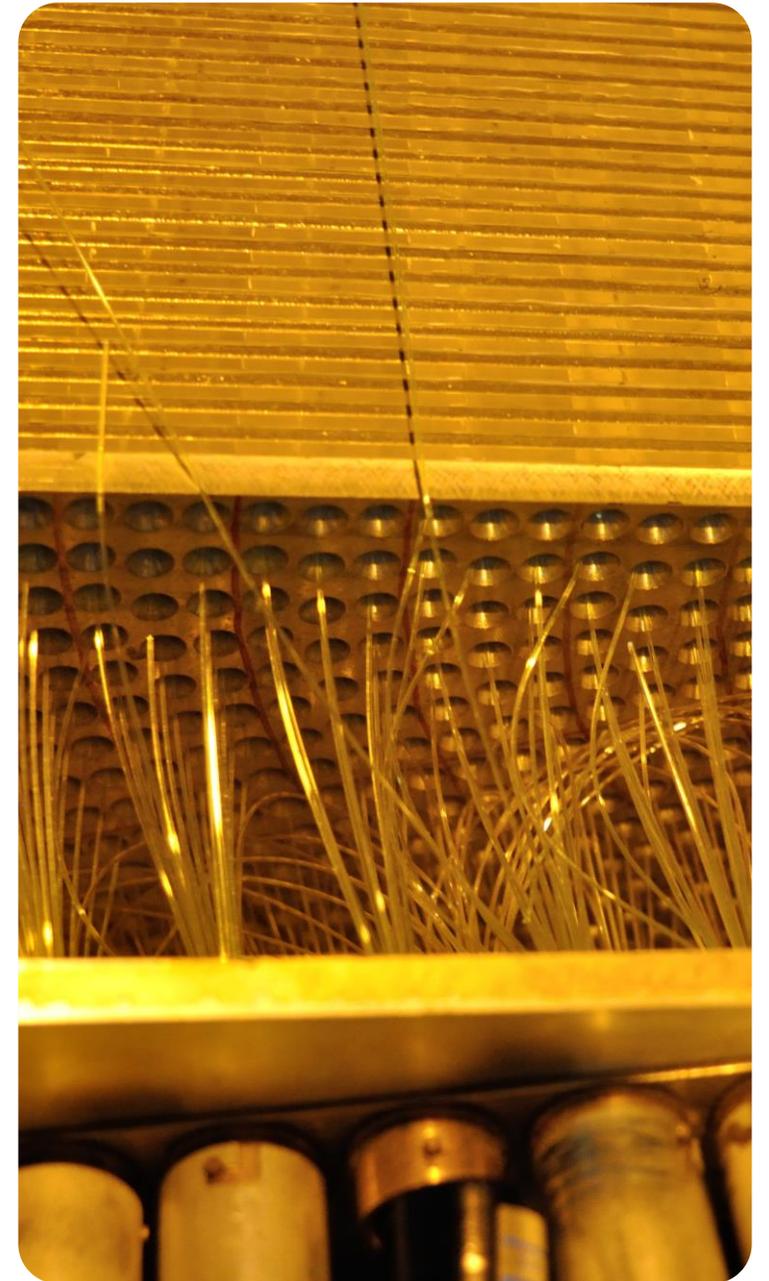
FOADM site

Raman span (current)

Test Setup

- Ribbon line system

- Ciena Waveserver 5 interconnect platform

- 2x Ciena WaveLogic 6E modules

- Amsterdam (Nikhef):

  - Juniper QFX router

  - Lenovo 4x400G packet generator server, NVDIA ConnectX-7 single port

- Geneva:

  - Ciena 8190 router

  - Lenovo 4x400G packet generator server, NVDIA ConnectX-7 single port
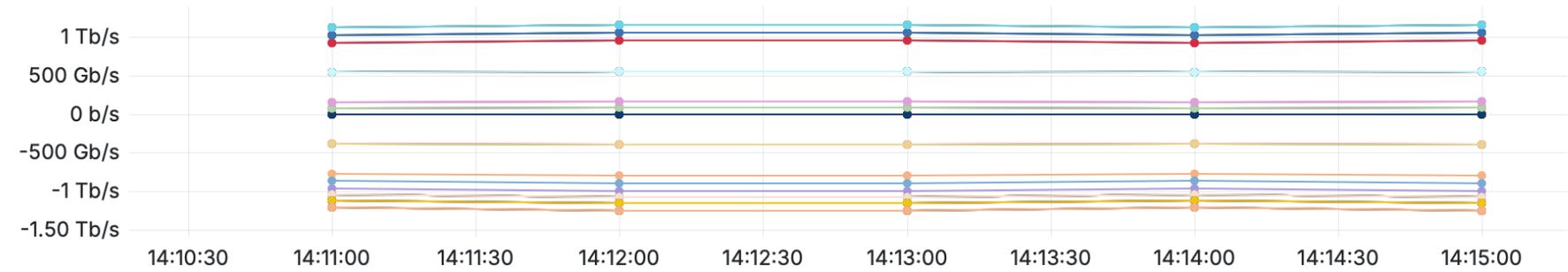

SURF

Optical Setup

- Two frequencies, 200 GHz bandwidth
  - 191.55000 THz
  - 193.20 THz

- Single lamba lines configurable to 800-1200 Gbit/s
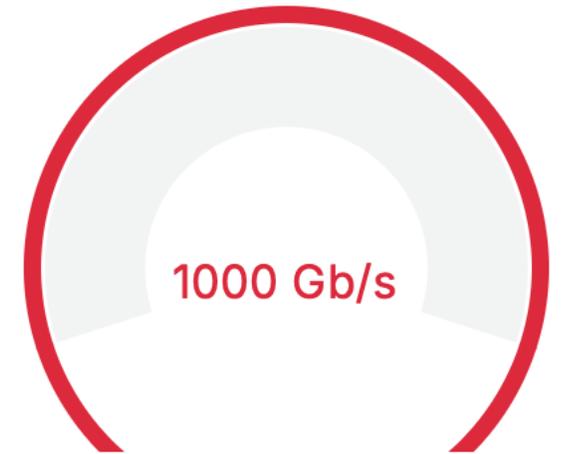
- Client side 2x400G + 4x100G Ethernet to match line speed

SURF

Results from Grafana

GEN LINE 1 → 8190

1000 Gb/s

AMSTERDAM QFX

What did we learn from the CIENA Trial?

- The current brownfield fiber is already *Terabit-ready*
- Some software and OSC issues limited throughput beyond 1 Tbit/s
- The existing fiber type is reaching its physical limits
- We plan to replace this fiber with new infrastructure
- RFI planned for late 2026 / early 2027

MANY THANKS TO

- Scott, Abdul, Marc *et al.* at Ciena

- Tristan Suerink at Nikhef

- John Shade *et al.* at CERN

Key Takeaways from this Presentation

SURF

- NL-T1 upgraded — new 800G routers and additional 400G link to SURFsara

- Ready for IPv6-only testing

- Juniper won the first SURFnet Infinity mini-competition

- New NetherLight core (PTX10008) planned for 2026 at Nikhef

- SURF's Cross-Border Fiber remains terabit-ready — fiber renewal planned for 2026–27

- Ongoing innovation through terabit and multi-Tbit trials

Thanks for listening!
Any questions?

- karin.wessel@surf.nl
- LinkedIn and #nren channel on Slack