



Fibre Sensing

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Network Technologies Workshop

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Public (PU)

GN5-2

Agenda

- An introduction to Fibre Sensing
- Aim of the FS-Subtask
- Main activities
 - Technologies
 - Data Acquisition and Security
 - Range of Possibilities
 - Pilot Project

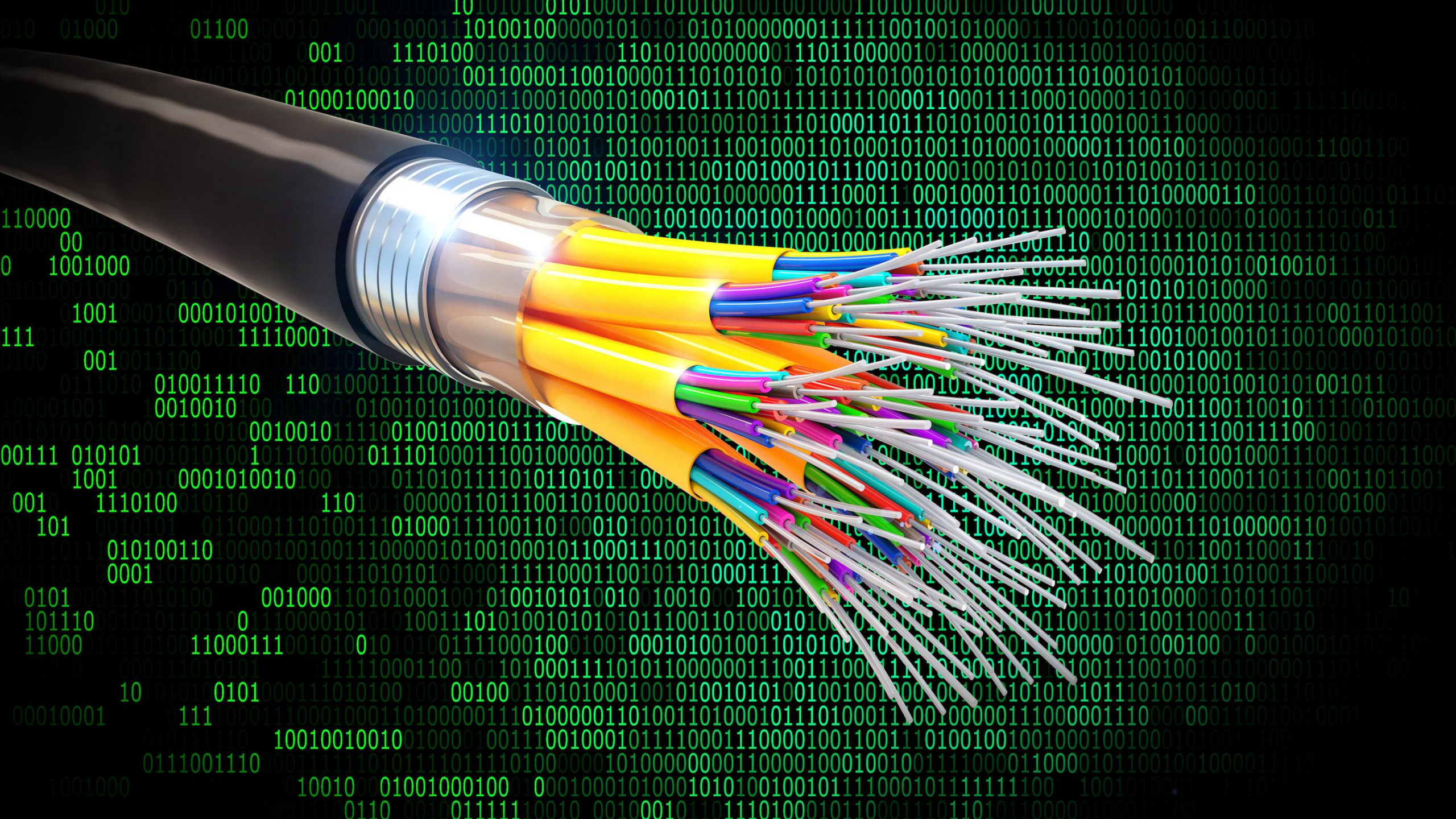
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An introduction to Fibre Sensing



- Fibre cables as an infrastructure for data transport are widespread
- Example: Research Network in Denmark, terrestrial and submarine cables



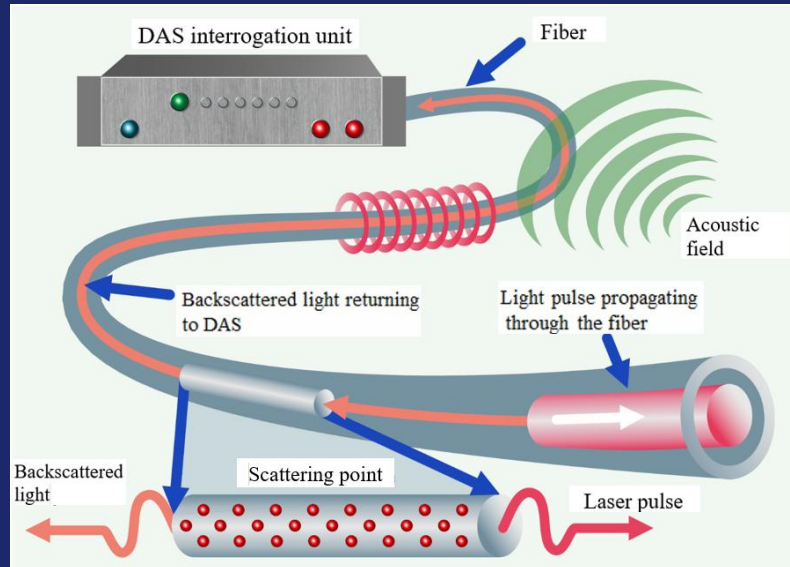
An introduction to Fibre Sensing



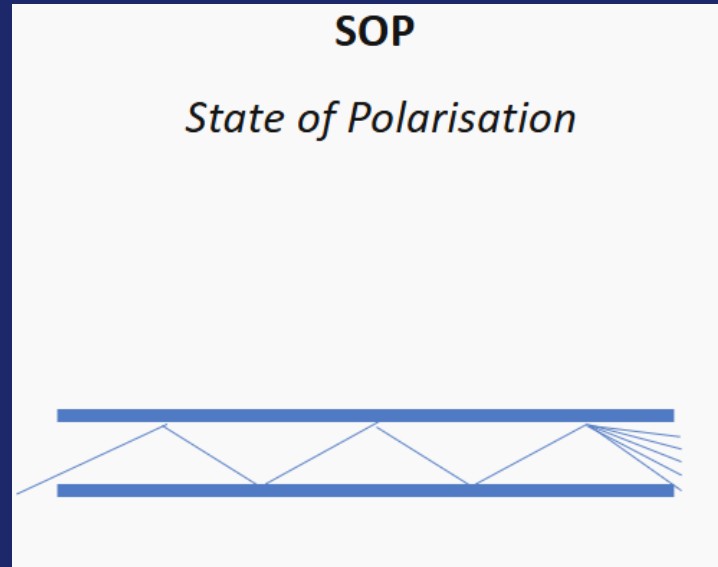
<https://www.optasense.com/technology/odhf/>

- By attaching interrogators to the cable the fibre works as a sensor and can collect information on what makes the surrounding move
- Detection of earthquakes, waves, tsunamis, whales, ships, submarines...
- Monitoring of infrastructure (train tracks, roads, airplanes...)

An introduction to Fibre Sensing

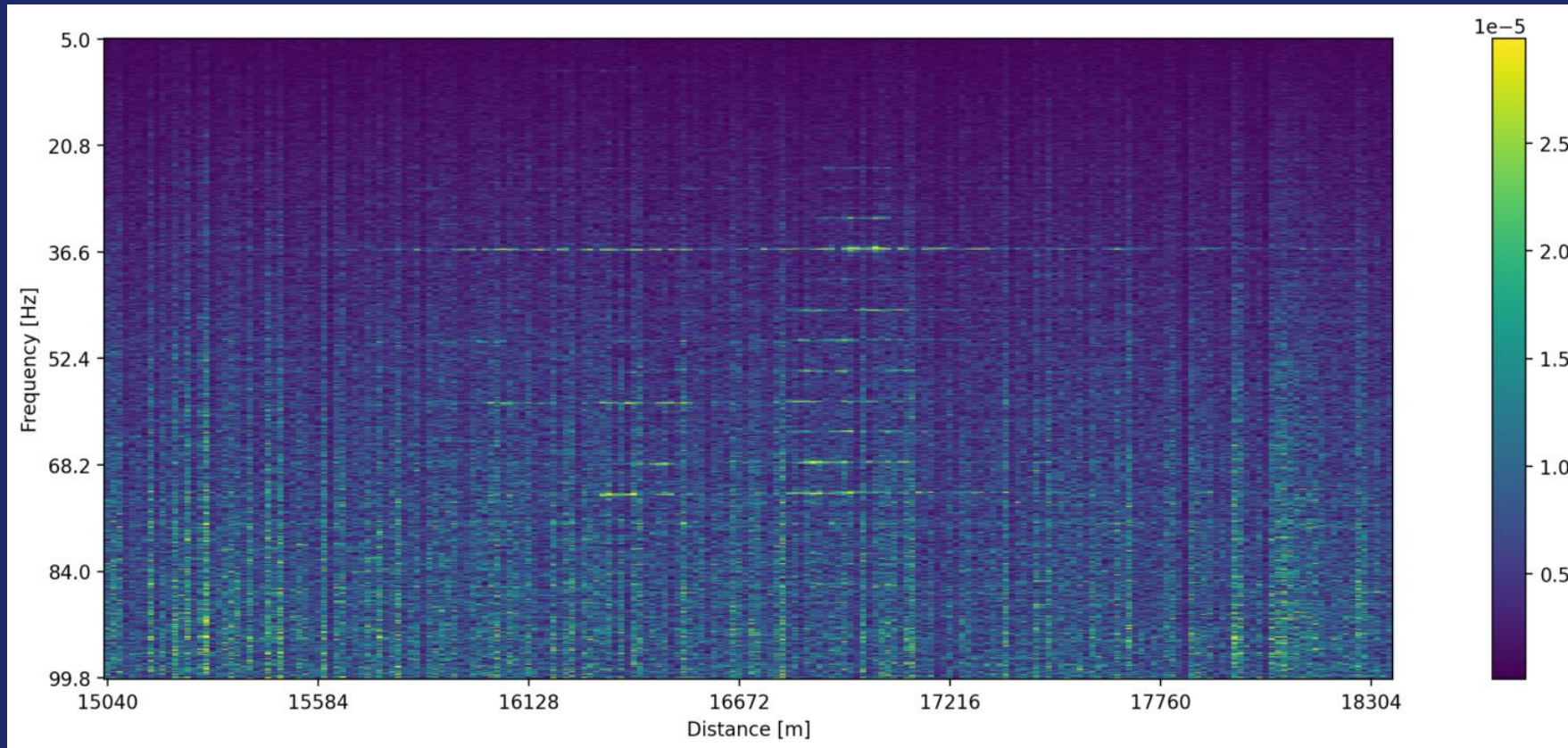


- Backscattered light (Rayleigh scattering)
- Scattering → interaction of light with atomic structures (silica) and particles (impurities) in the fibre
- Detection and measuring of stretch/stress and strain/pressures.



- Changes in the state of polarization of light to detect anomalies
- Caused by changes in fibre birefringence
- stretch/stress and strain/pressures can be detected and measured similar to DAS

An introduction to fibre sensing



- Example: Frequency Domain plot for a ship passing over a cable

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Aim of the Fibre Sensing Subtask

- Transformed from an incubator to a subtask
- The goal: Transform this subtask into a service
 - Documents need to be prepared
 - Our own knowledge needs to be expanded
 - We need to expand our collaboration with NRENs
- Subgroups have been formed to achieve this

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Technologies

- Fibre Sensing needs Technology
- Different technologies are available for DAS and SoP
- Different projects and conferences around fibre sensing are highlighting progress
- Equipment needs to be benchmarked and compared to each other

Technologies - outputs – outputs (in 2025 and beyond)

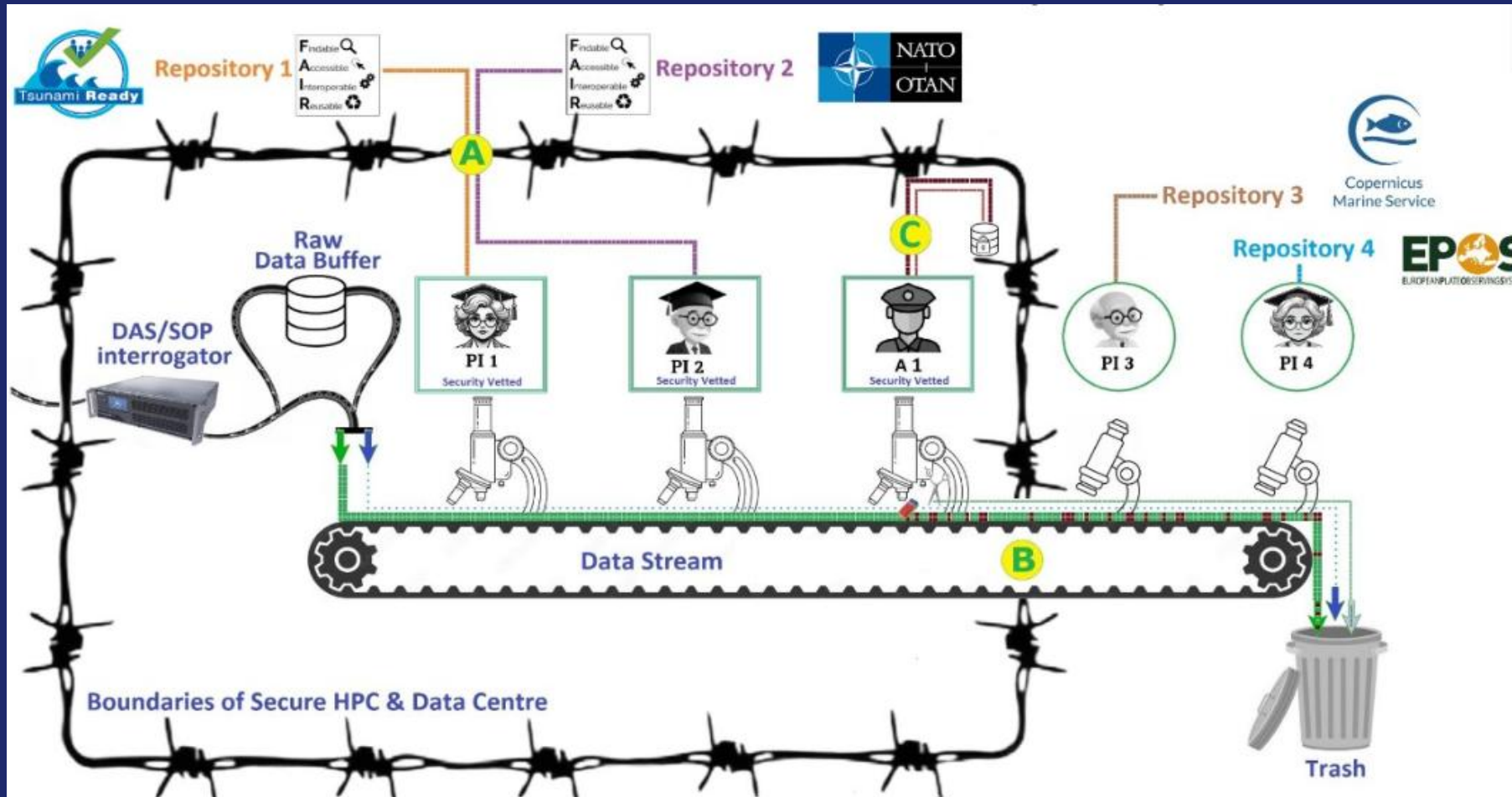
- Reports
 - Conference reports (e.g. ECOC and OFC)
 - Benchmarking sensing equipment
 - Analyze and describe DAS benchmarking procedures: criteria & parameters, scenarios, different fiber types and environment, etc.
 - Test results from different DAS equipment available in the market
 - White Paper: Best practices for an NREN
 - Infrastructure
 - Stakeholders
 - Technology
 - Use cases
 - Mapping of use case - sensing technology – TCO
- Workshop
 - Methods and tools for data analysis
- Creating an overview
 - Ongoing fibre sensing projects and the technologies being used

Data Acquisition and Security

- Data can be collected from fibres within data cables
 - both subsea and terrestrial cables
- Large amounts of data are created
 - A field campaign from Svalbard: up to 7 TB per day
 - Data can be reduced by filtering, exclusion of channels and spatial limits
- A lot of noise
 - But we don't know yet what noise is really just noise or could be interesting
 - General noise and discipline specific noise
- Involvement of different stakeholders
 - Researchers, NRENs, Fibre infrastructure owners, civil protection agencies, national security agencies...

We want FAIR data!

Data Acquisition and Security



- The security architecture as envisioned in the SUBMERSE White Paper

(available here:
<https://zenodo.org/records/14998707>
<https://zenodo.org/records/14998707>)

Data Acquisition and Security

- Next steps:
 - Alignment of Data Management and Security issues across different Fibre Sensing projects
 - Informal workshop with prepared questions on the project's thoughts and plans on making data accessible in a secure way.

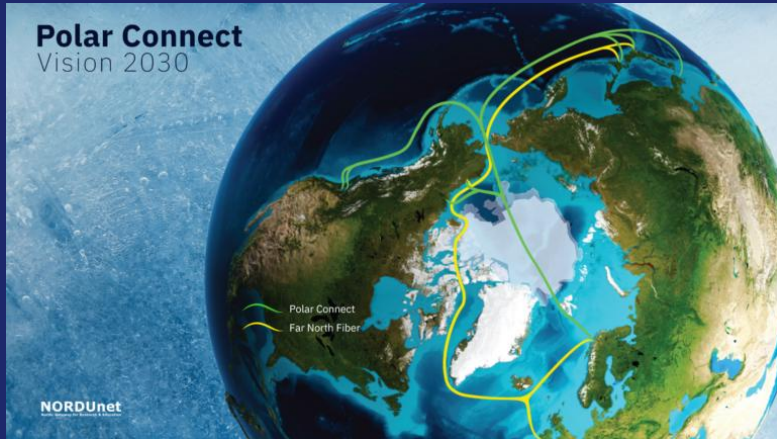
Range of Possibilities

- Focusing on *Users* and *Cases*
 - NRENs – monitor their own infrastructure
 - Research groups – various opportunities in environmental monitoring
- Collect knowledge for example through direct interaction with known user groups
 - What are the user requirements?
 - What is their knowledge level?
 - What do they want to monitor?

Range of Possibilities - outputs

- Short and longer documents
 - Table of user requirements
 - Finishing the Use Case document
- Presentations at infoshares, workshops and conferences

Other Projects



The Pilot

- GÉANT's DAS unit
 - deployment in 2025
 - on the cable between England and Ireland
- Integrating the knowledge of all 3 subgroups
- Pulling on knowledge of other projects with experience



Thank You, any questions?

If you have more in depth questions, please contact:
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