NDFF
EPSRC National Dark Fibre Facility

NDFF:
The National Dark Fibre Facility

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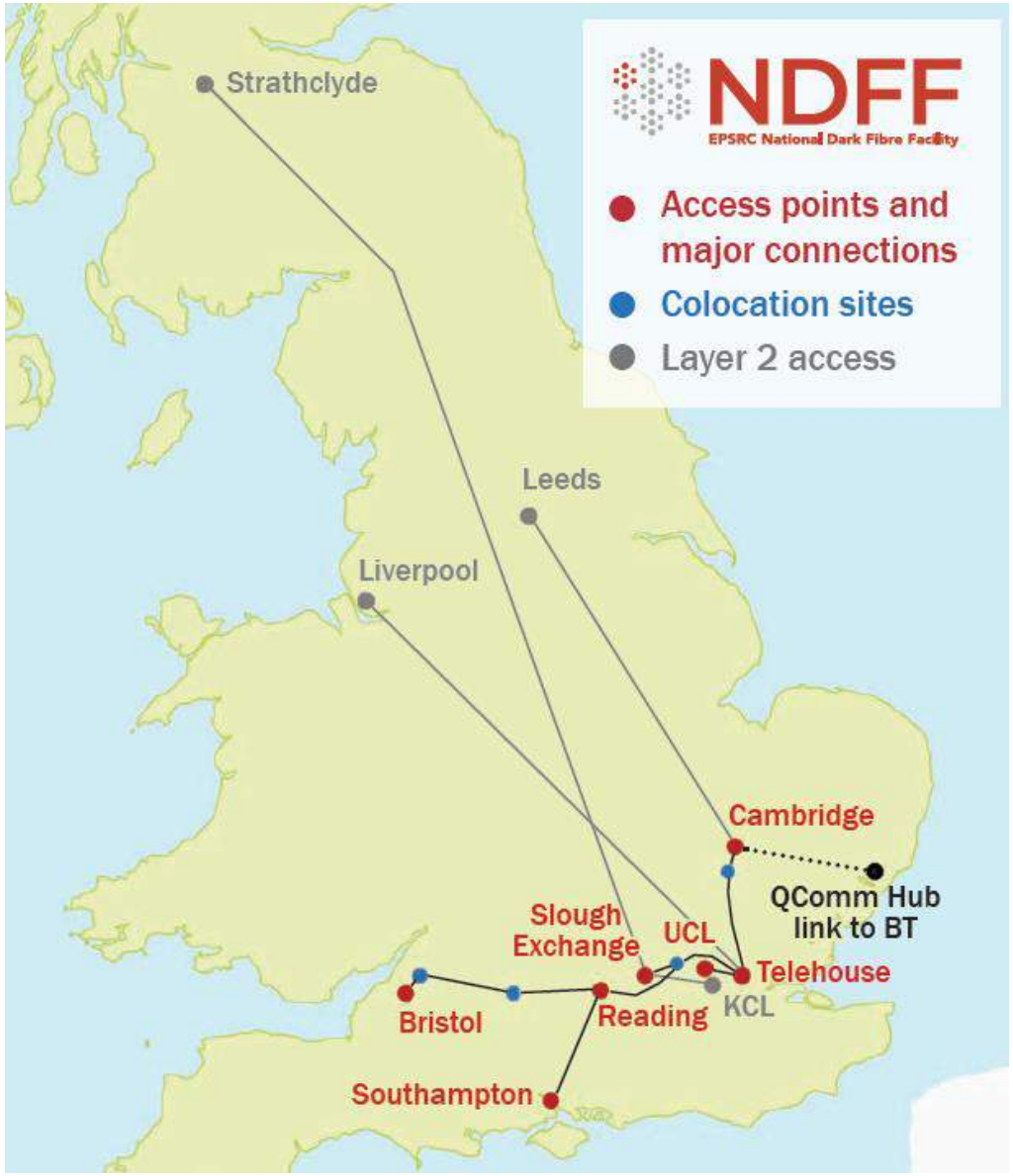
UCL · University of Bristol · University of Cambridge · University of Southampton · UKRI Engineering and Physical Sciences Research Council

In Partnership with Jisc

The National Dark Fibre Facility

The National Dark Fibre Facility

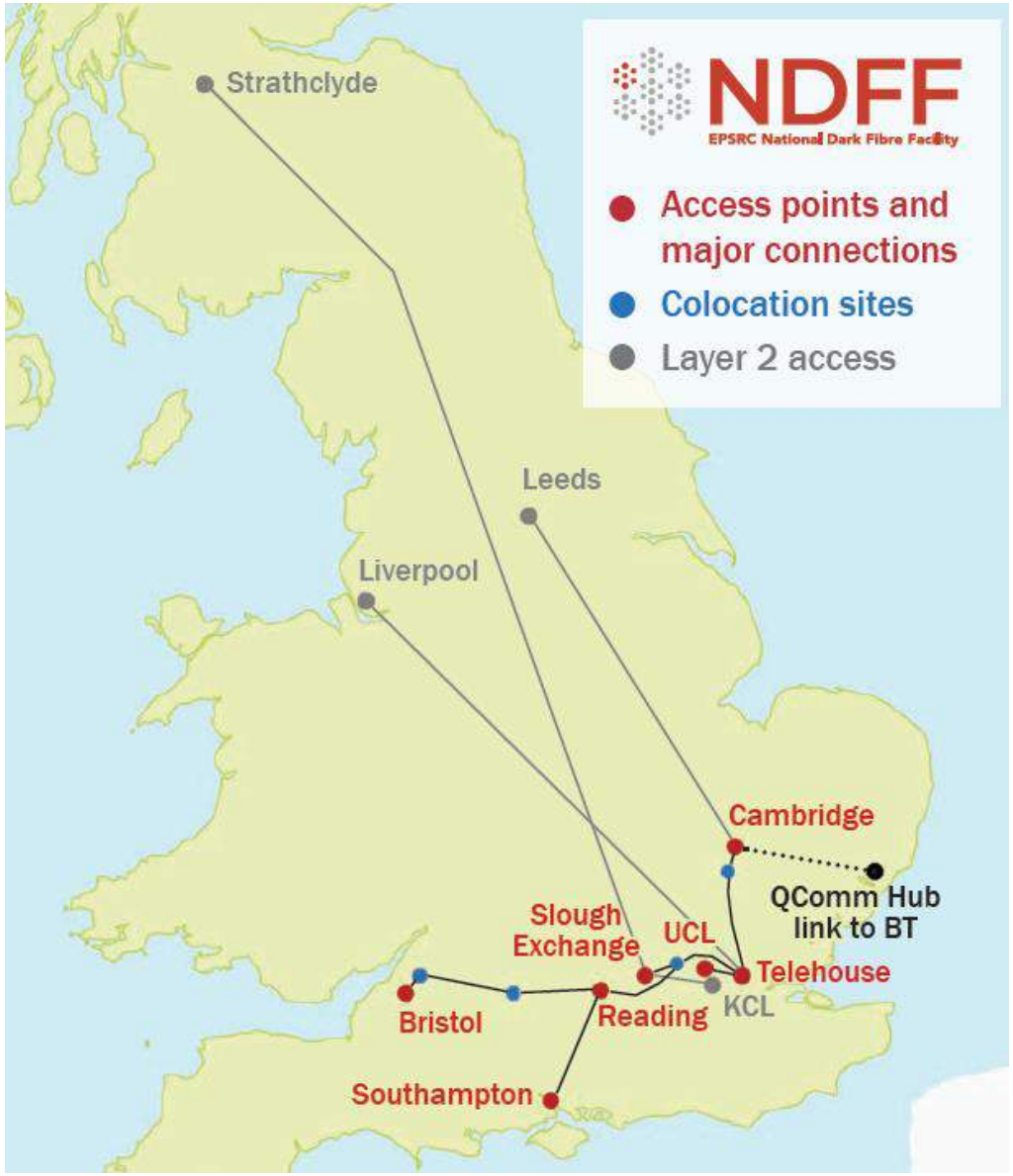
is an EPSRC National Research Facility supporting research into new communications technologies for the future internet



The National Dark Fibre Facility

NDFF provides:

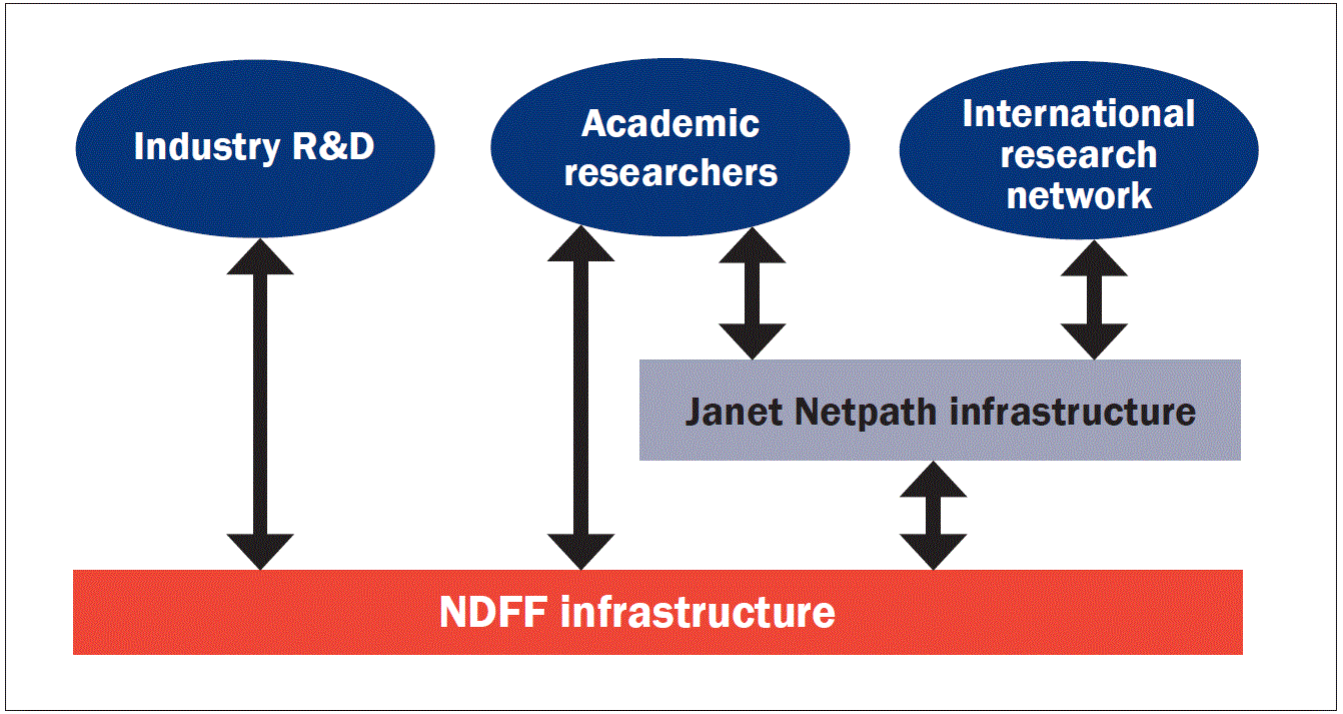
- a network of over 1000 km of single-mode optical fibre, together with control and monitoring systems (provided through the Jisc Janet Network).
- access to a dedicated dark fibre network at the physical layer, through access points at four universities and major internet exchanges.
- access for researchers throughout the UK via Layer-2 connections, equipment hosted at access points and remotely.
- a reliable, ultra-high-bandwidth network that can be configured remotely and dynamically.



Access to the network

The NDFF research network can be utilised by a wide range of users, including EPSRC funded researchers, industrial partners, other public bodies and overseas research collaborators.

Researchers can access the network both directly, by installing equipment at a host university, or by attaching to the network remotely through the Janet Netpath service.



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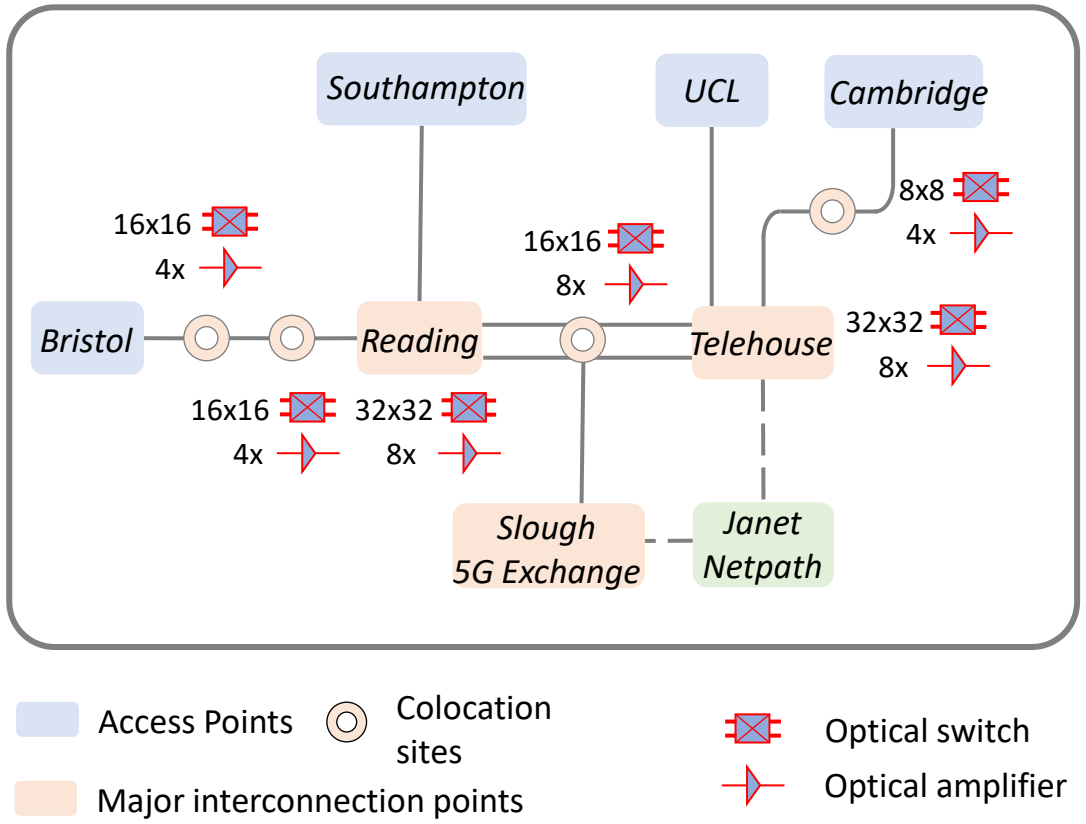
Infrastructure



- All nodes have optical switches and amplifiers installed.

Polatis optical switch

LeaPhotonics EDFAs

- All nodes have L2 switches hosting up to 48 channels using 10 Gbit/s SFP+.

- All nodes have switchable optical dispersion compensation.

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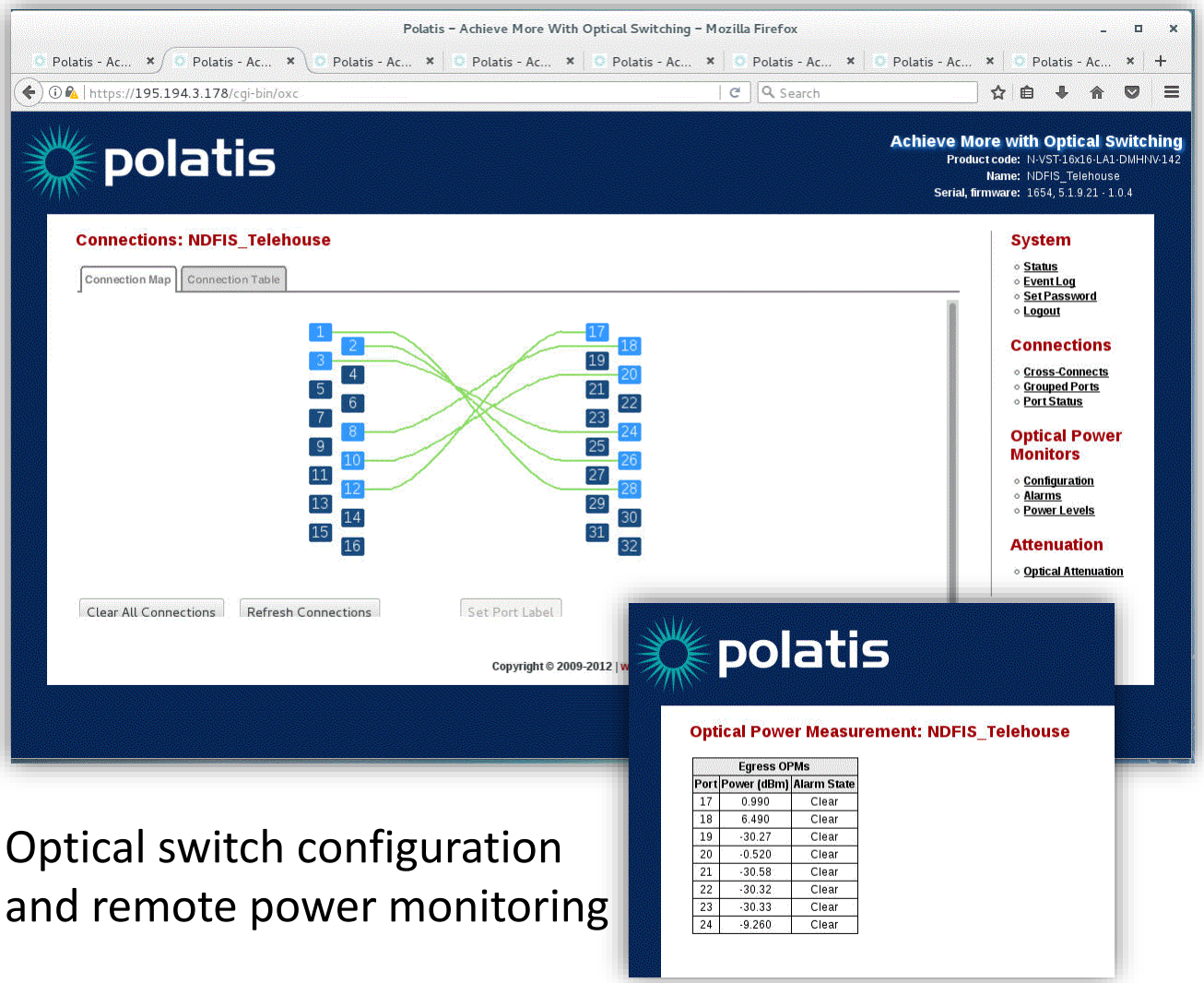
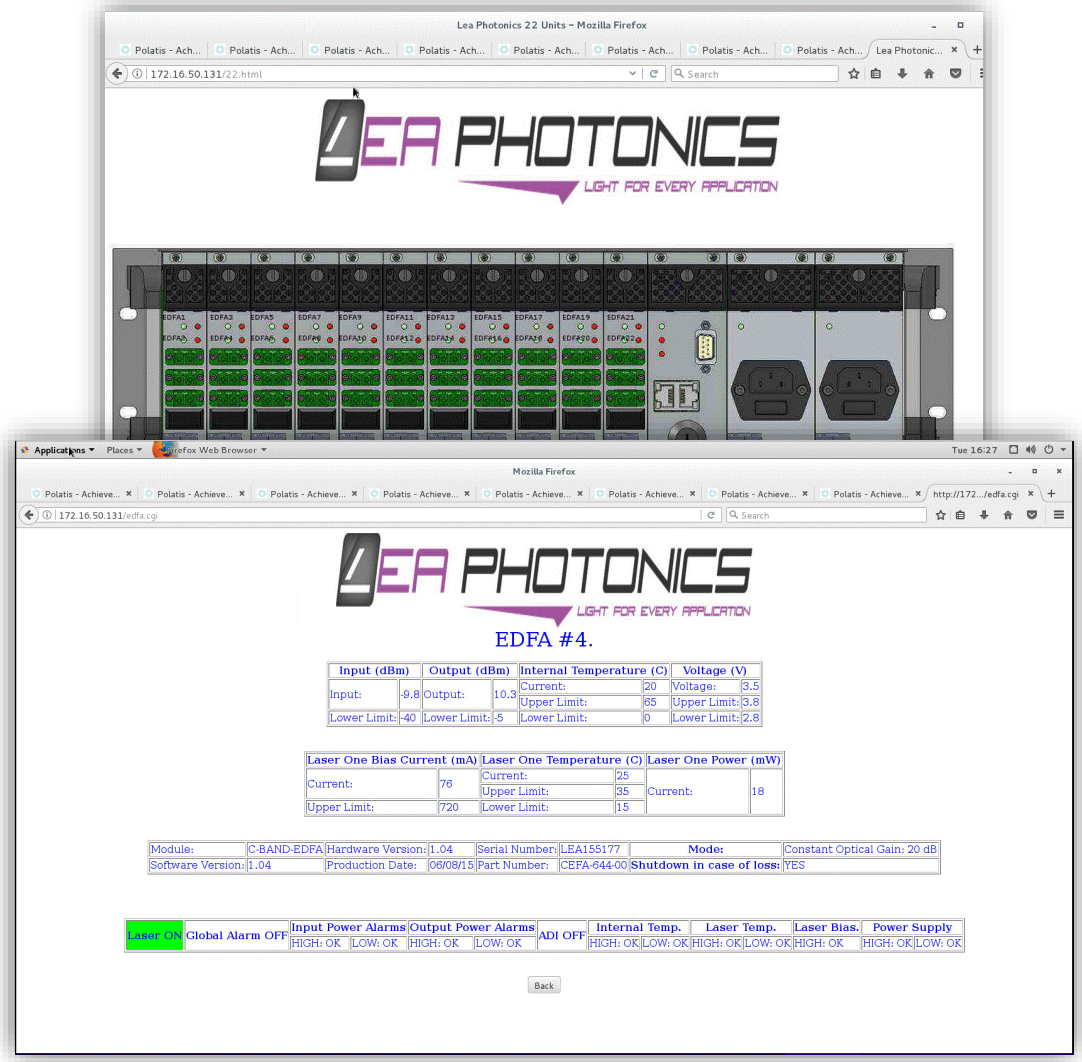
Remote configuration



Optical switch configuration and remote power monitoring



EDFA control and monitoring interface

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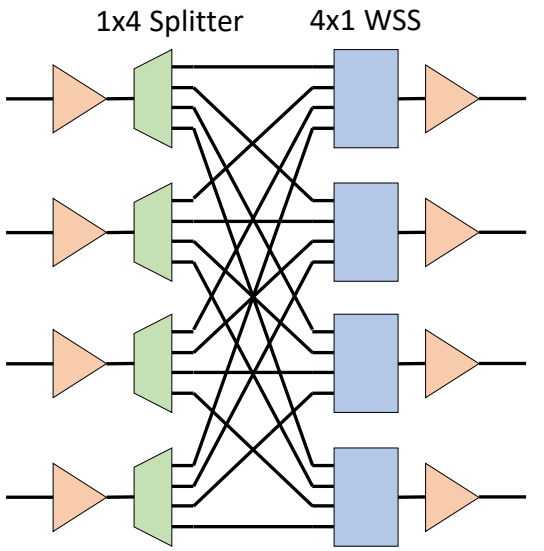
Facility enhancements

NDFF is developing and extending the Aurora2 physical network of NDFIS, adding:

- Dual fibre pairs on all routes
- New fibre link to Slough Virtus to link to 5G UK Exchange for connectivity to 5G UK test bed and L2 connections
- Metro-scale mesh network at Cambridge
- Wavelength routing at major interconnects
- L-band optical amplifiers



4x4 Wavelength Cross-Connection

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Applications

- Optical communications
- Software Defined Networking
- Wireless research
- Next Generation Internet (NGI)
- Quantum Communication
- Immersive and Virtual Reality
- Precision Time and Frequency Distribution

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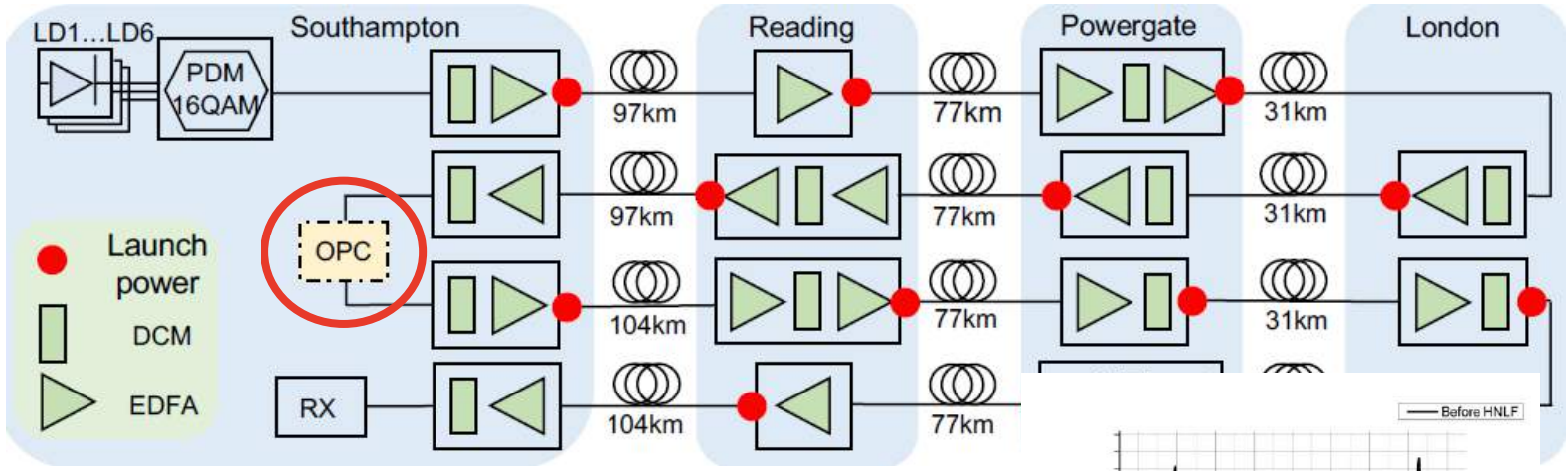
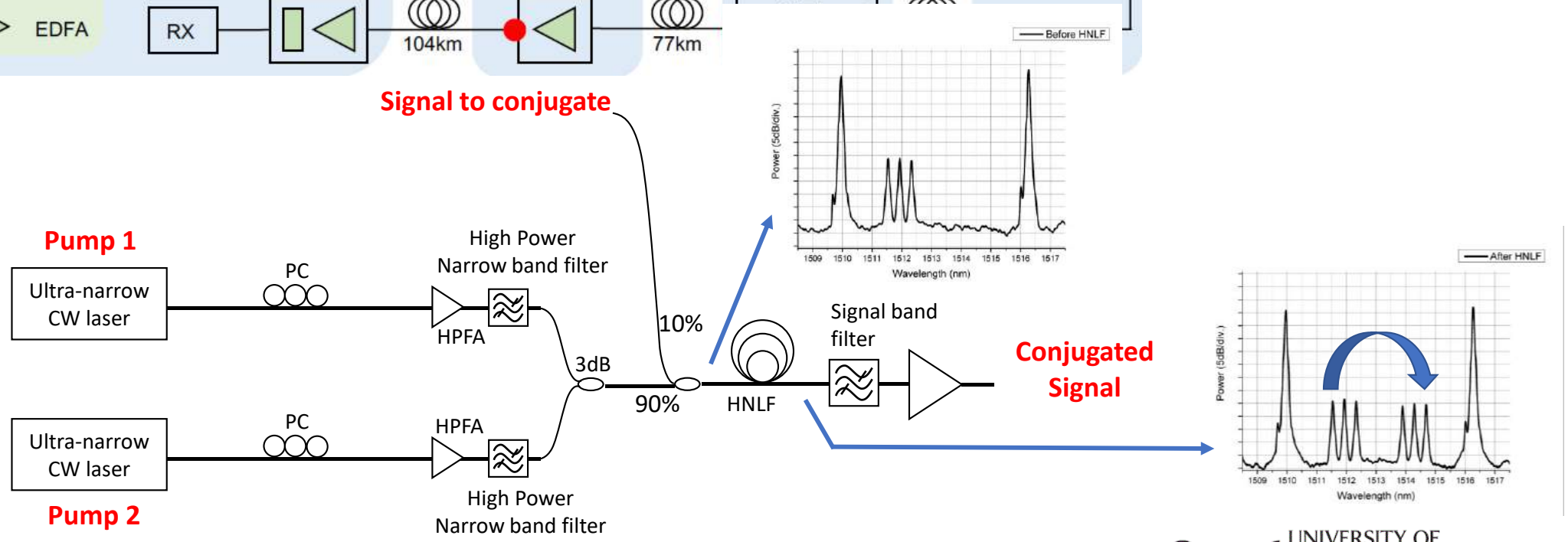
Optical phase conjugation

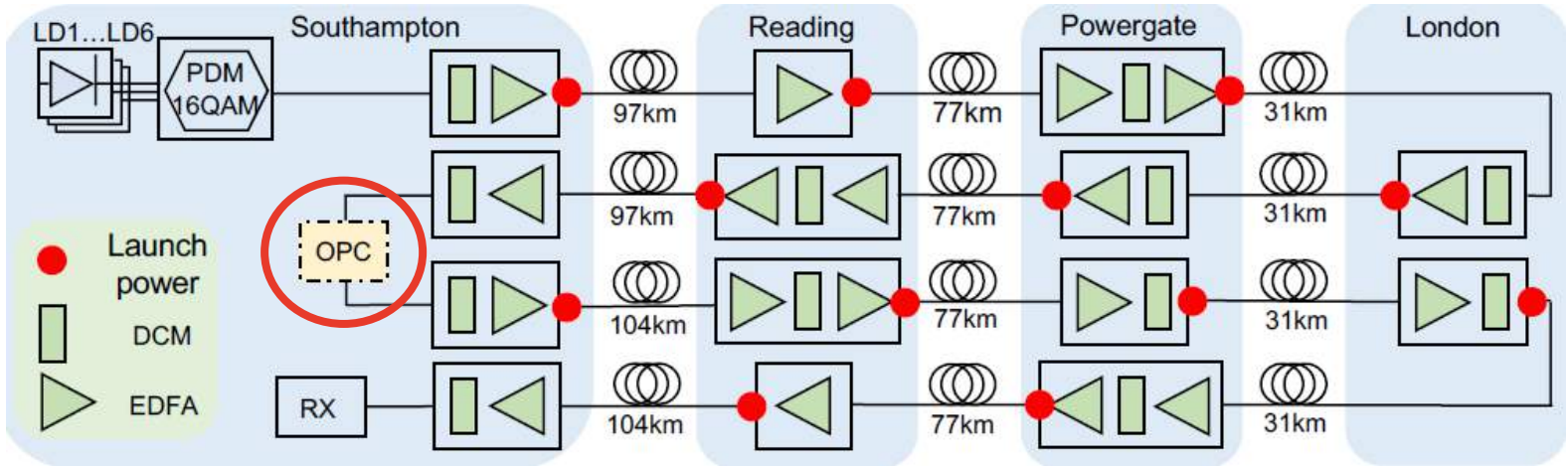


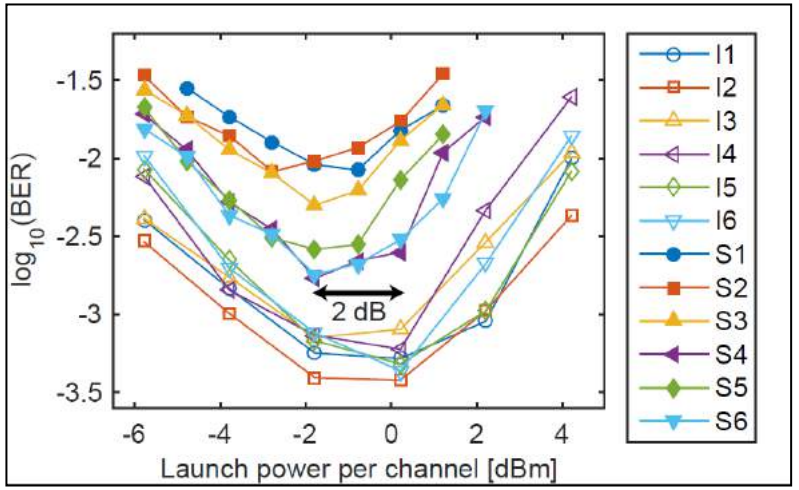
480 Gbps over 834 km
(400 Tbps.km):

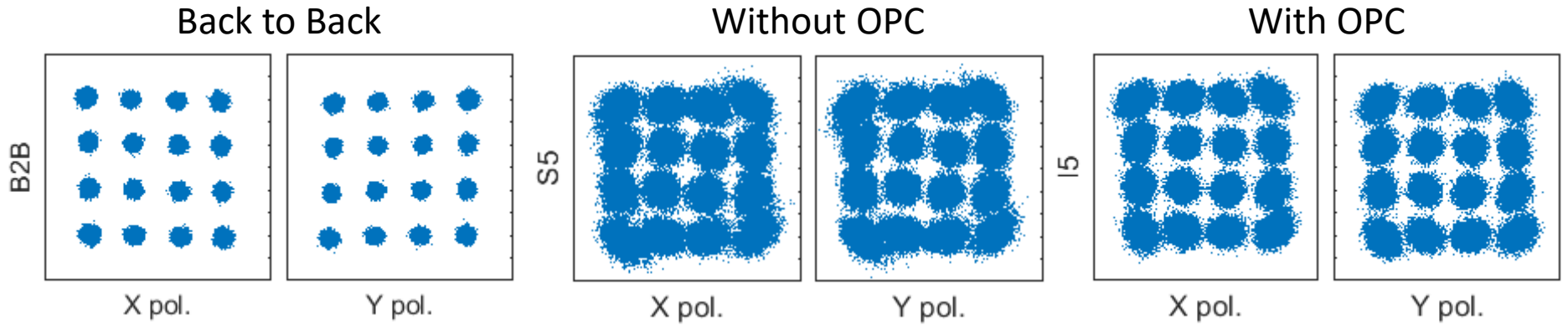
2 pol x 4 bits per symbol
x 10 Gbaud x 6 channels



Optical phase conjugation

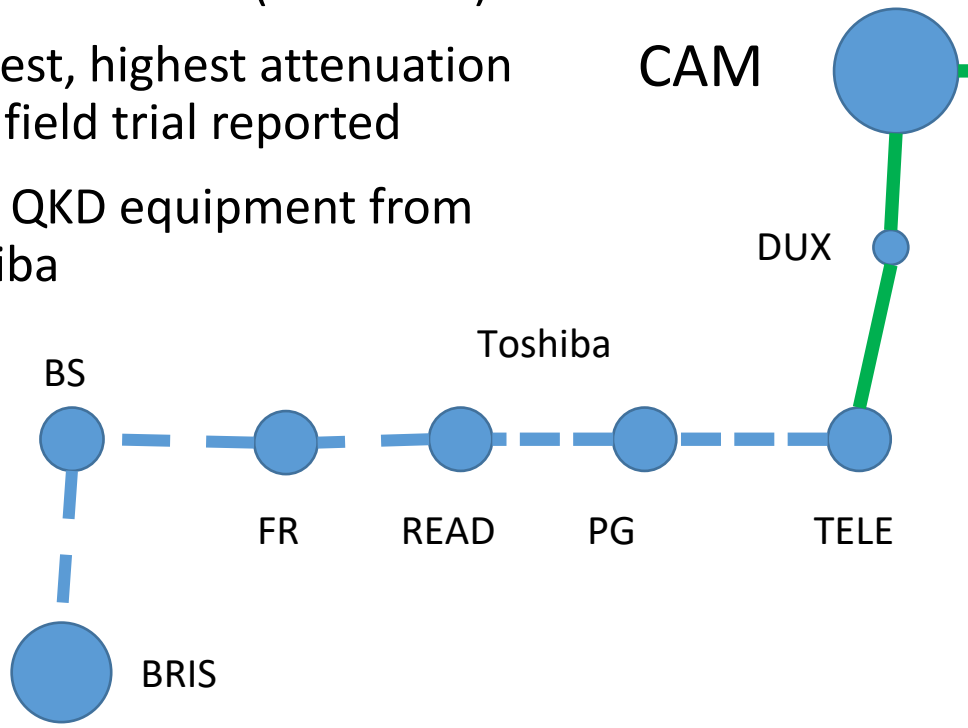






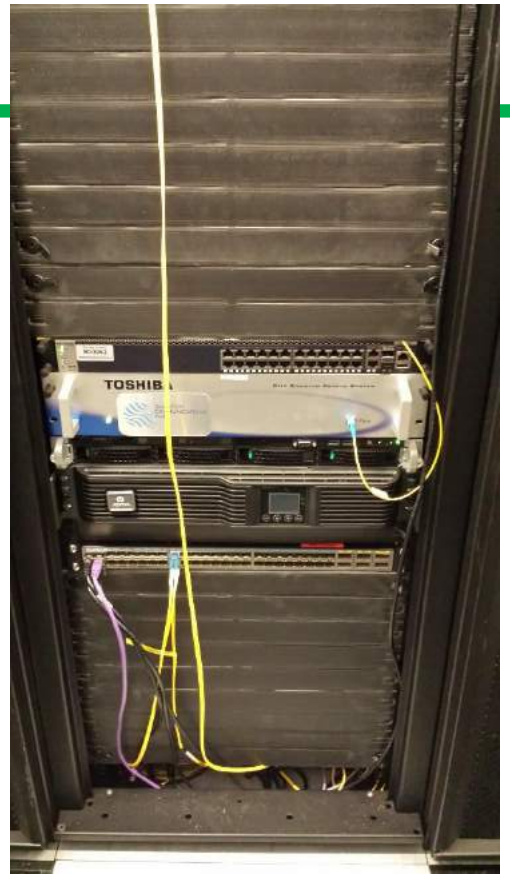
UK long-distance quantum network

- 129 km of NDFF (28dB loss)
- Longest, highest attenuation QKD field trial reported
- Uses QKD equipment from Toshiba

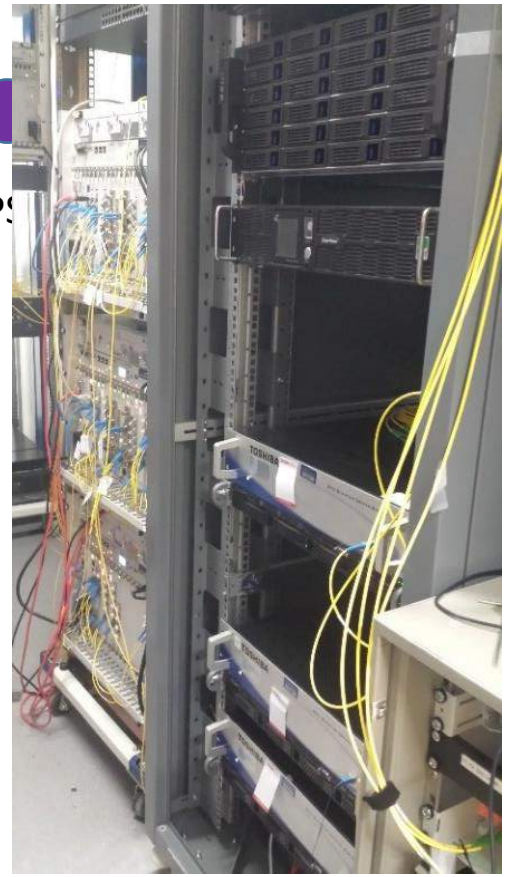


UKQN – linking Cambridge and Bristol – over NDFF

UKQNTel – linking Cambridge with BT Adastral Park



QKD Alice
Telehouse London



QKD Bob
Cambridge Electrical Engineering

UK long-distance quantum network

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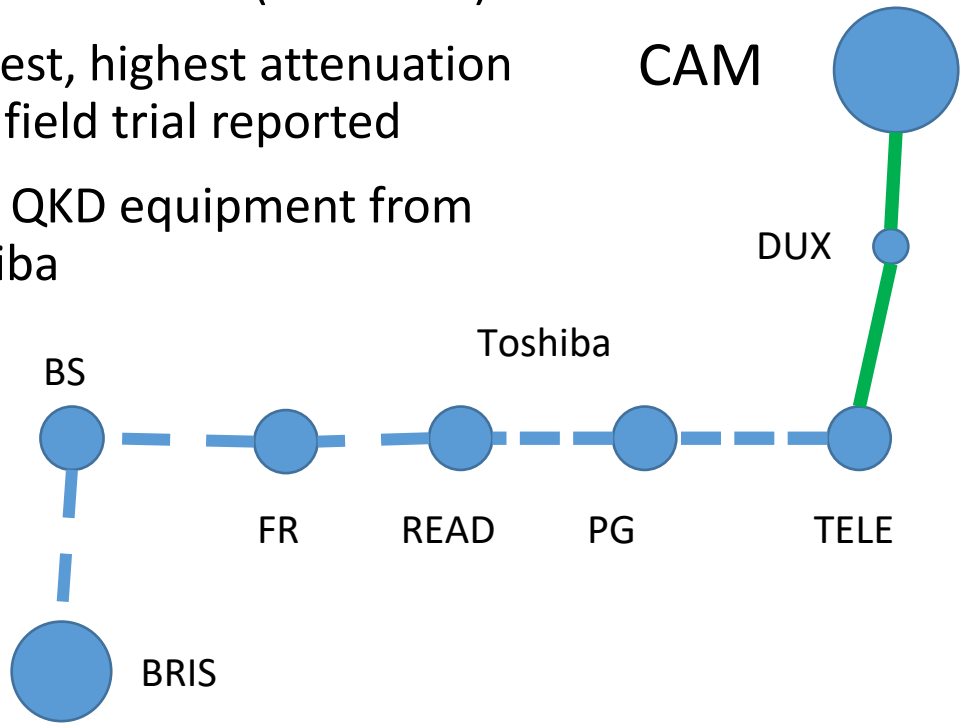

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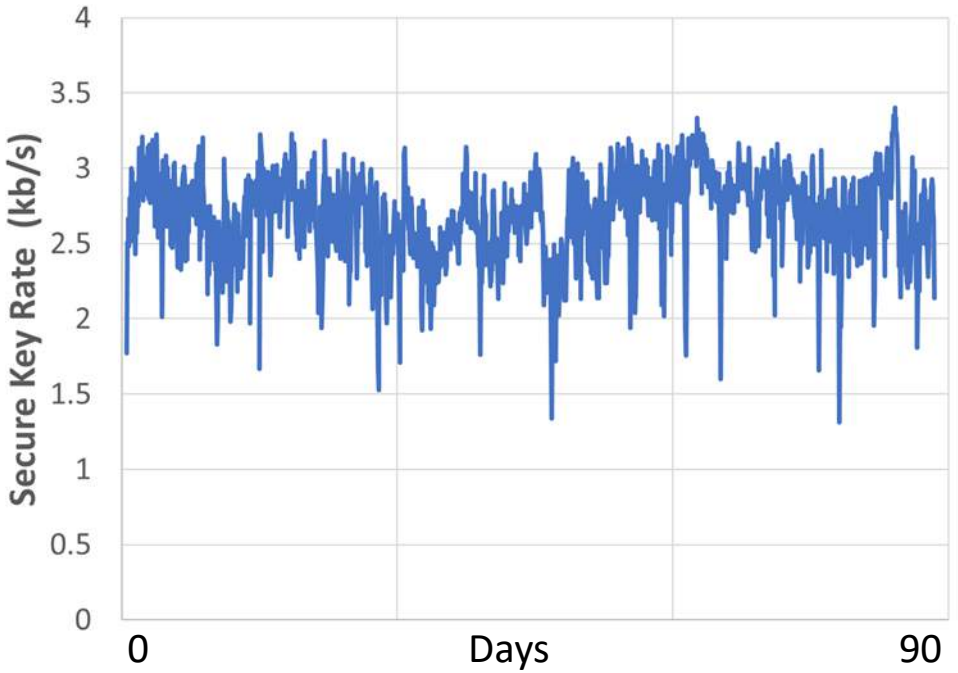

- Secure key rate 2.7 ± 0.3 kb/s over 129km with 28 dB loss
- Stable operation over more than 3 months

Abstraction of optical network

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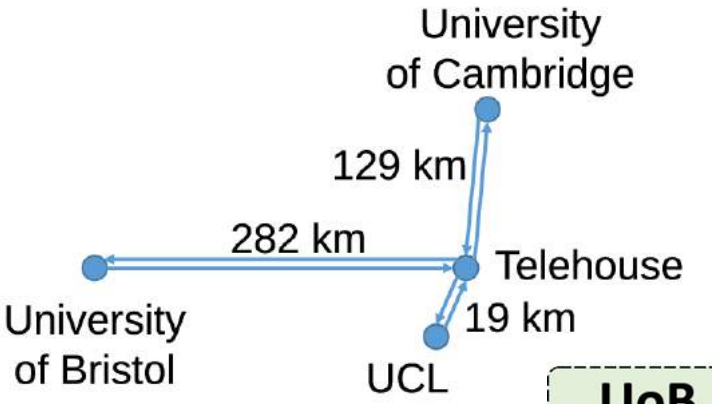
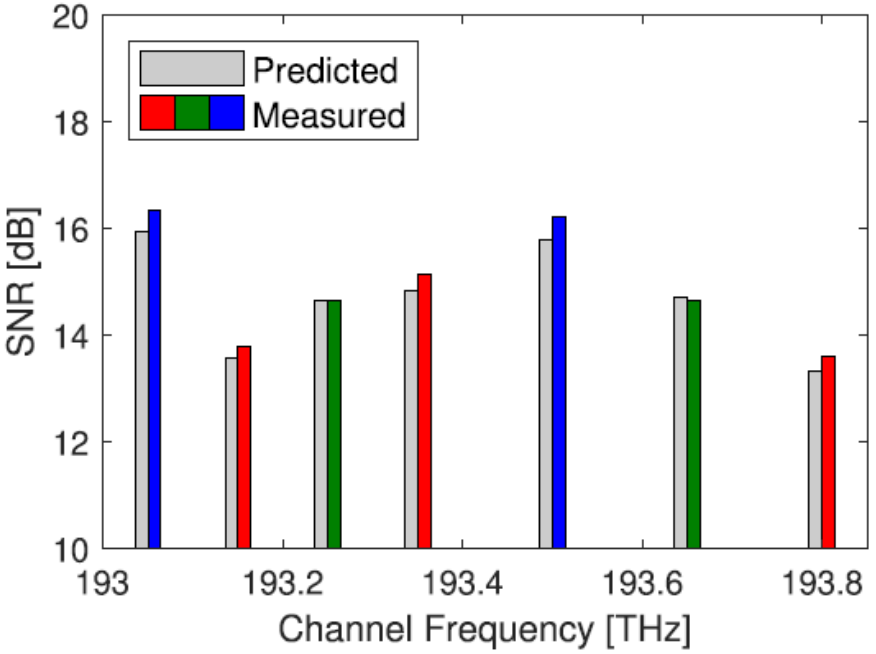
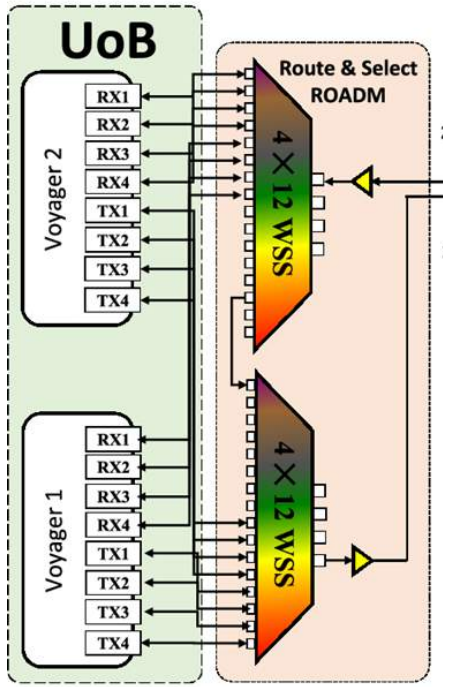
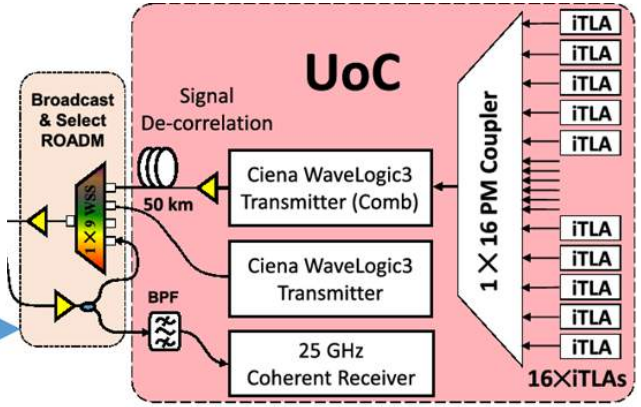
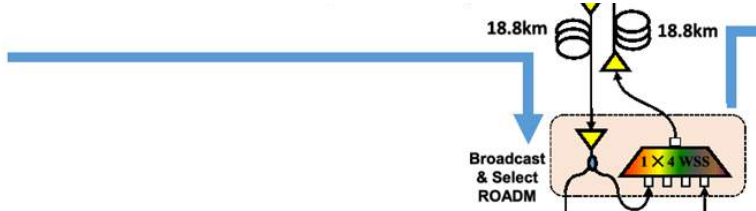
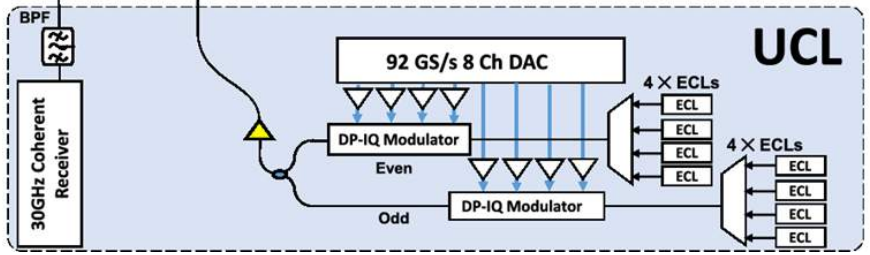










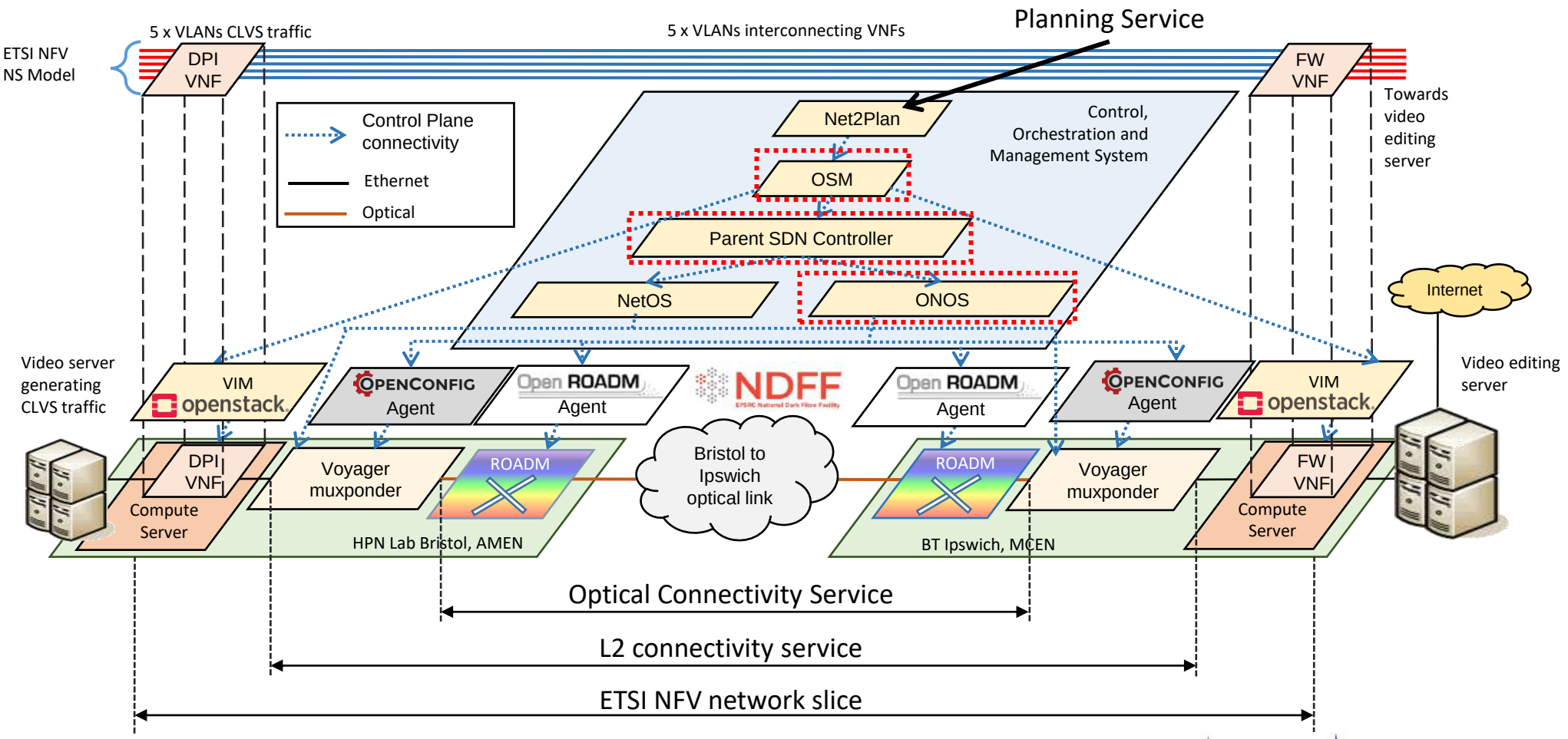


University of BRISTOL

UCL

UNIVERSITY OF CAMBRIDGE

Crowdsourced live video streaming



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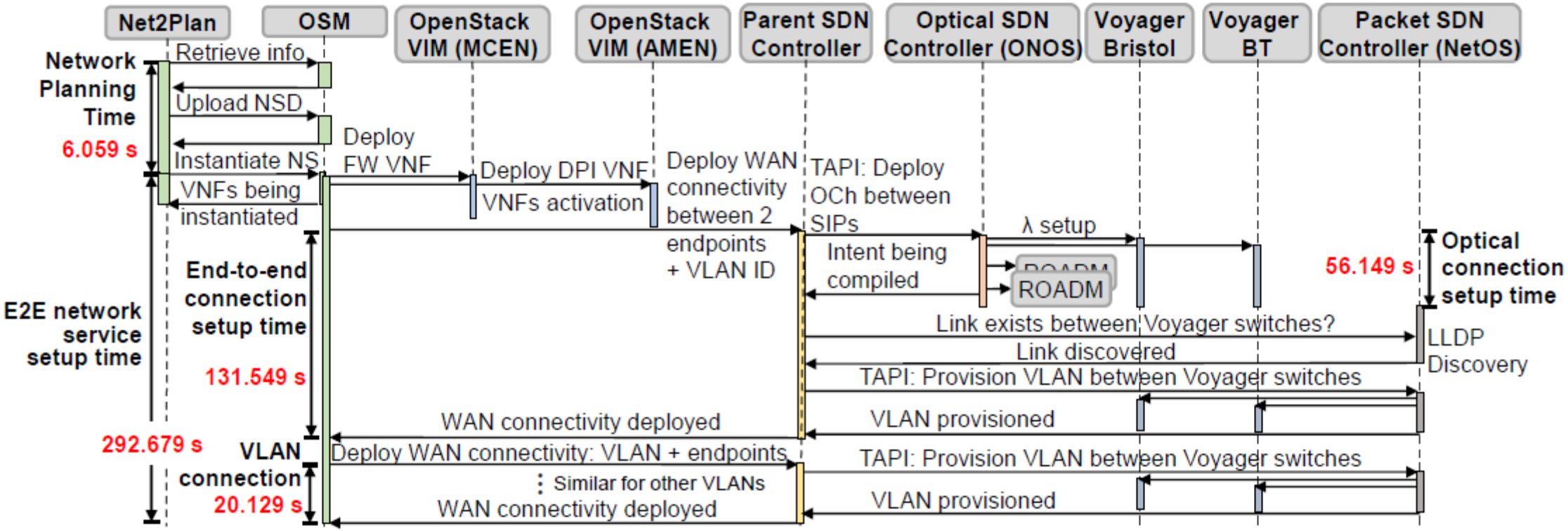

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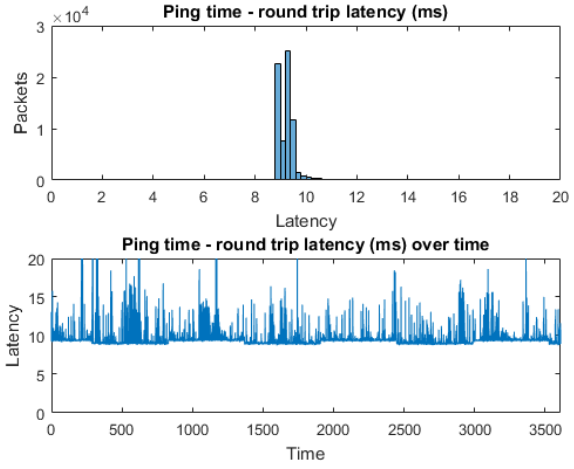
CASMS – Context Aware network architectures for Sending Multiple Senses

Focus is on **collaborative** VR tasks and experiences.
- mandates an understanding of network and users.

Determining network performance and requirements:
- Using standard and new network metrics (QoS)
- Linking network quality to human factors trials (QoE)

Benefits of NDFF:

- Uncontended (quiet) fibre access for experiments.
- High speed, low latency connectivity.



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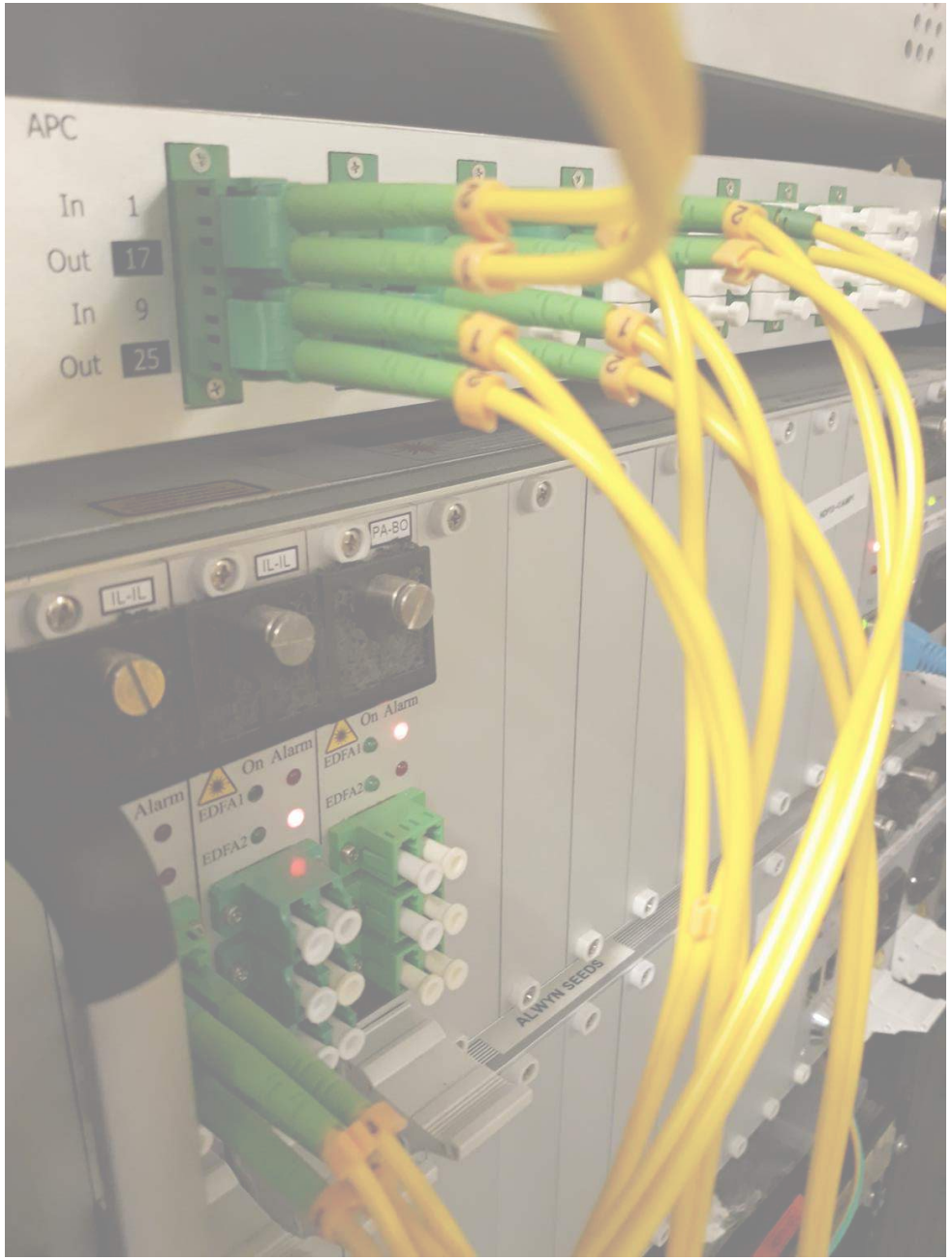
Summary

- The UK National Dark Fibre Facility provides Layer 1 and Layer 2 access to a 1000 km dark fibre network, which is software configurable and has rich connectivity to other networks
- It supports academic and industrial research on new network technologies
- It supports a wide range of applications including optical communications, quantum communications, and immersive and virtual reality research
- Planned enhancements include connection to a large Layer 2 exchange and the addition of a metro-scale mesh network



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Thank you!

How to contact us

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Formal access requests: Complete an application for at www.ndff.ac.uk/how-to-access-ndff

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