

National Dark-Fibre Infrastructure Service

MSN 2013

David.Salmon@ja.net



Aurora and NDFIS: The UK's Experimental Platform for Clean Slate Network Research

An Optical Network Test-bed for Emerging Network Technologies

Alwyn Seeds (UCL), Dimitra Simeonidou (Bristol University)



JANET Aurora - 2013



University of
Cambridge

550km of fibre-pairs

University of
Essex

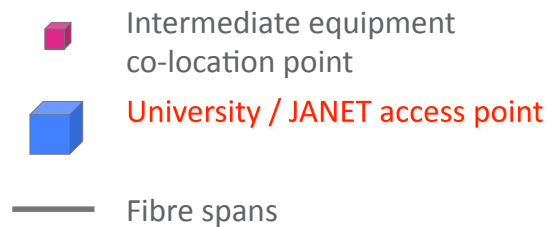
JANET Lightpath access to
other UK Locations

UCL

Telehouse
London

International Lightpath access
to other NRENs via JANET &
GEANT

University of
Southampton



Realising Infrastructure Capabilities: Research Evaluation Platforms

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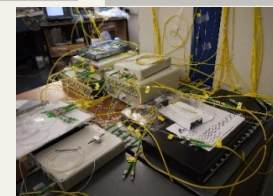
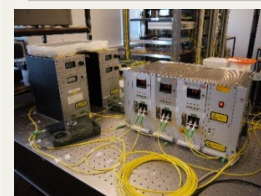
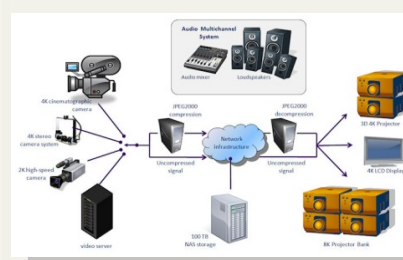
Simulation Facilities

OPNET® Modeler, VPI
TransmissionMaker™,
Customized MATLAB models/
simulations, Design and
development of application
specific simulation models (e.g.,
C/C++), Co-Simulation studies
(e.g., OPNET+MATLAB) to
capture the impact of cross-
layer issues.

Emulation Facilities

Extensible Optical Network
Emulation (EI), Emulab-based
emulation facilities, Common
Open Research Emulators,
Customized models of systems/
sub-systems for integration in
Emulation facility.

Technology prototypes and Experimental



London Olympics 2012

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- Implemented and demonstrate experimental services for real-time 4K and 8K multi-view video formats

Sporting event

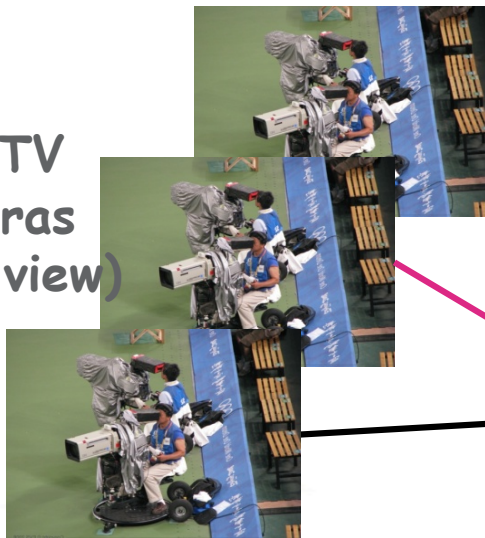


Remote location



UHDTV Back Projection
7680x4320

UHDTV
Cameras
(Multi-view)

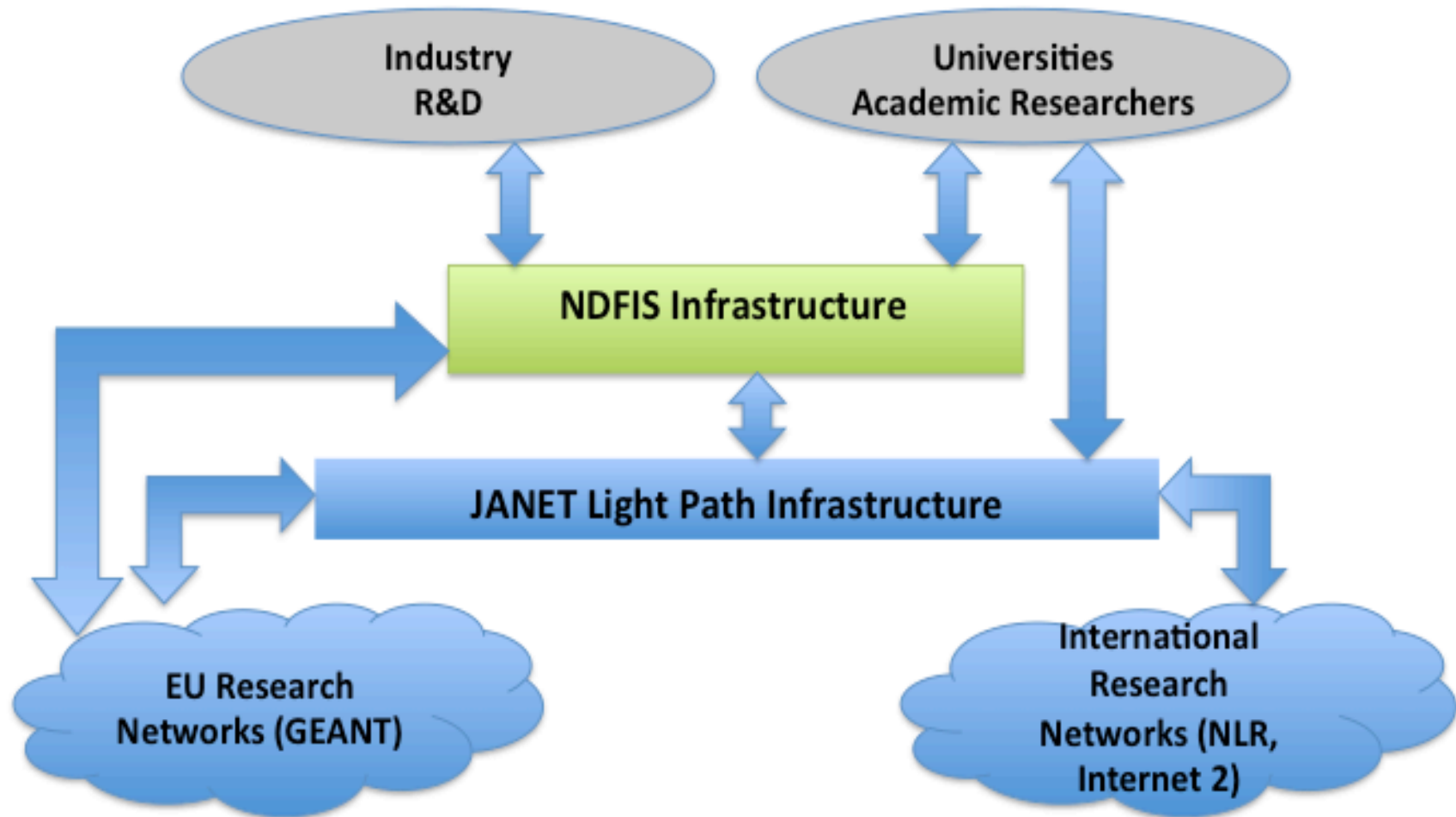


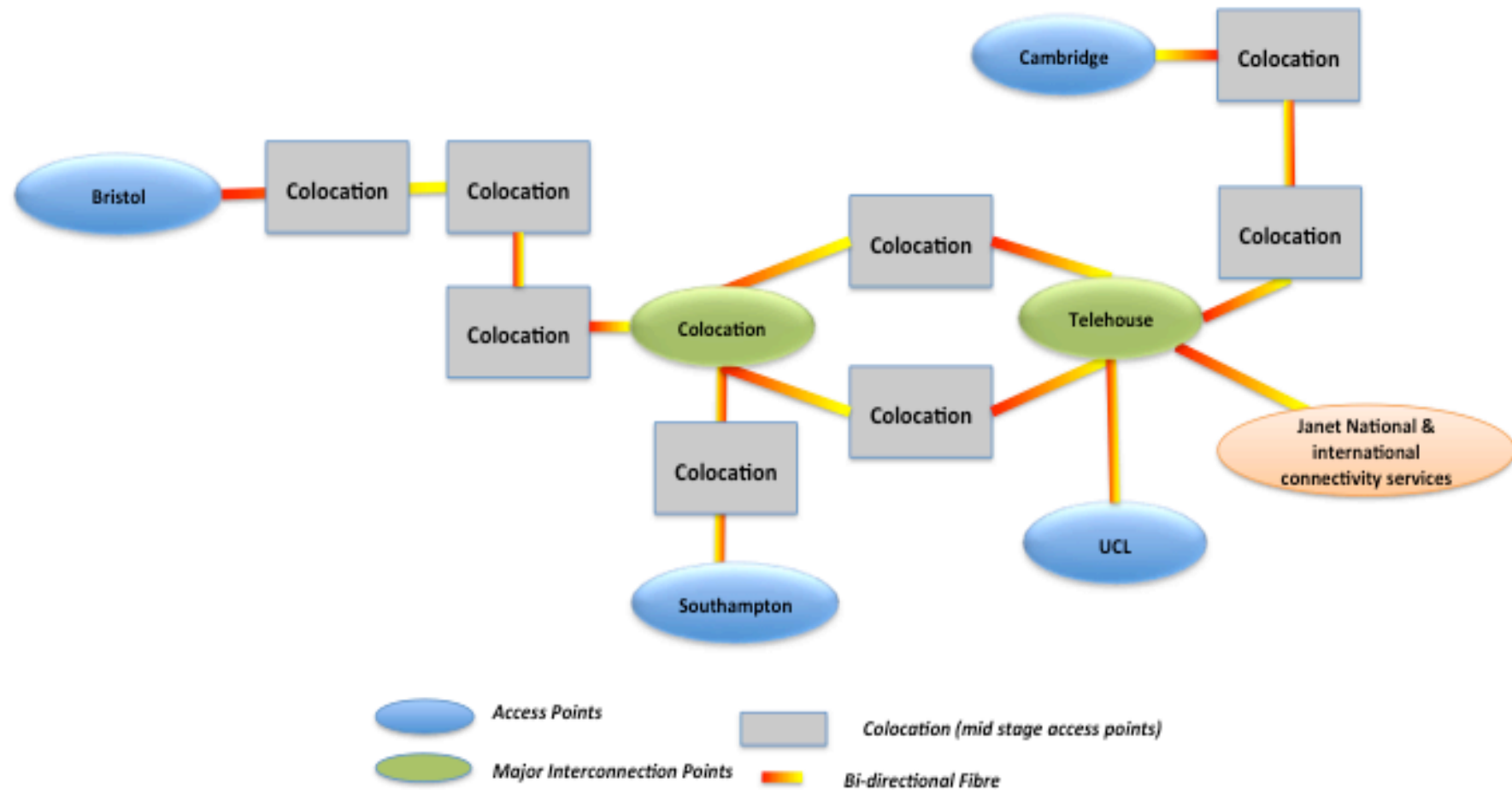
Audience

Towards a National Dark Fibre Infrastructure Service



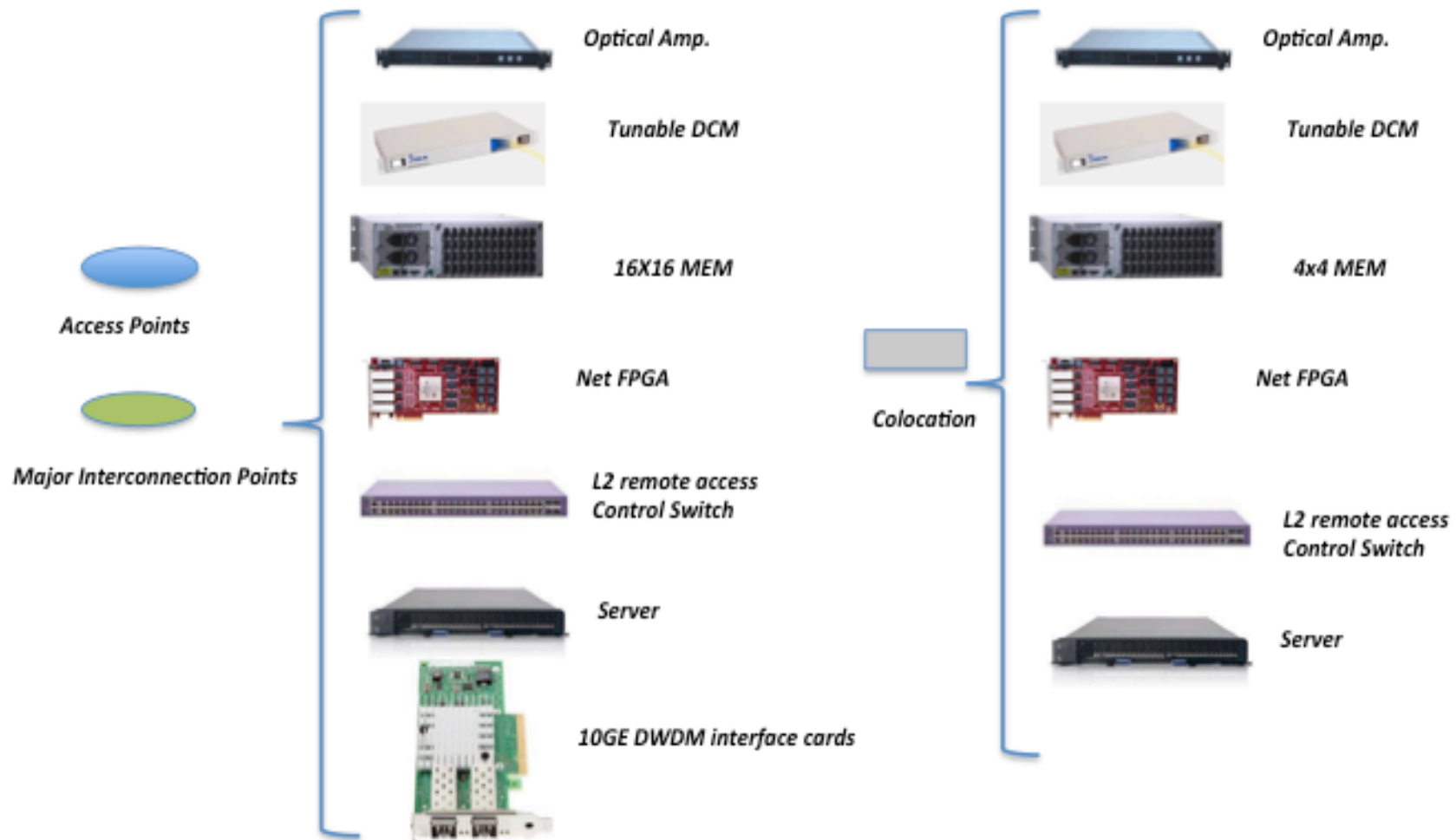
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- Statement of need submitted to EPSRC ICT Mid-Range Facilities Consultation to provide a dark fibre networking facility accessible to the UK ICT research community- 2009
 - The panel ranked it top in priority- 2009
 - Progress in the tender delayed due to uncertainty on responsibility for funding of underlying dark fibre
 - Janet confirmed support for future leasing of fibre in support of NDFIS
 - EPSRC tender issued December 2012, closed February 2013
 - Consortium comprising UCL, Bristol, Cambridge, Janet and Southampton selected as preferred tenderer, May 2013
 - Contract negotiations to start, with planned start of service, September 2013
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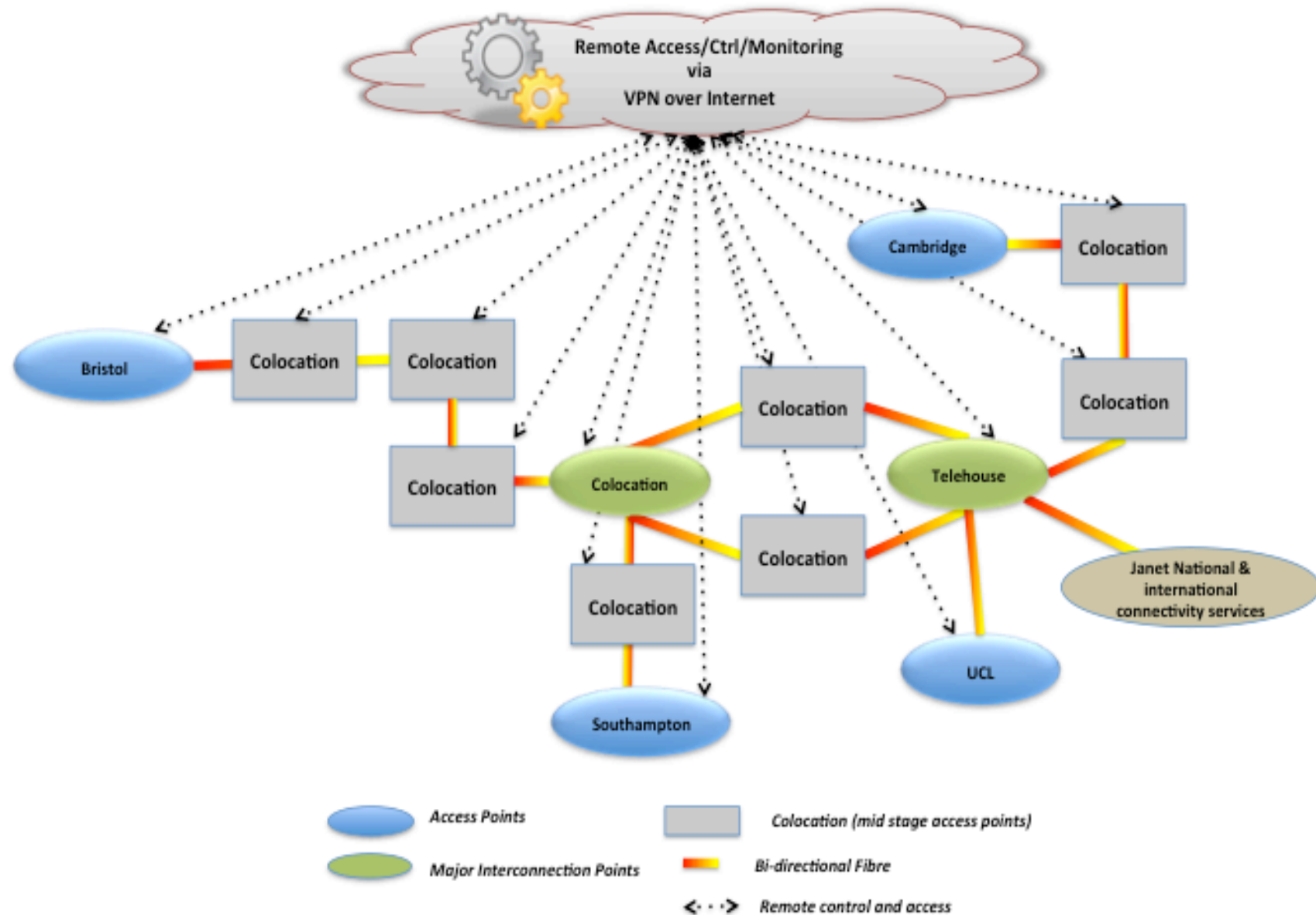




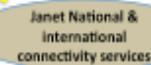
Software Defined Transmission Network

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- The future internet will depend on a transmission infrastructure of greatly increased capacity and flexibility
- The Aurora dark fibre network has enabled experimentation at the physical layer to study new devices, sub-systems and transmission formats to deliver the capacity and flexibility required
- The NDFIS, a collaboration between Janet and Universities with strong research records in optical communications and networking, will provide a platform for the development of software defined networks for the future internet
- NDFIS will have novel capabilities for software defined transmission path parameters and physical and logical connectivity
- NDFIS will also have strong connectivity to other experimental networks worldwide for collaborative research



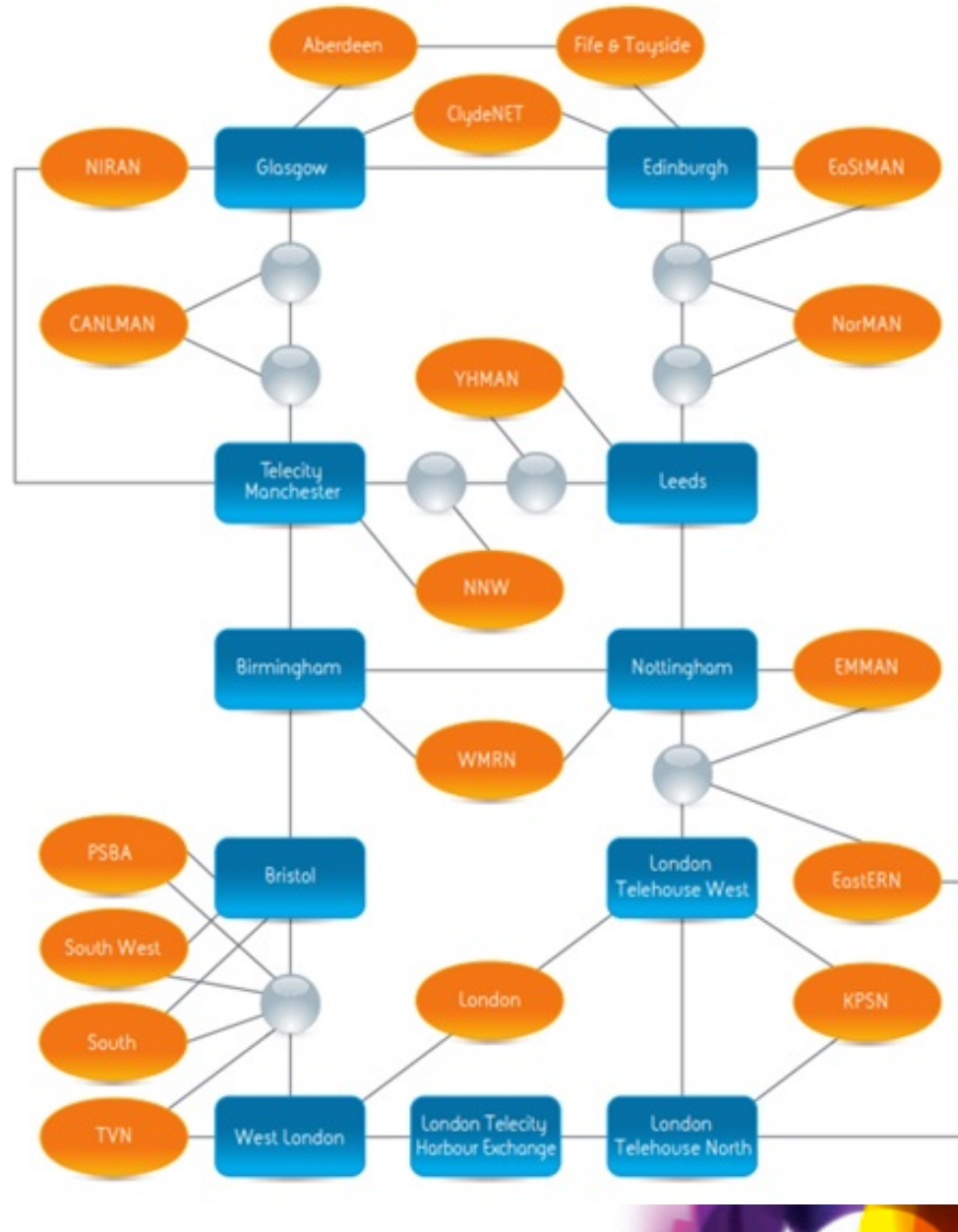
Building multi-layer testbeds



Janet6



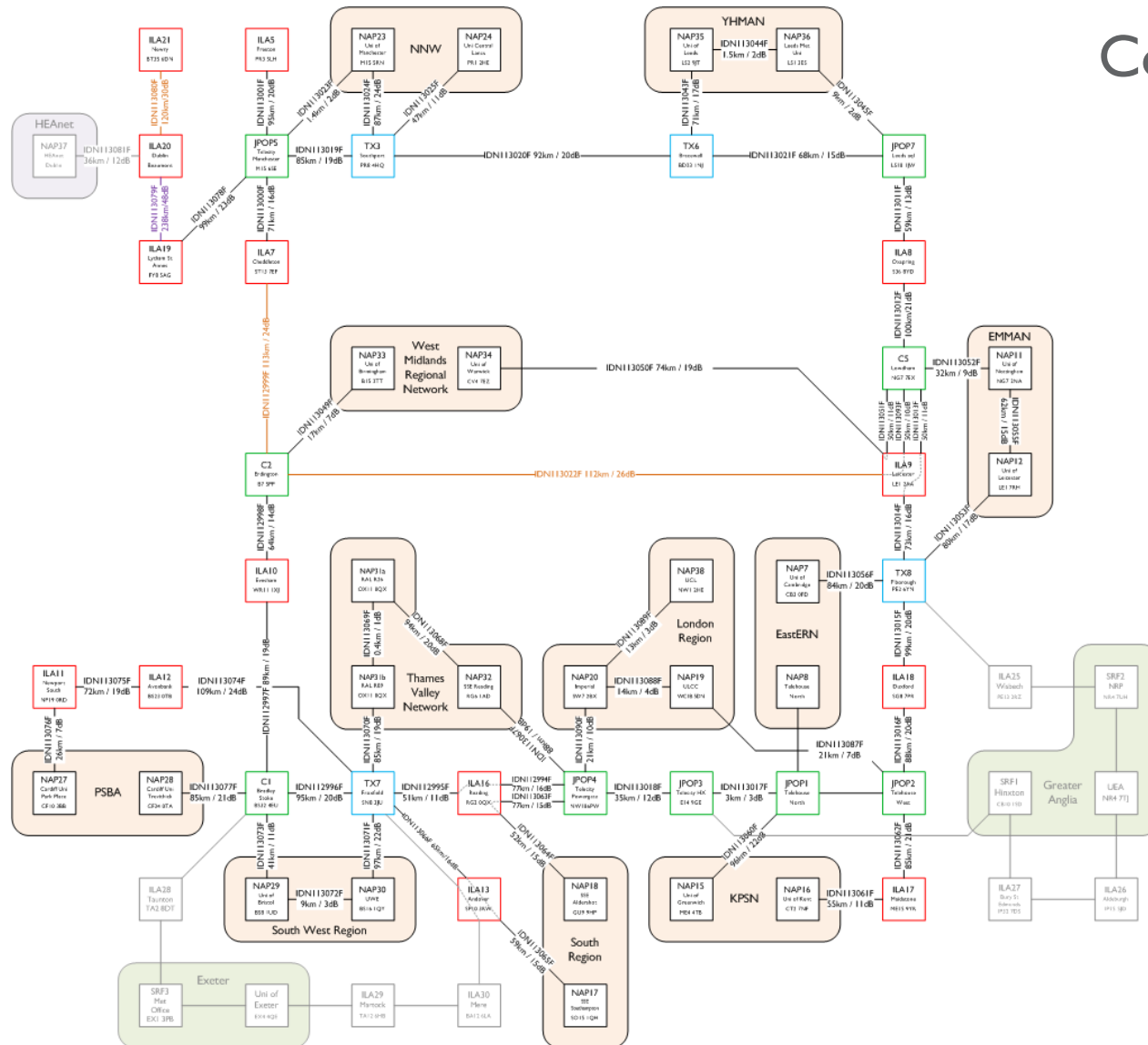
Janet6 Topology



Straightforward



Janet6 Topology

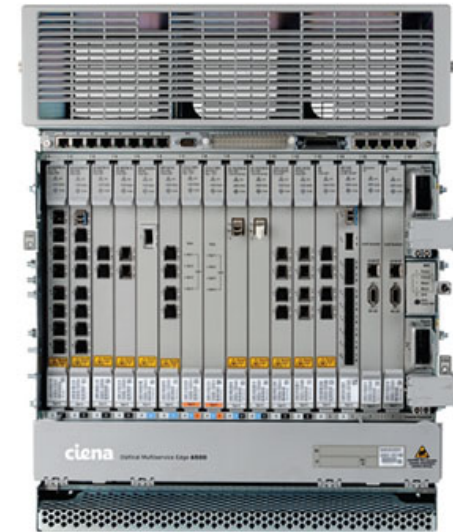


Complicated



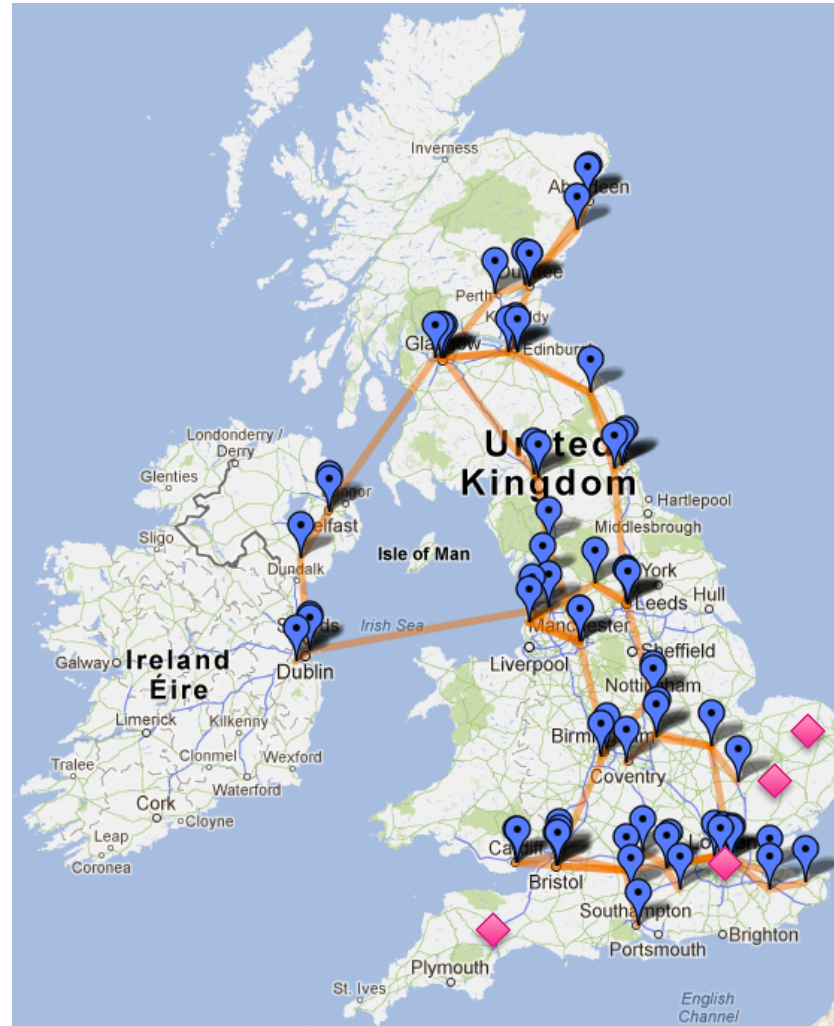
Project Update

- Ciena 6500 optical equipment
 - Located at all 80 PoPs on the network
 - 40 & 100Gbit/s
- Juniper T4000 routers
 - Located at all 10 core PoPs
- Juniper MX series for “Lightpaths”



Janet6 and e-Infrastructure fibre

- Complementary & integrated with Janet6



- IP Network (Layer3)
 - High-capacity, quality, reliability/resilience
 - IPv4, IPv6, multicast
- JANET Lightpath – (Layer 1 & 2) – point-to-point circuits
- University connections
 - Typically small $n * 1 \text{ Gbit/s}$
 - Several now at 10 Gbit/s , increasing
- RAL – special case
 - $2 * 30 \text{ Gbit/s}$ IP (resilient)
 - $2 * 10 \text{ Gbit/s}$ Lightpath – CERN
 - +others... $\sim 100 \text{ Gb/s}$ total



Testbeds

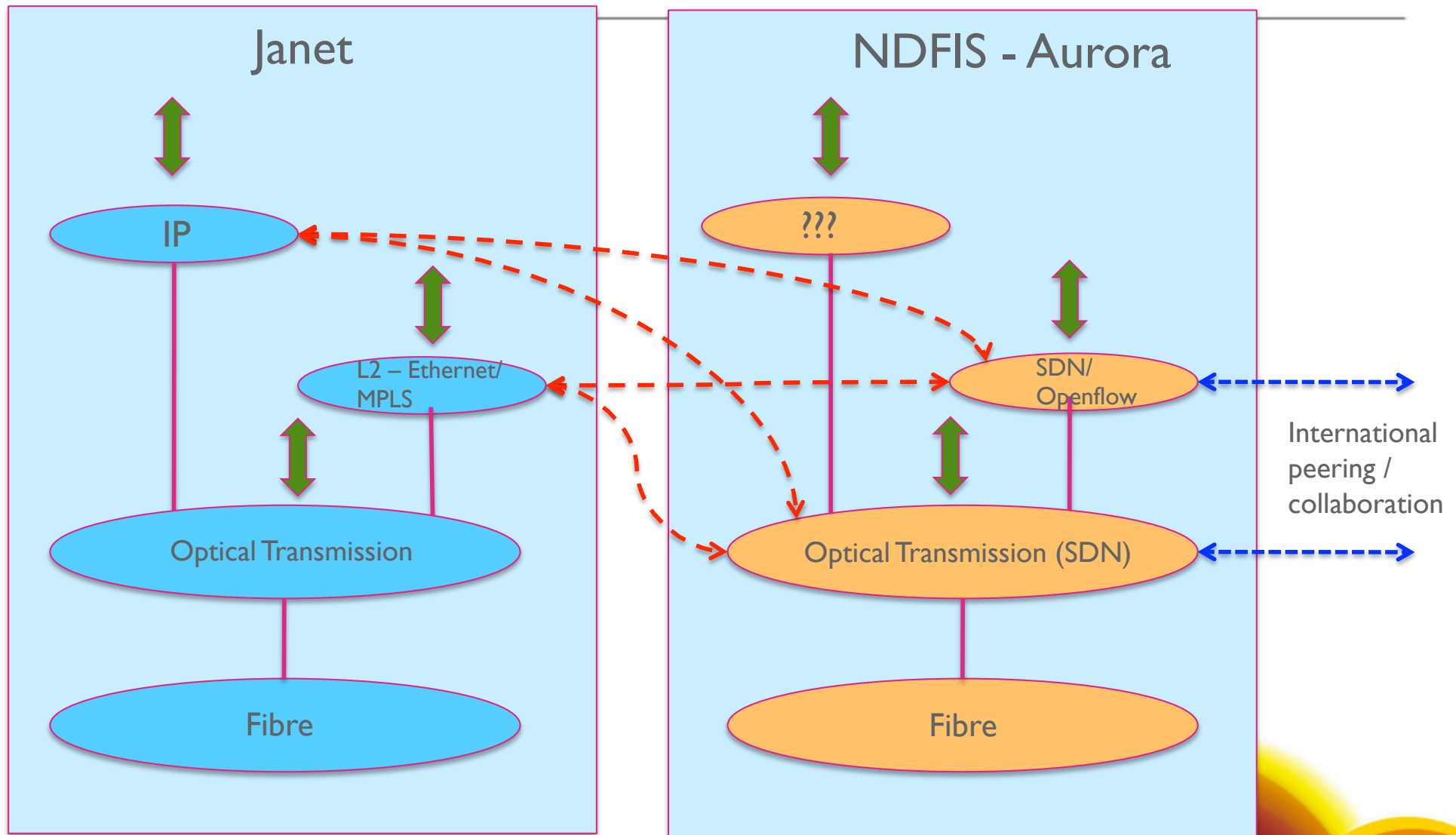
- Supporting Network & application R&D at all levels
- Strong Research Council and Community interest
- Active discussions & workshops
- Vision of a rich multi-layer R&D platform
- Optical Foundation – Aurora & NDFIS
- Layer 2 access extends scope & reach – Janet Lightpath & VPNs
- Layer 3 techniques & application interfaces
- Advanced Wireless access at edges
- Extends internationally
- NOT yet a “done-deal”
- Much work being done towards realising this



Janet Testbed connection components

- Layer 3 (IP)
 - Tunnels
- Layer 2
 - Janet Lightpaths
 - Ethernet / MPLS
- Layer 1
 - Optical: whole wavelengths
 - 40G / 100G in core





 Application access /
Project connection point

Summary

- Rich set of testbed components available
 - Janet6 services – particularly layer 2
 - Janet Aurora
 - EPSRC National Dark Fibre Infrastructure Service
- Now needs interest & funded projects to fully exploit these resources



Finish !

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