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Janet Research Update

Networkshop 42

David Salmon

Topics

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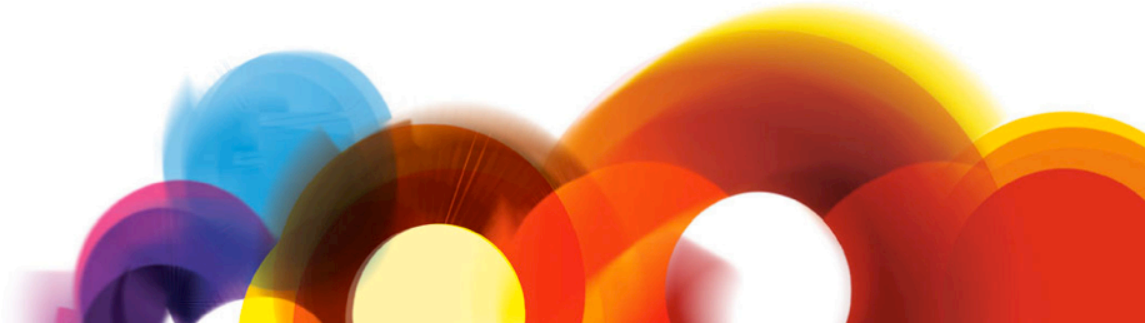
- e-Infrastructure
- Connecting Industry – Janet Reach
- High-Throughput Networking
- International projects - EYR
- Testbeds
  - Aurora2 – NDFIS
  - SDN



e-Infrastructure

e-Infrastructure

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- Strategic sites – Fibre & Optical Transmission
  - Complete (or very close)
    - Exeter – Met. Office & University
    - Norwich – NBI & University
    - Hinxton – EMBL/EBI & Wellcome Sanger Institute
  - To be done this year
    - London - Francis Crick Institute
- Other Important locations
  - Thames Valley – re-engineering this year
    - RAL (Harwell Oxford Campus), Oxford, Reading, Culham
    - Edinburgh ACF
      - National: HECToR/ARCHER – RDF (Research Data Facility)
      - Local: GridPP & other Edinburgh Systems
  - Durham – Dirac Astrophysics
- Regional integration programme
  - Identify research/data-intensive sites pre-procurement

Janet Reach
- Connnecting Industry

Janet Reach

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- What is it ?
  - A scheme to support & subsidise Janet connections for Industrial / Commercial entities
- Why are we doing this ?
  - BIS Funding from the e-Infrastructure programme
- Why are BIS funding e-Infrastructure
  - Perceived economic benefit for the UK
- What is e-Infrastructure ?
  - Major Facilities
    - Science – Diamond Light Source, Genomics....
    - Data repositories
    - Computation centres
    - Networks - of course :-)

Janet and e-Infrastructure

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- e-Infrastructure programme funding announced late 2011
- £150-£160M total
- £26M for Janet via HEFCE

Breakdown

- £10M Contribution to Janet6 backbone
- £12M Network provision within "classic" Janet community, including key locations which may need additional fibre access
- £4M "Industry connection"

Industry access to e-Infrastructure ?

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- Access to academic community knowledge & expertise
- Access to academic community systems & resources
  - these are already connected to Janet
  - use of community access mechanisms
    - Federation – Moonshot trial
- High-capacity Network connections

Industry connections to Janet ?

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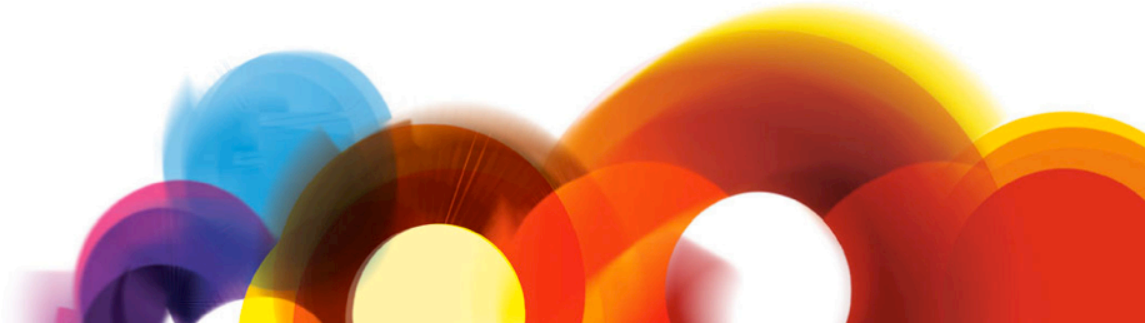
- Existing Janet policy
  - OK where supporting collaborative R&D
    - They pay marginal costs and no "internet access"
  - Business and Community Engagement (BCE)
- Policy evolution ?
- e-Infrastructure
  - "Open and accessible Janet"



The £4M

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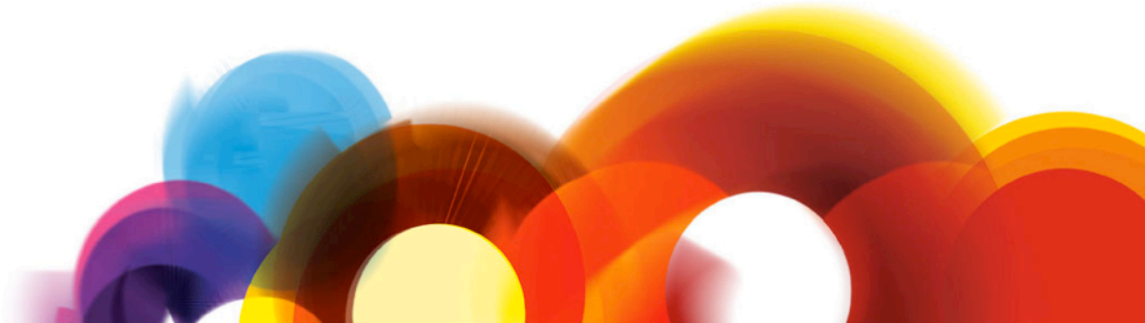
- £1.5M – AAI
  - Support Industry participation in UK academic AAI
- £2.5M – Connections to Janet
  - Janet Reach
  - Issues for us
    - State aid
    - Administration



Janet Reach

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- We must be fair in providing access to the funds
  - Equitable application process
- State aid
  - Industry must also contribute
  - There are rules about the proportions of public and private funding allowed within a project

State aid 1

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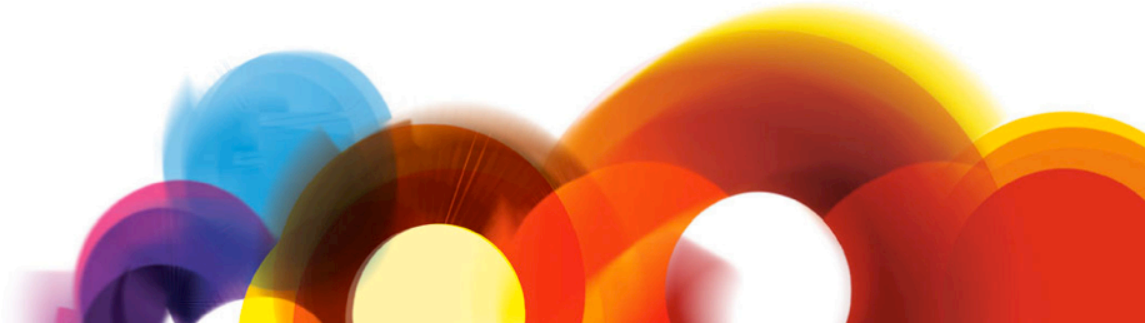
- Projects must be collaborations between industry and academic partners
  - General R&D – up to 75% public funding allowed
  - "Close to market" development – maybe only 30% allowed
  - Someone has to evaluate this....



State aid example

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- Janet connection values
  - Market rate – no distortion
  - 1Gb/s - £50-70k
  - 10Gb/s - £250-300k
- Example at 10Gbit/s
  - very R&D oriented
  - Janet connection @ £300k
  - Industry contributes £150k
  - Total value = £450k
  - Level of assistance = 300/450 or 67% - OK !

Janet Reach – the process

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- Two monthly cycles (approximately)
  - Informal discussions
  - Project submits application form and finance spreadsheets
  - External assessors judge state aid issues
    - Finance proportions OK, sufficient innovation...
  - Janet panel meets
    - For projects assessed OK – do we accept them ?
      - Do we have enough budget to fund the connections
    - Approved projects
      - proceed to connection

Janet Reach cycles – 2014

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- Feb/March
  - Just closed
  - Three diverse applications
- April/May
- June/July
- August/September
- October/November
- If budgets run out, we'll finish early (treated as a competition, so don't delay !)
- Beyond this will be reviewed
- Ongoing monitoring of projects

Janet – who is involved

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- ST e-Infrastructure – scheme support & management
  - consultancy contracts, project advice..., ongoing monitoring
- Customer engagement
  - discussions with potential customers
- Service desk
  - handling and ticketing enquiries
- Connections team
- Finance – e-Infrastructure budget
- Marketing % comms – scheme promotion

High-Throughput Networking

High-Throughput Networking

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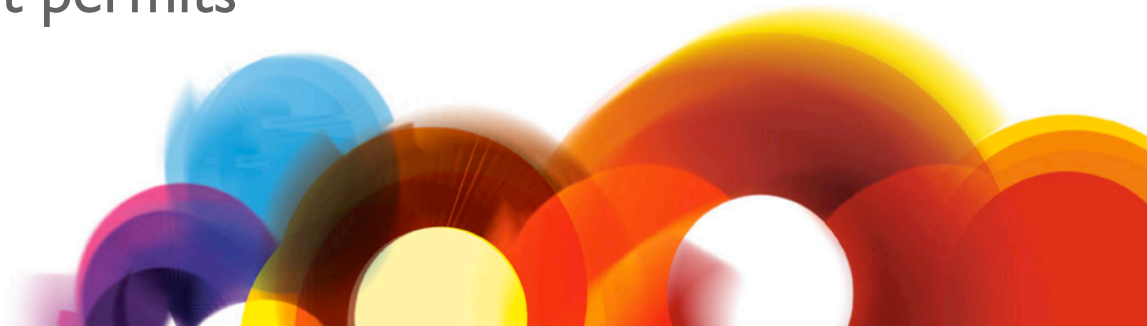
- Mentioned at Networkshop last year
- Good meeting last year
  - Classifying data transfer applications
  - Classifying Operating System standard settings for Network stacks
  - Relevance of Monitoring/probing tools (PerfSonar etc.)
- Then stalled – effort
  - Paul Lewis move to lectureship at Cranfield
  - Re-recruitment planned
  - Several posts in ST – staged
- More to come as effort permits



Network Research & Testbeds

Renewed interest in testbeds

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- Research Council (EPSRC) & Network Research Community
- Research Council Networks (Human)
  - Commnet
  - Unison
- Sequence of meetings / Workshops
  - 2012
    - Surrey
    - Southampton
  - 2013
    - April – Commnet/Unison Workshop on Testbeds
    - May – Commnet - Networks
  - 2014
    - February – Commnet – Network Research Agenda Workshop
    - March – Commnet/Unison Town meeting with EPSRC

Aurora2 & NDFIS

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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 - 20

550km of fibre-pairs

University of Cambridge

72km

VM Bury St Edmonds PoP

50km

VM Ipswich PoP

54km

University of Essex

VM Chelmsford PoP

57km

VM Enfield PoP

55km

30km

JANET Lightpath access to other UK Locations

UCL

Telehouse London

VM Brentford PoP

31km

International Lightpath access to other NRENs via JANET & GEANT

VM Camberley PoP

52km

VM Crawley Court PoP

58km

43km

University of Southampton

Intermediate equipment co-location point

University / JANET access point

Fibre spans

Realising Infrastructure Capabilities: Research Evaluation Platforms

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.

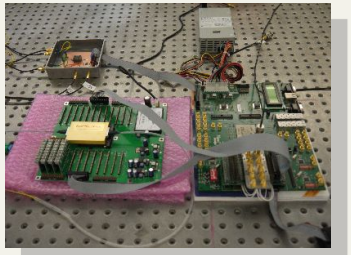
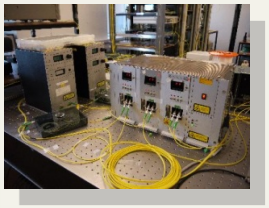
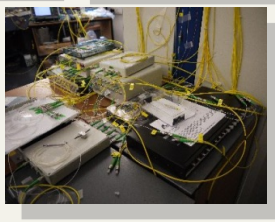
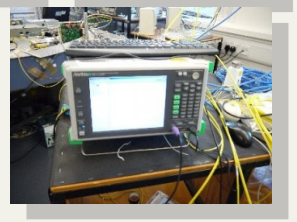
Emulation Facilities

Extensible Optical Network Emulation (E1), Emulab-based emulation facilities, Common Open Research Emulators, Customized models of systems/ sub-systems for integration in Emulation facility.

Technology prototypes and Experimental test-beds





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

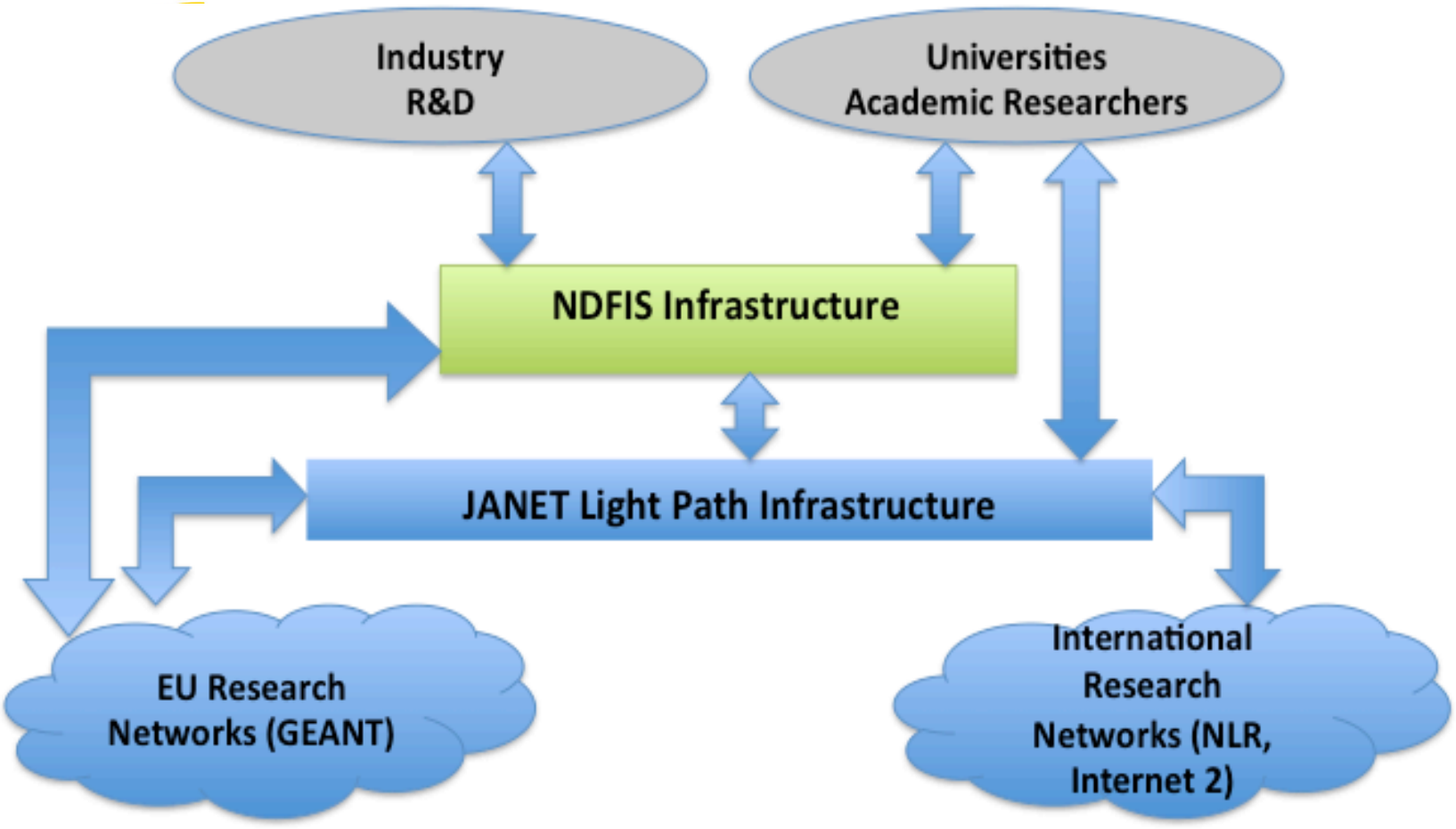
- Janet confirmed support for future leasing of fibre in support of NDFIS

- EPSRC tender issued December 2012, closed February 2013

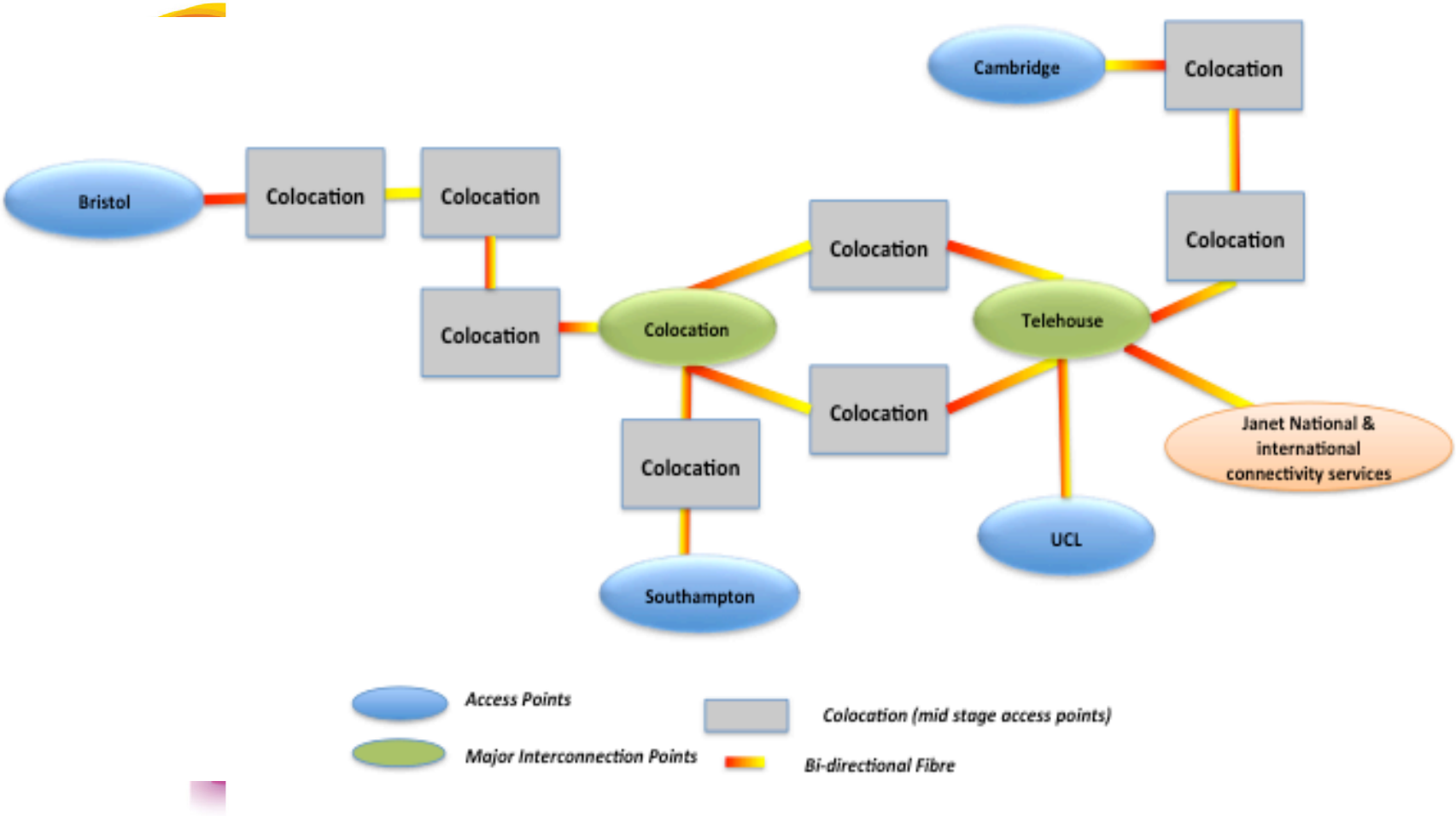
- Consortium comprising UCL, Bristol, Cambridge,Janet and Southampton selected as preferred tenderer, May 2013

- Contract negotiations to start, with planned start of service, September 2013

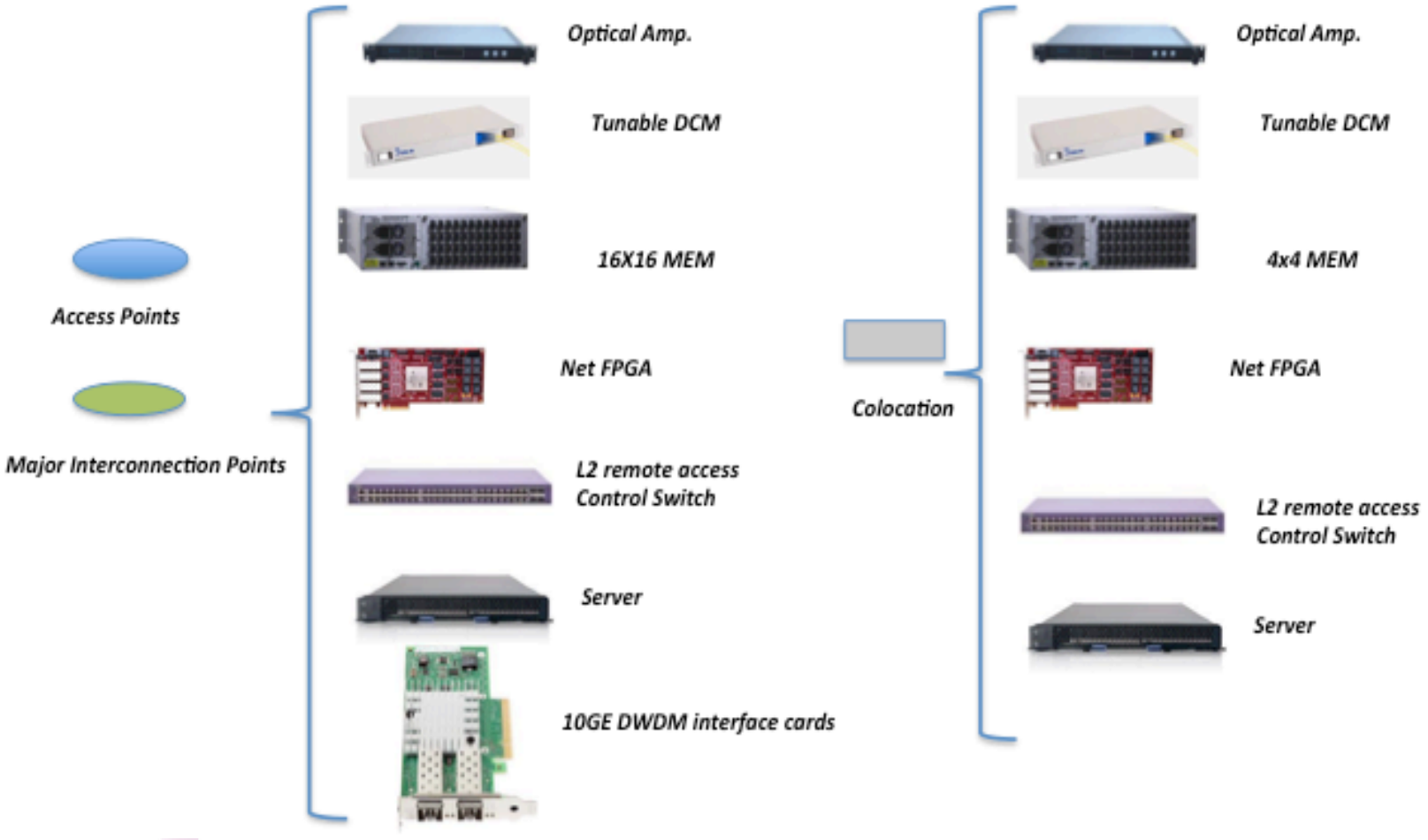
NDFIS Connections



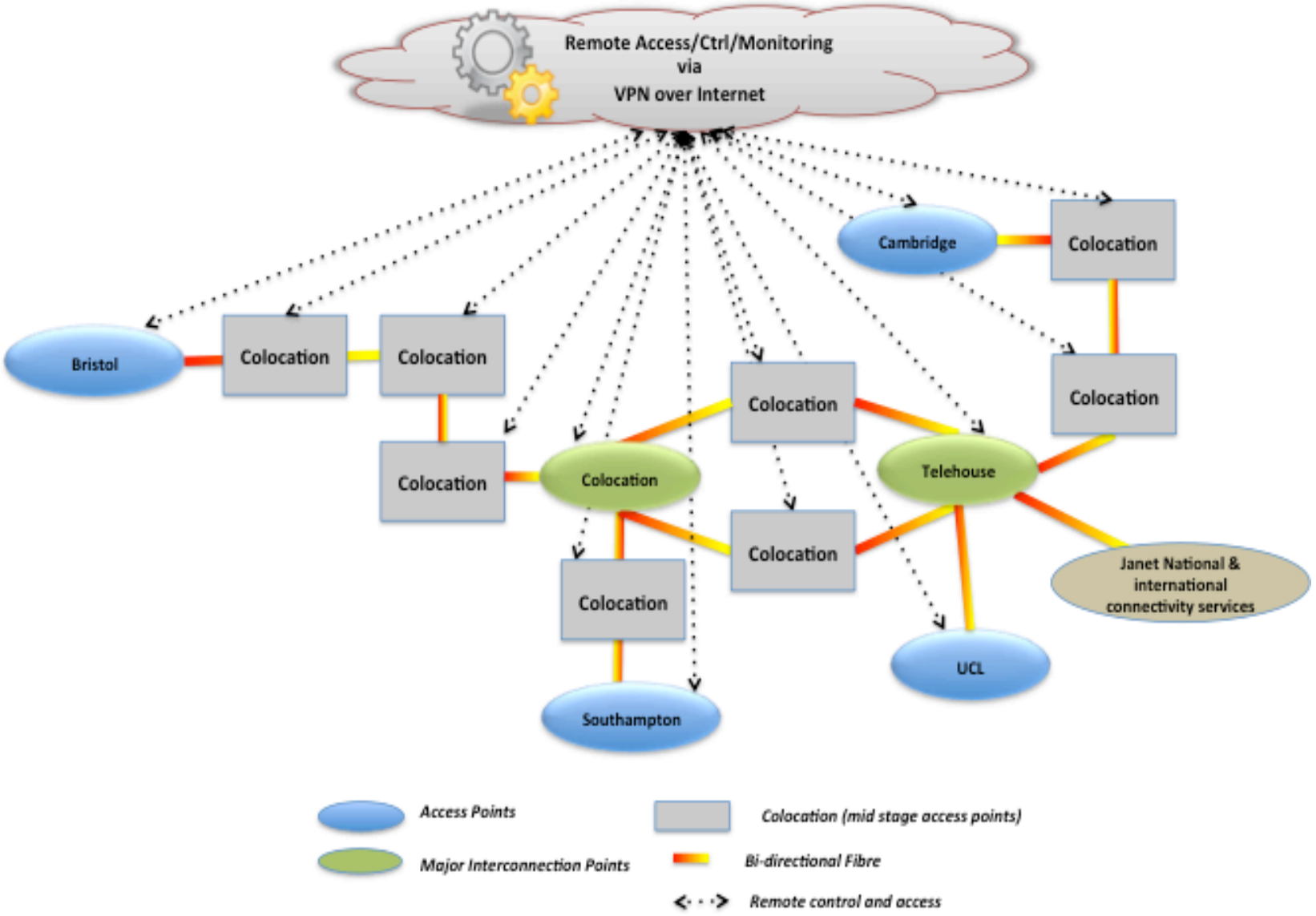
NDFIS Topology



Software Defined Transmission Network



NDFIS Control



NDFIS Experiment Management

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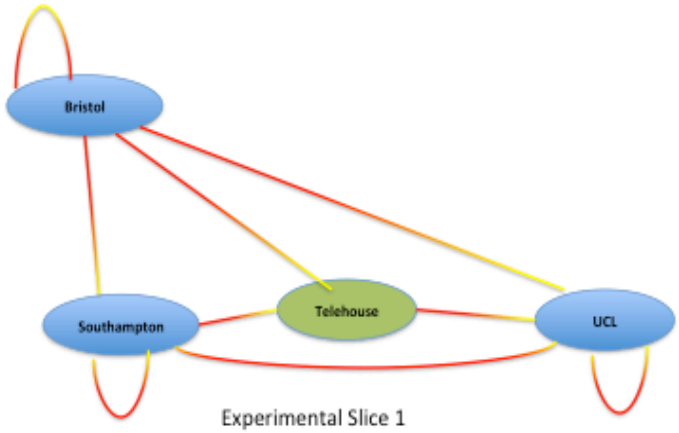
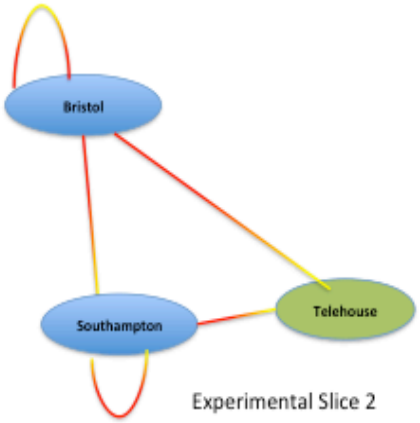
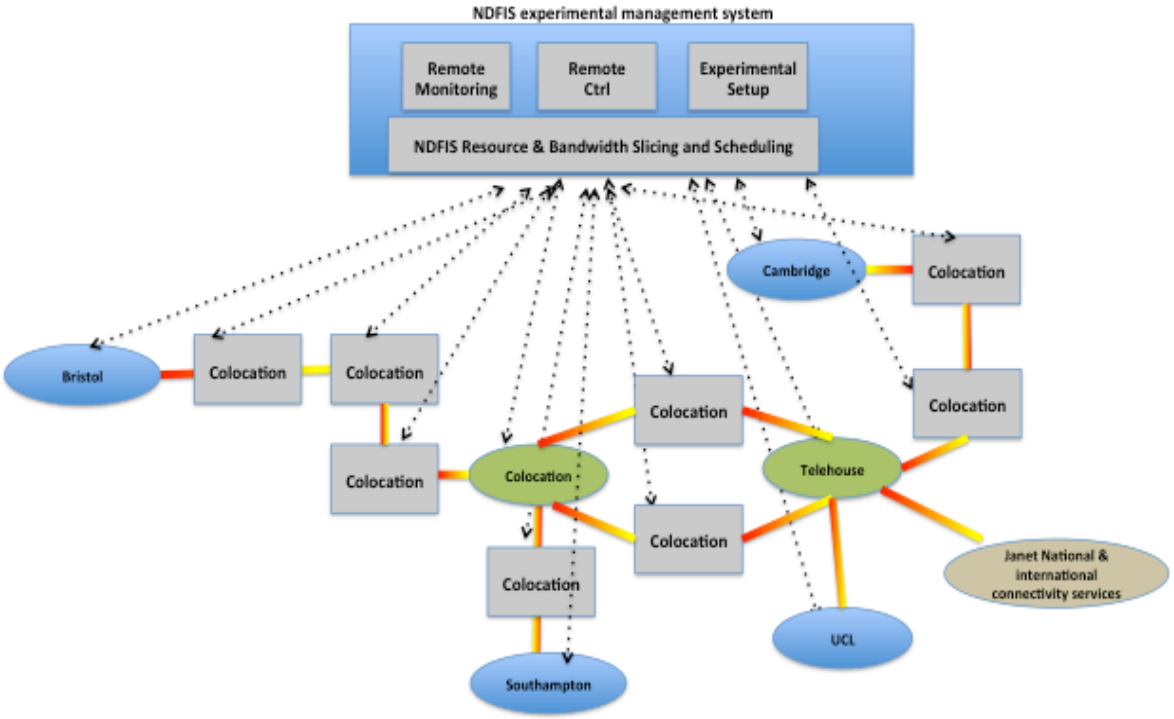


Experimental Slice 1



Experimental Slice 2



Conclusion

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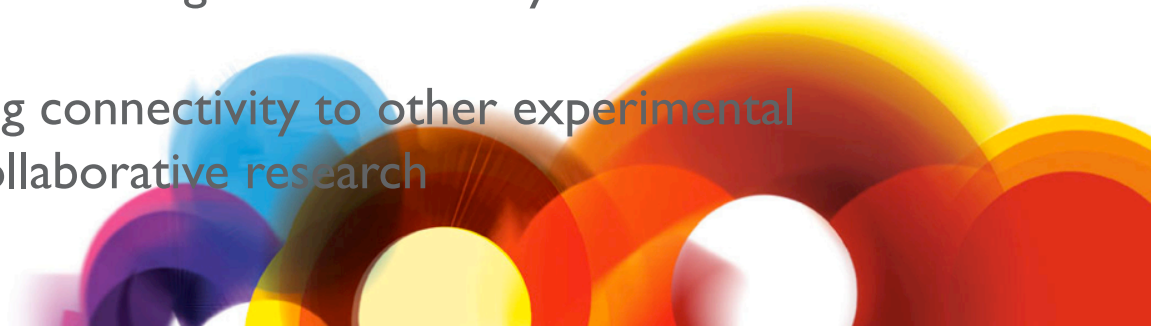
- The future internet will depend on a transmission infrastructure of greatly increased capacity and flexibility

- 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

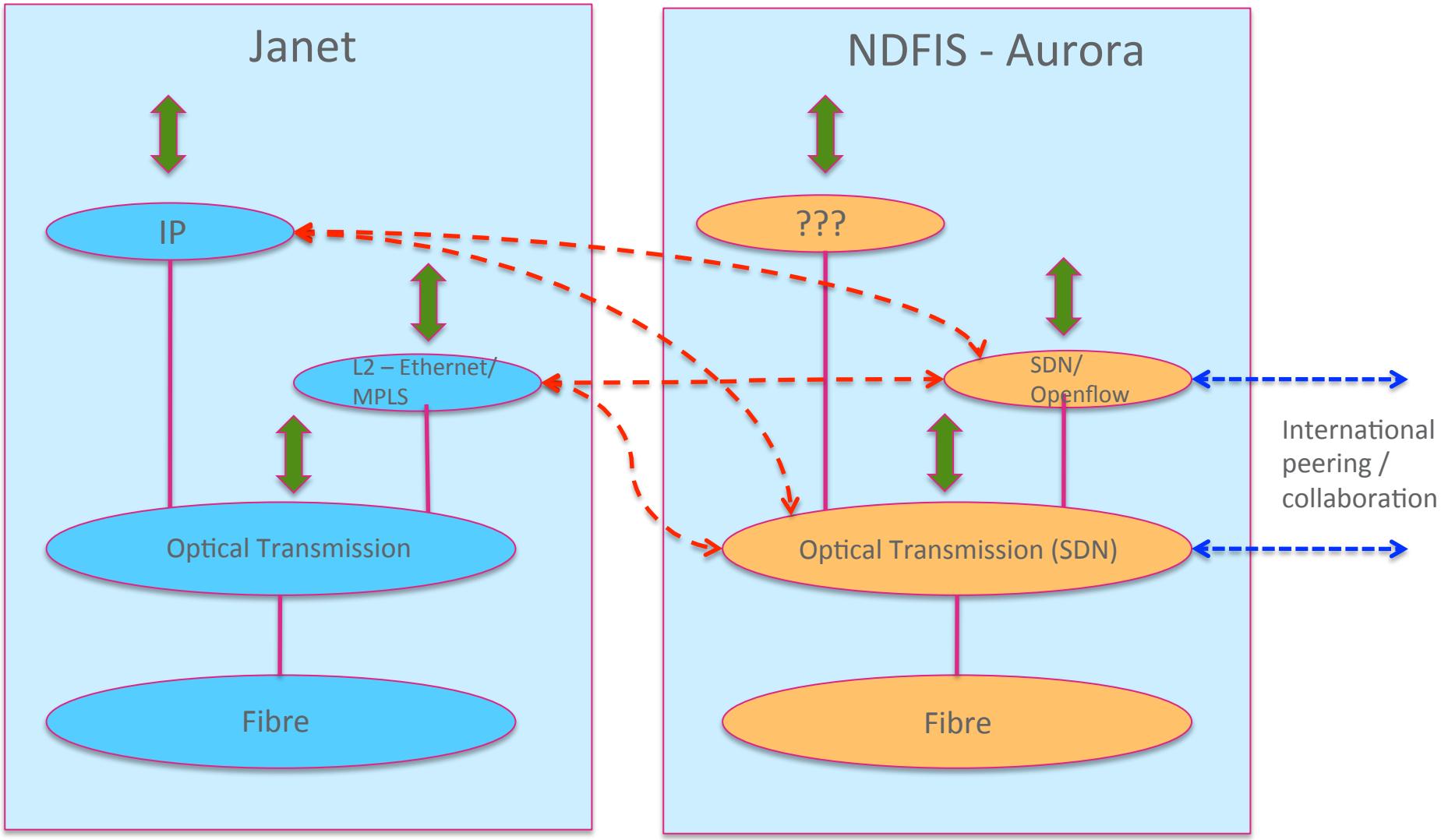
- The NDFIS, a collaboration between Janet and Universities with strong research records in optical communications and networking, will provide a platform for the development of software defined networks for the future internet

- 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

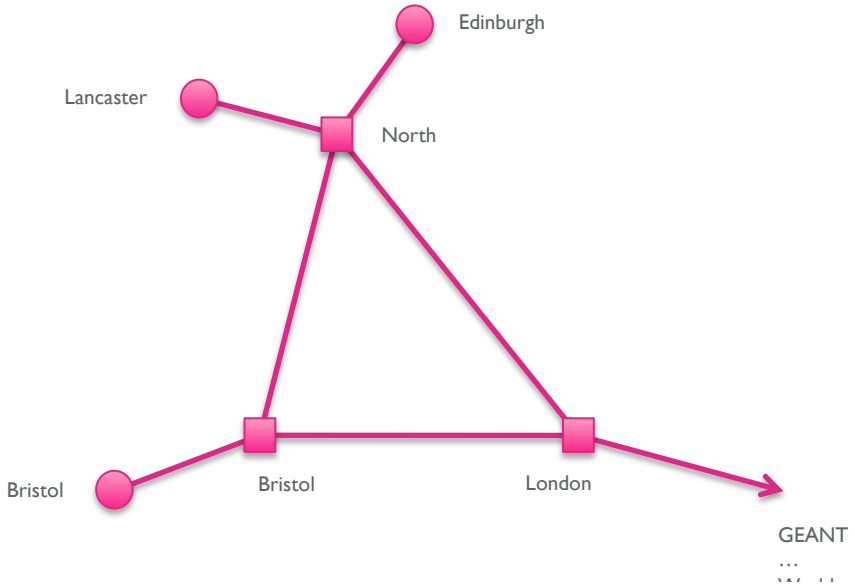


UK Testbed Infrastructure components

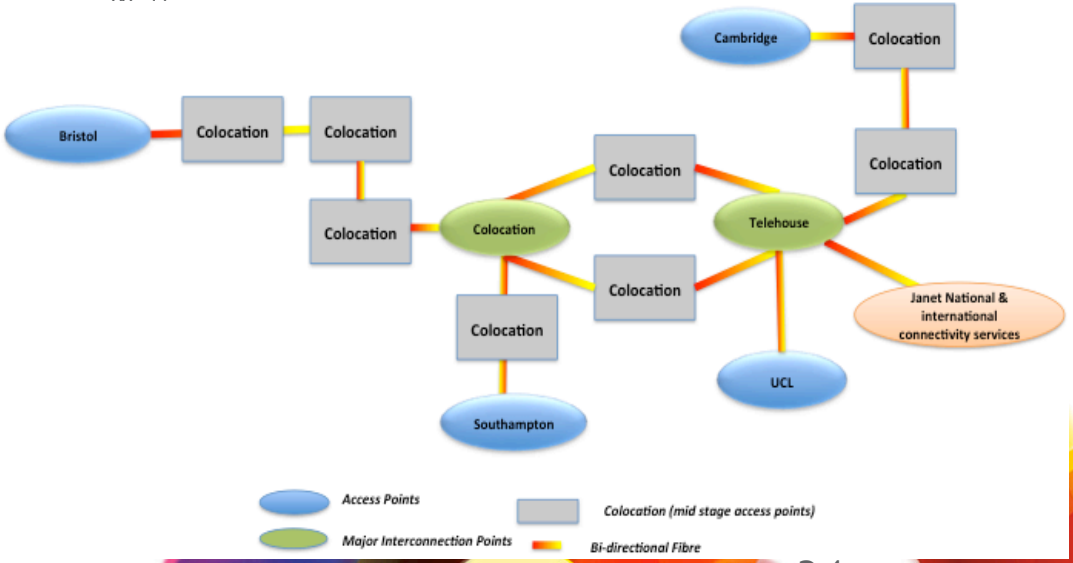


SDN Overlay / Testbed

Examples – Potential SDN Overlay & Aurora2



- **Janet service components**
  - Layer 3 (IP)
    - Tunnels/VPNs
  - Layer 2
    - Janet "Lightpaths"
      - Ethernet / MPLS
        - committed capacity
        - VPNs – uncommitted capacity - future
  - Layer 1
    - Optical: whole wavelengths
    - 40G / 100G in core



Workshop to clarify requirements

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- Last week in London – UCL
- Aimed at network research community
- Delegates from:
  - Birmingham
  - Bristol
  - Edinburgh
  - Essex
  - Glasgow
  - Kings College
  - Lancaster
  - Loughborough
  - Southampton
  - UCL

Requirements & considerations

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- Topology
  - Richer than at triangle – can we afford more ? – maybe 4 nodes
- Management
  - Who does it ?
    - Janet or a research project
- Slicing / partitioning
  - Can this be realised ?
    - Delegation of control / management within the partitions
  - What are the constraints (if any)
- Openflow
  - Which version ?
    - 1.0 or 1.3 ?
    - Legacy compatibility issues with projects such as Ofelia
- Real users & traffic ? – Maybe – Lancaster have achieved this
- Work with research community to refine these
- Aqcuire 3 or 4 devices and deploy them
  - Operational Autumn ?

More interest ?

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- If others are interested – please let us know
- NOT Exclusive
- Within Janet
  - Myself, Rob Evans, Victor Olifer
- SDNUK@jiscmail.ac.uk

- Recent news – TOUCAN project
  - Bristol, Edinburgh, Lancaster
- EPSRC Programme Grant - £12M !
  - EPSRC £6M – Industry £6M (value, not cash)
  - Janet supported this proposal

Finish !