The National Dark Fibre Infrastructure Service, a Facility for Network Experiments

Alwyn Seeds, UCL and Dimitra Simeonidou, University of Bristol
• The EPSRC ICT Mid-Range Facilities Consultation established the need to provide a dark fibre networking facility accessible to the UK ICT research community

• janet confirmed support for future leasing of fibre in support of NDFIS

• EPSRC issued an EU tender for the provision of NDFIS

• Consortium comprising UCL, janet, Bristol, Cambridge, and Southampton Universities selected as preferred tenderer, May 2013

• Contract negotiations and fibre procurement completed November 2013

• Fibre is being installed and equipment is starting to be delivered

• It is planned to roll-out the service, starting end July 2014
The New Aurora2 Dark Fibre Network

800 km of single mode optical fibre
Node Hardware

Access Points
- Major Interconnection Points
  - Optical Amp.
  - Tunable DCM
  - 16X16 MEM
  - Net FPGA
  - L2 remote access Control Switch
  - Server
  - 10GE DWDM interface cards

Colocation
- Optical Amp.
- Tunable DCM
- 4x4 MEM
- Net FPGA
- L2 remote access Control Switch
- Server
- Bidirectional, dark-fibre optical switch using beam-steered piezoelectric actuators
- Collimated fibre pairs are directly aligned for lowest loss & back-reflection
- Integral position control ensures reliable connections regardless of light level
- Modular architecture is scalable to non-blocking cross-connect of several hundred fibre ports
- Optical power monitors enable mesh protection switching and variable attenuation

Typical loss <0.4 dB
• Collaboration between University of Bristol and Polatis to add optical circuit switching functions to software-defined networks

• Embedded OpenFlow agent enables rapid provisioning, protection and monitoring of dark fibre connections from an SDN controller

• Facilitates hybrid packet/optical circuit switched architectures under a common SDN control plane

• Live Polatis/Bristol SDN datacentre VM migration demonstration at ECOC 2013
Network Control and Monitoring

Remote Access/Ctrl/Monitoring via VPN over Internet

- Bristol
- Colocation
- Colocation
- Colocation
- Colocation
- Colocation
- Colocation
- Colocation
- Telehouse
- UCL
- Janet National & international connectivity services

Access Points
Colocation (mid stage access points)
Major Interconnection Points
Bi-directional Fibre
Remote control and access

July 11 2014
• Initial experiments will be aimed at verifying the performance of the transmission infrastructure

• Software defined networking technologies will be developed and NDFIS welcomes proposals for SDN experiments using Aurora2

• It is planned that Aurora2 will interconnect with the NPL dark fibre network

• Aurora2 will also interconnect with the

• Users can access the Aurora2 network, both directly by installing equipment at the host universities and remotely using the janet Lightpath service

• NDFIS has proposed extending the reach of the Aurora2 network to give direct connection to other major centres for network research as part of the BIS Capital consultation
• 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
If your research could benefit from working with NDFIS please get in touch:

a.seeds@ucl.ac.uk

We look forward to working with you.