

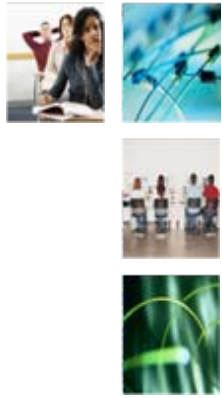
# Development and Operations on JANET.

Jeremy Sharp

Head of Strategic Technologies

Tim Kidd

Head of Operations



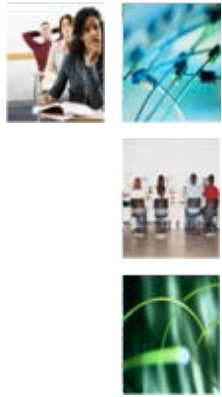
# Themes...

- The network infrastructure
- Using the network

Each from the perspective of:

- development; and
- operations.

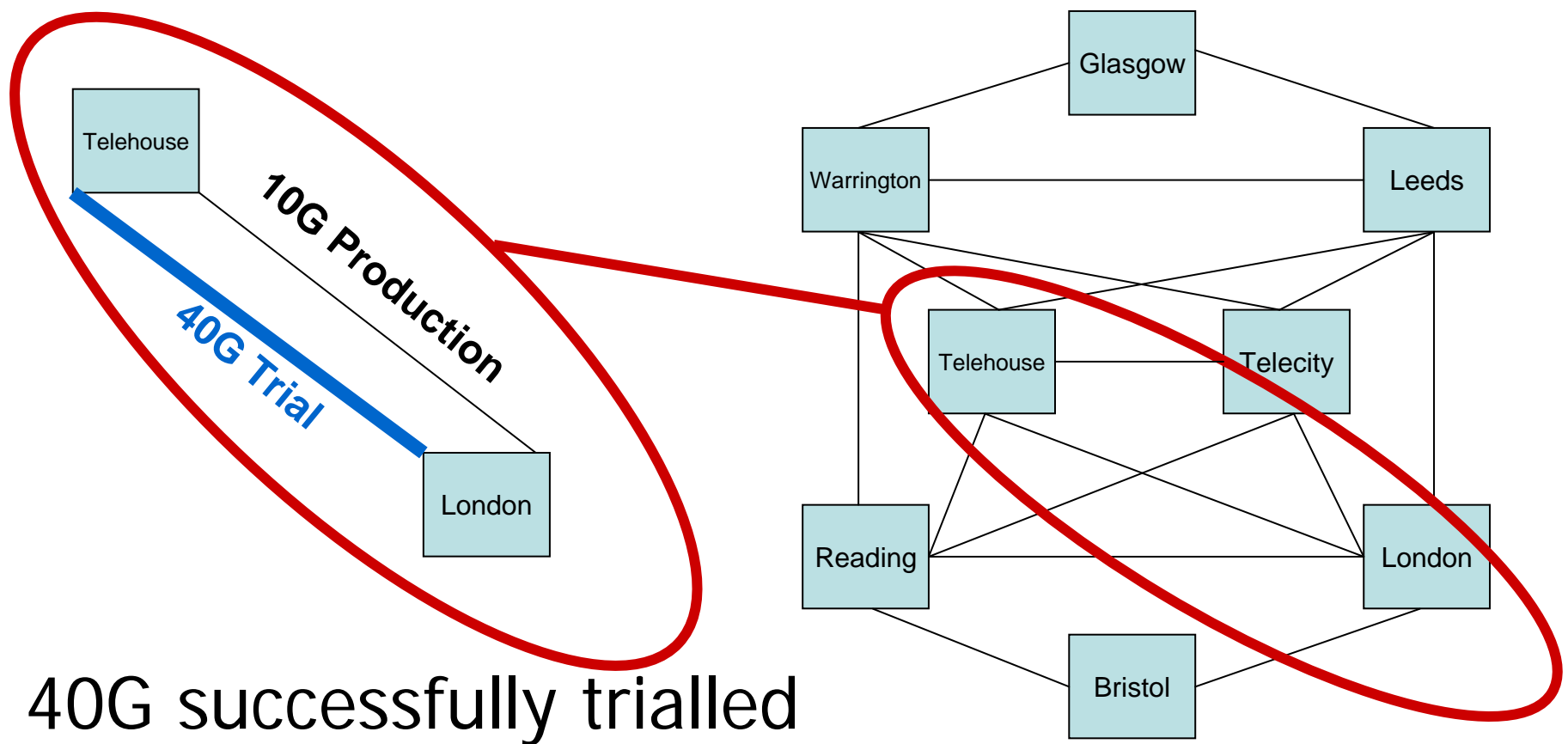
# Developing the network infrastructure Themes



- Faster & Bigger
- Separability & Flexibility
- Network engineering support
- Looking to the future
- Looking into the network



# Dizzy heights of 40G

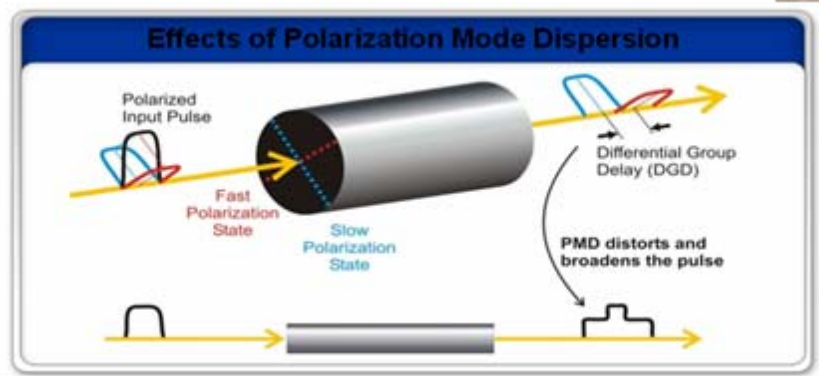


40G successfully trialled

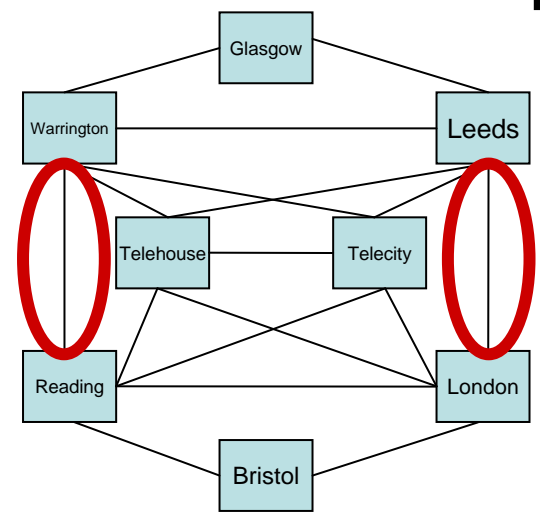


# Challenges of 40G

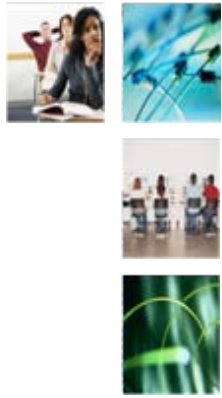
- Fibre quality & PMD



- Two links are particularly challenging



- Looking at the use of a different line encoding technique DPQPSK



# JANET Lightpath Service



# JANET Lightpath Service

- Dedicated network connections for demanding projects and applications
- Typically around 1Gbit/s, some at 10Gbit/s
- Transfer times for
  - CD - 700MBytes
  - DVD - 5GBytes

Launched Mid 2007

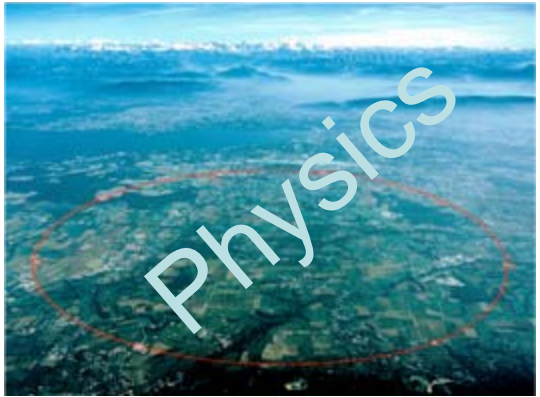
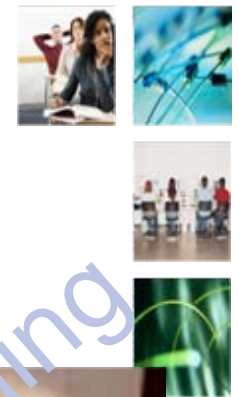
	CD	DVD
1Gb/s	6s	40s
10Gb/s	0.6s	4s



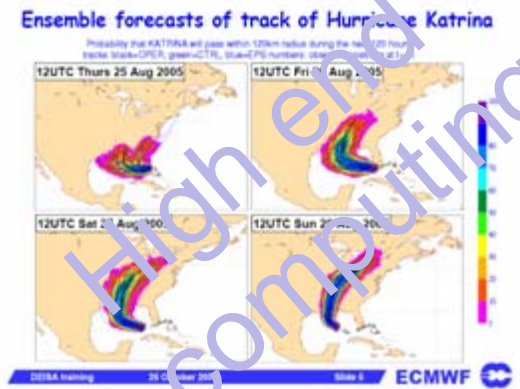
# Project Classification

- Single lightpath
  - 1 point to point connection
- Multiple Lightpaths
  - Multiple p2p connections
  - Starting to build an “overlay” network
- Project lifetimes / Lightpath persistence
  - Months to years
  - Persistent or semi-persistent overlays

# Supporting Research



Physics



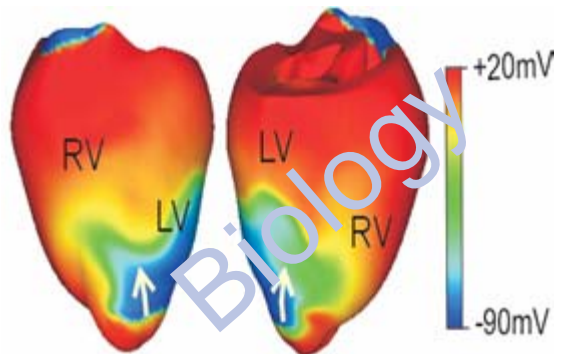
High end computing



Performing arts



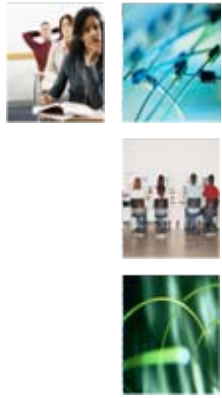
Astronomy



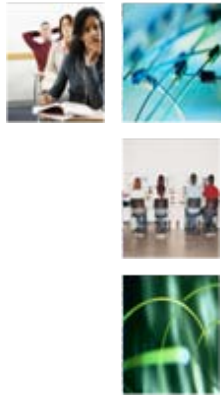
Biology



Network research



# Network engineering support



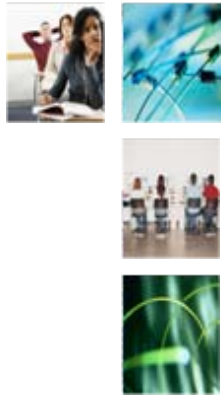
# Network Engineering Support

## IPv6

- Fully supported on the JANET core
- All regional networks must support it by October '08
- Range of supporting material

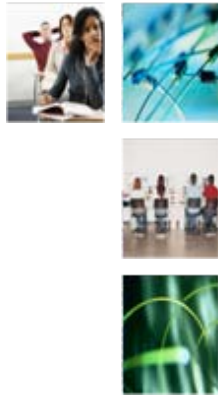
## QoS

- Multi-year JANET QoS project completed
- Standards for using QoS on JANET published



# Supporting future network development

# JANET Optical Development Programme



**Control: Management & provisioning**

**Network architectures**

**Transmission Techniques & Technologies**

- Improve management and delivery of network capacity
- Technology & architectures for future network services



# JANET Aurora

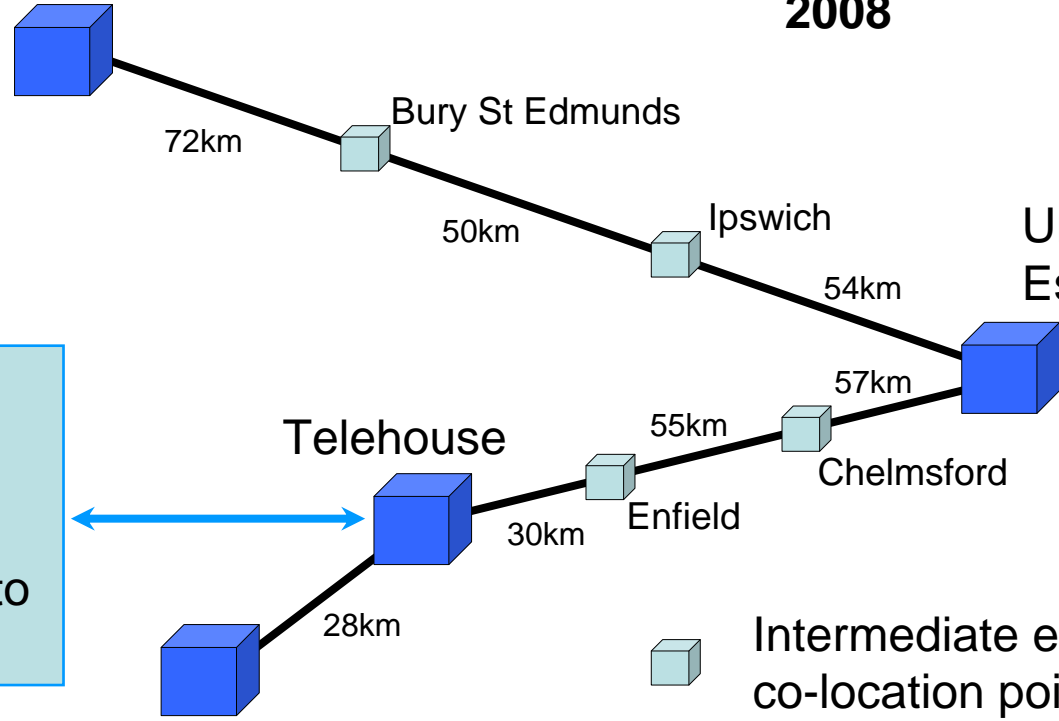
# JANET Aurora

Dark Fibre Testbed supporting Photonics research

**Went live December 2008**


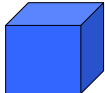



University of Cambridge



Interconnection with JANET Services - National & International Lightpaths  
 Broader community access to Dark Fibre facility

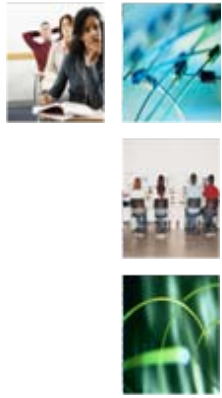
UCL

-  Intermediate equipment co-location point
-  University / JANET access point
-  Fibre spans



# Supporting photonics research

- Phosphorus Project – EU FP6 funding
  - End-to-end lightpath provisioning
  - Co-scheduling with GRID resources
- Photonics Device research
  - Install bespoke optical equipment on fibres (lasers/modulators/compensators)
  - Ultra-fast photonics research
- Optical Burst Switching
  - Flow triggered switched lightpaths (genuine lambdas/wavelengths)
- Ultra fast photonics



# How's the network performing?

# The "Fifth Objective" Network Visibility



## Objectives:

- Increase the granularity of the measurement data
- Increase the reach of the system by allowing researchers and others access to data
- Extend the types of measurement data available



## The plan:

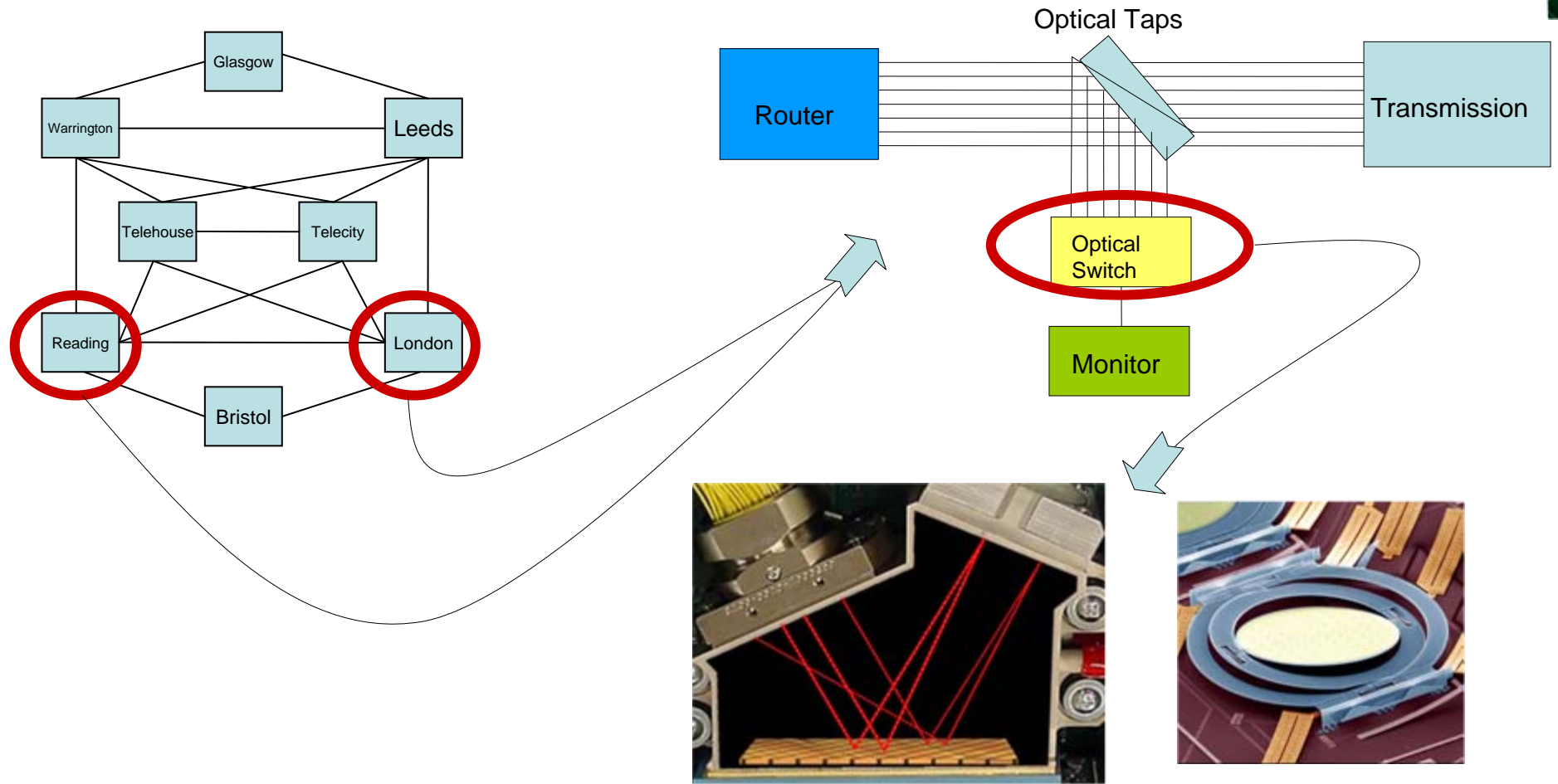
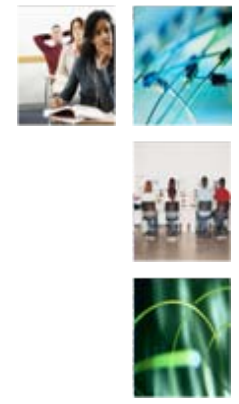
- Replace Netsight
- Central database architecture
- Available mid 2008

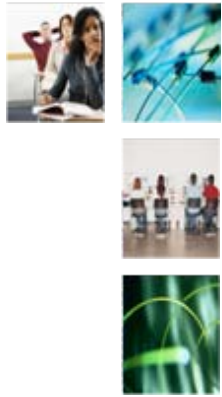


## Research access to JANET traffic data

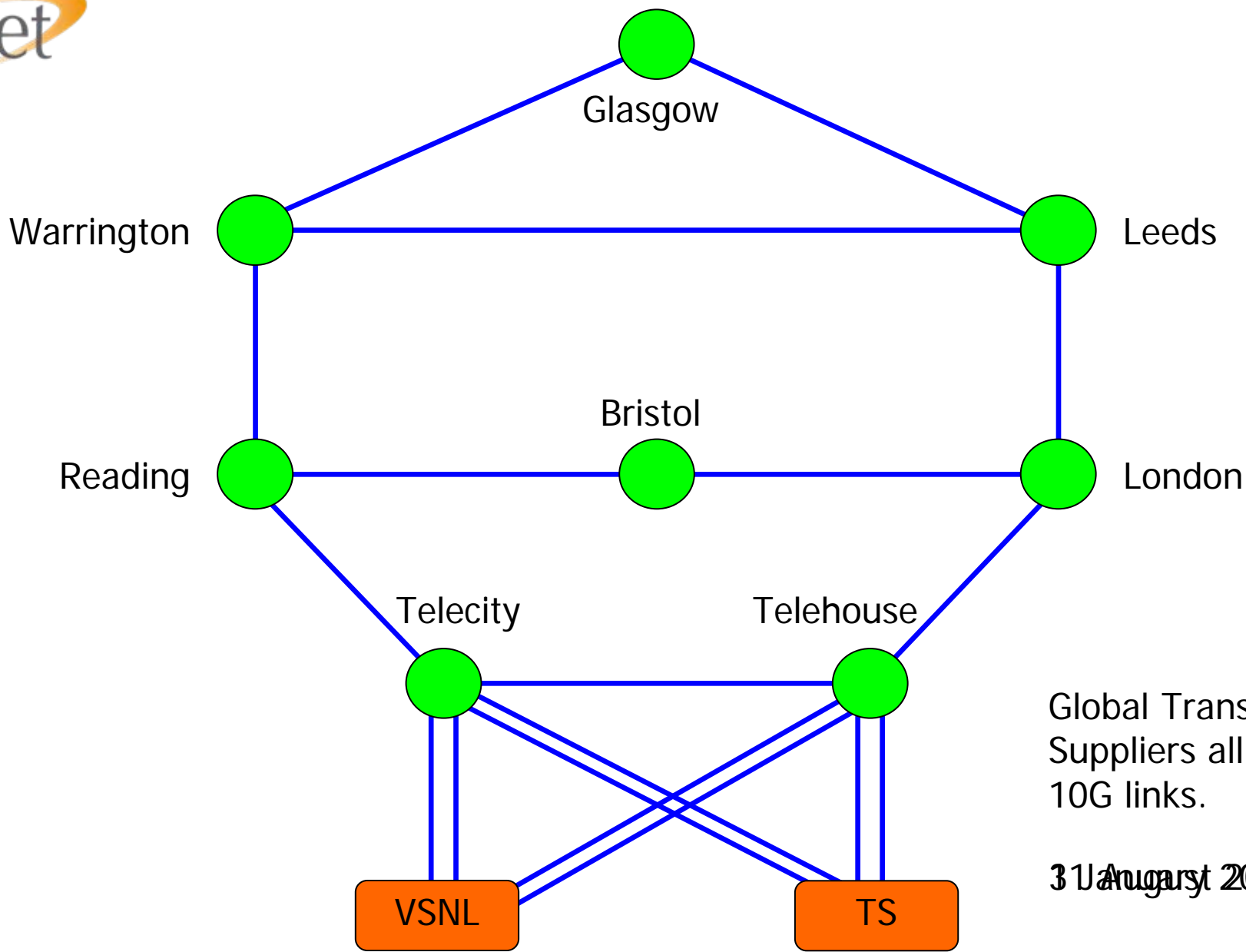
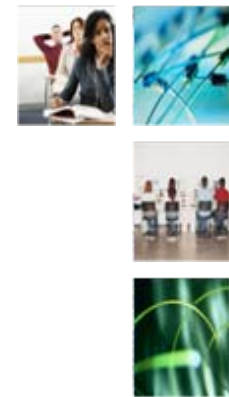
- JANET(UK) – Legal framework for access to JANET traffic data
  - Ensure compliance with Law
    - Regulation of Investigatory Powers Act (RIPA)
    - Data Protection Act (DPA)
  - Contract with researchers
    - Describes work to be undertaken
    - How data will be handled & store

# Research access to JANET traffic data - Technical framework



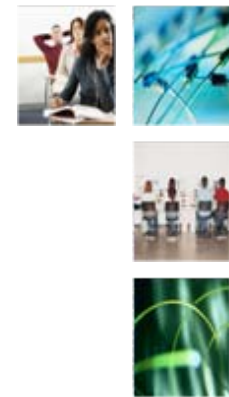


# The network infrastructure: operational changes.



Global Transit Suppliers all 10G links.

31 August 2008



# Savings...

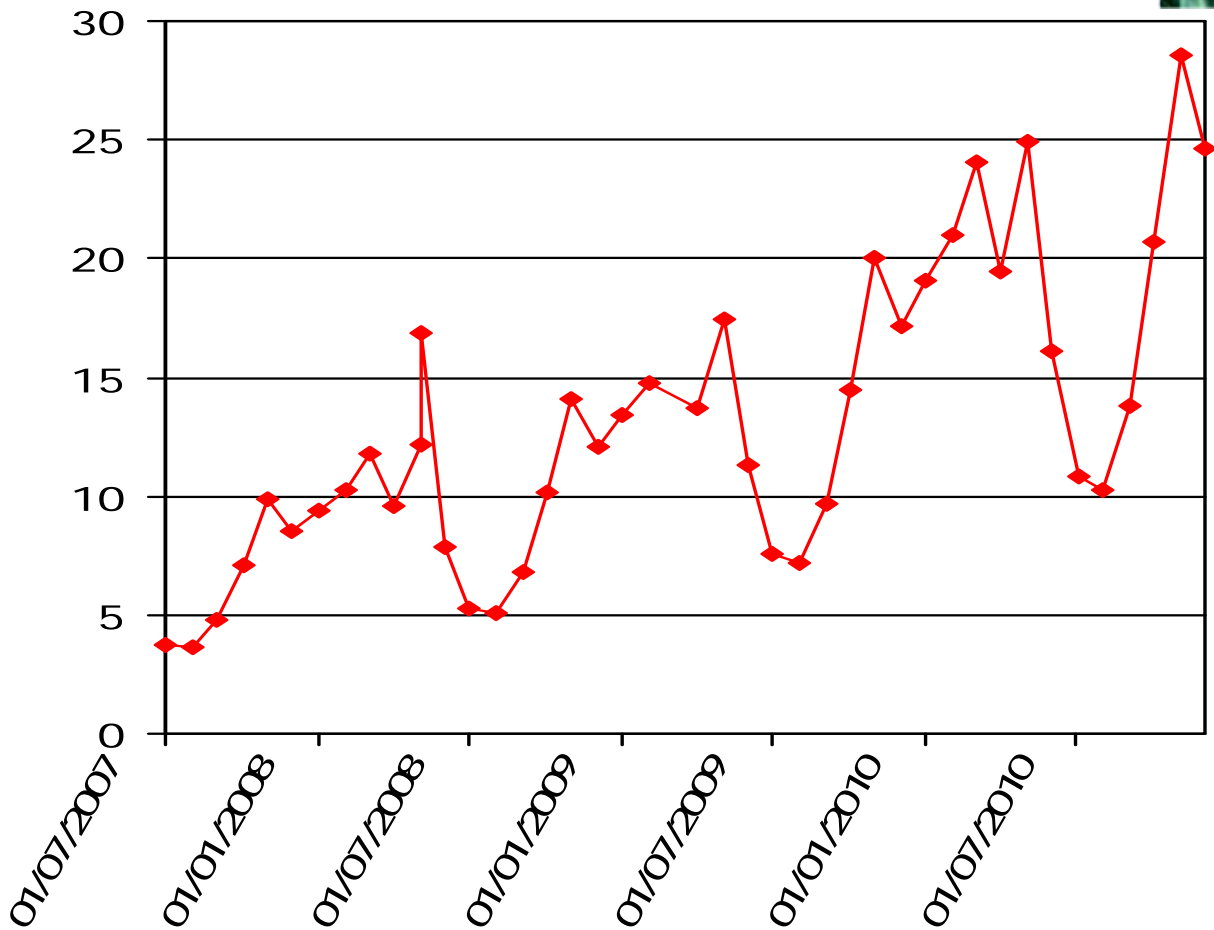
3 year cost:

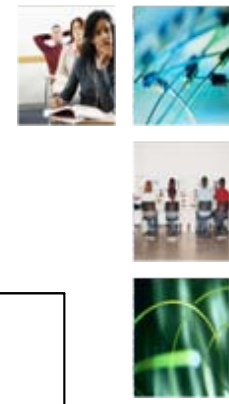
Old £3.4M

New £1.9M

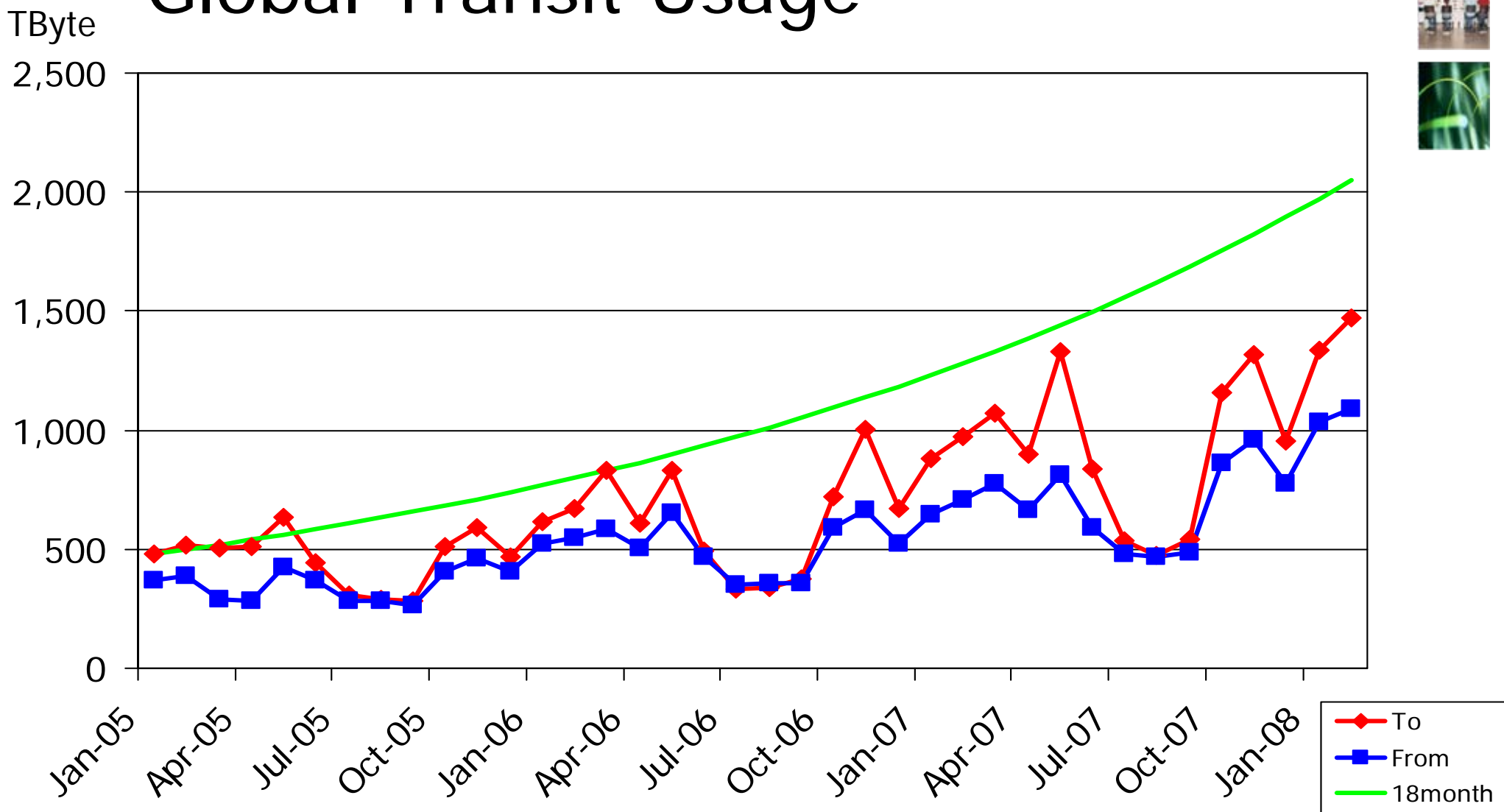
Saving £1.5M

Half Projected Usage (Mbit/s)

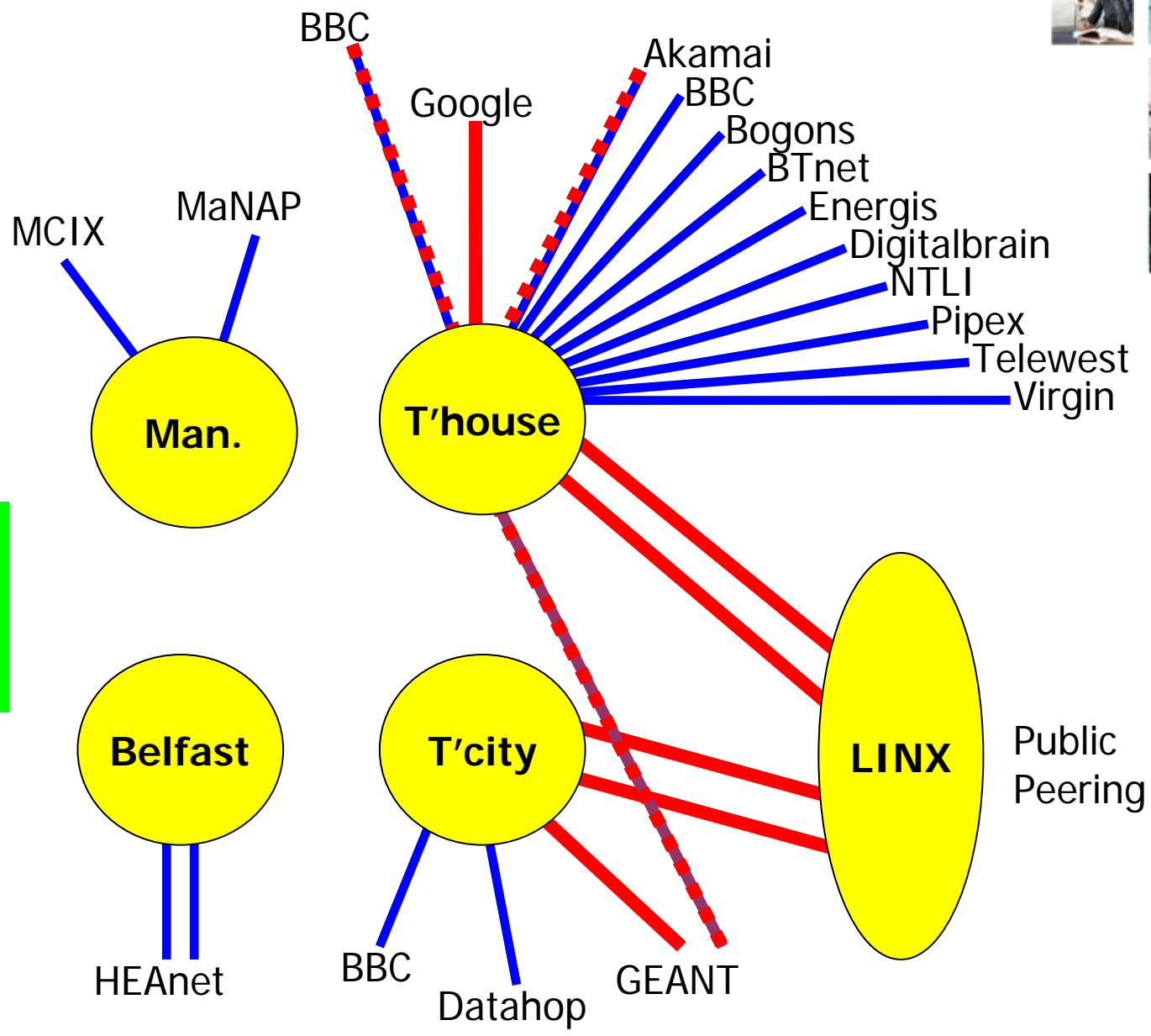
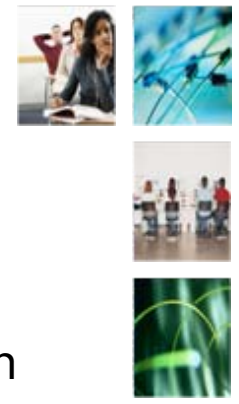




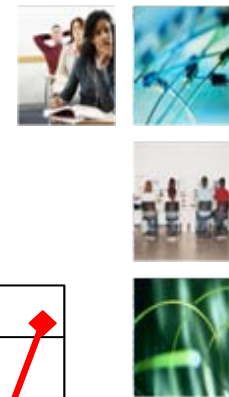
# Global Transit Usage



# Peering

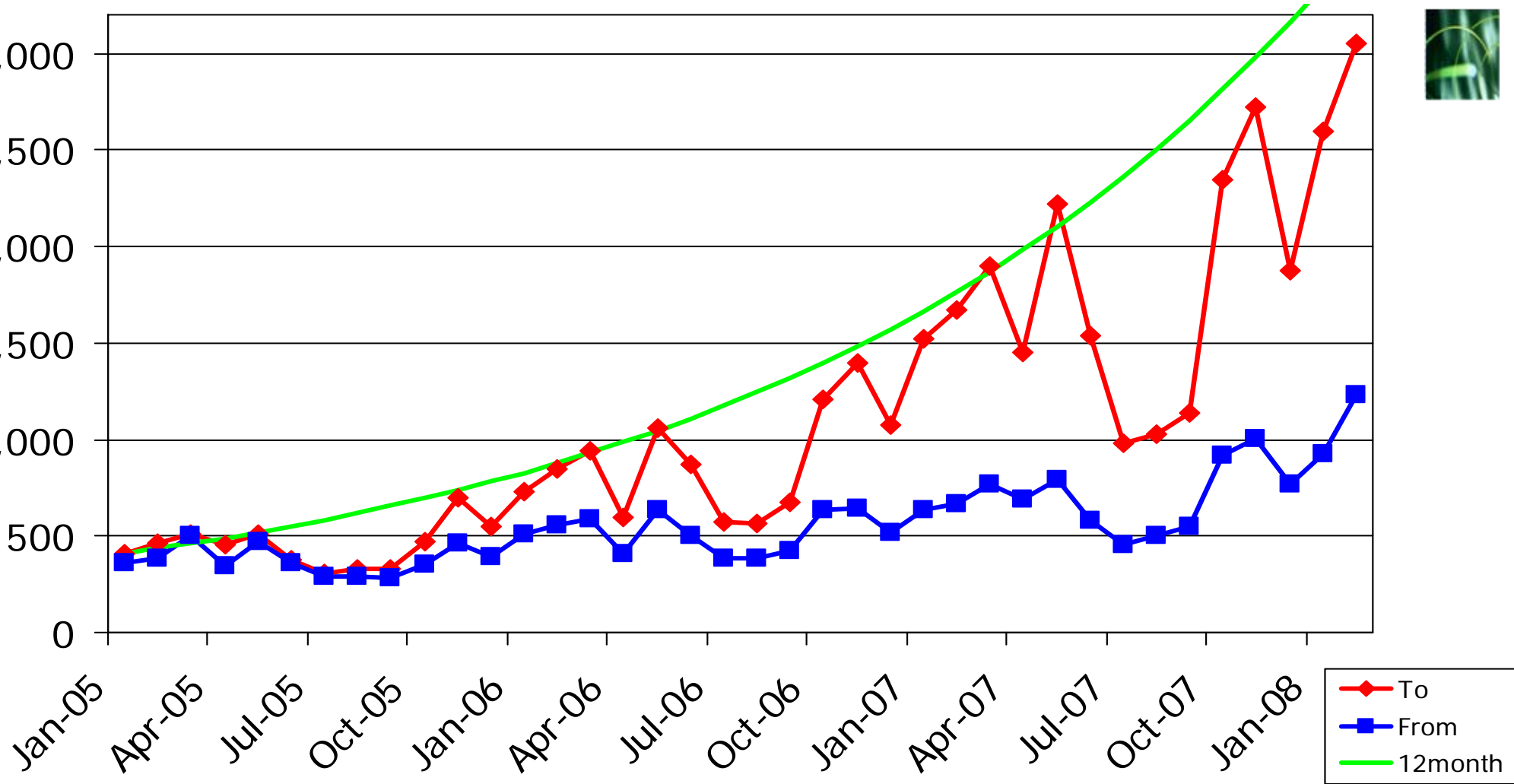


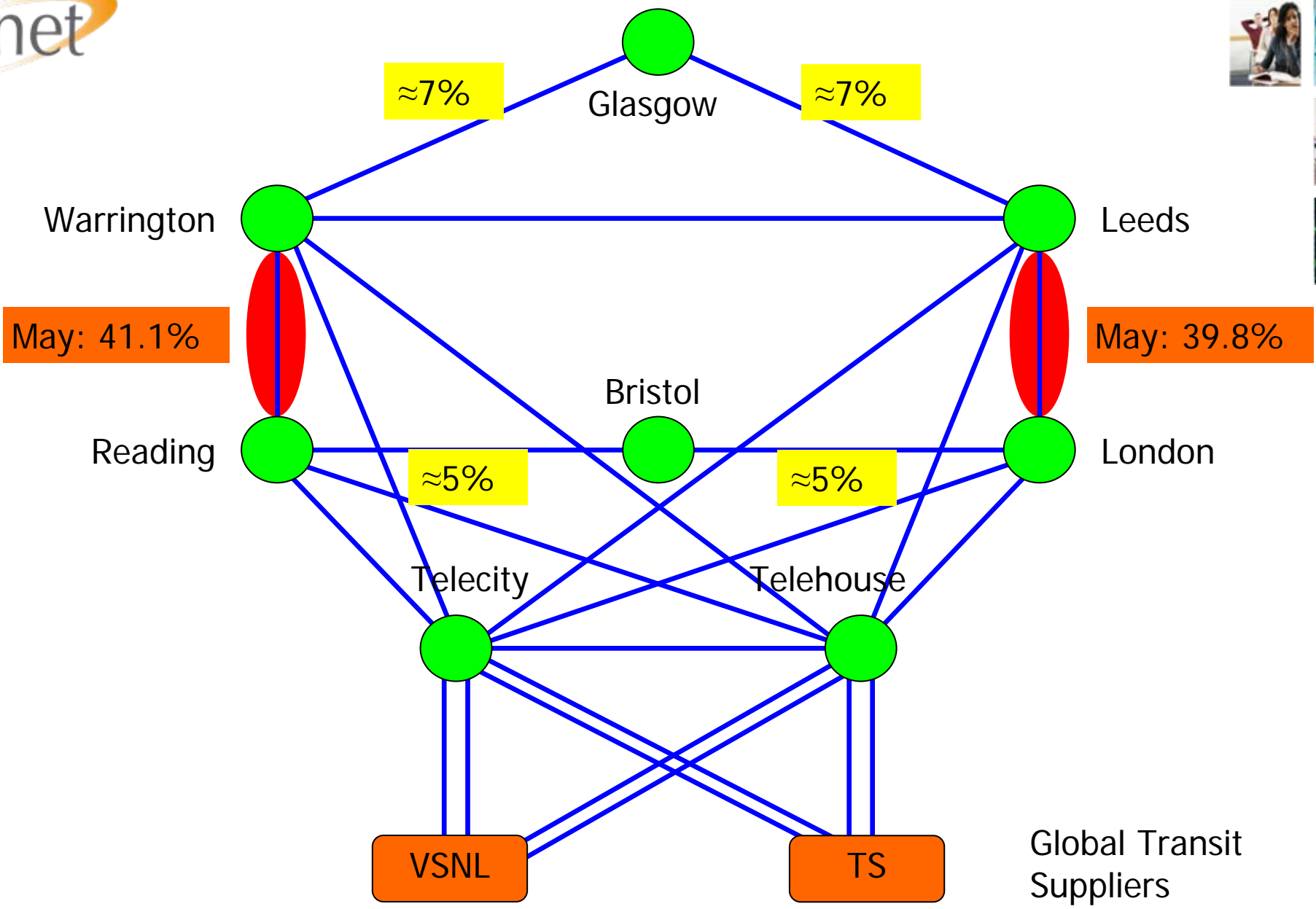
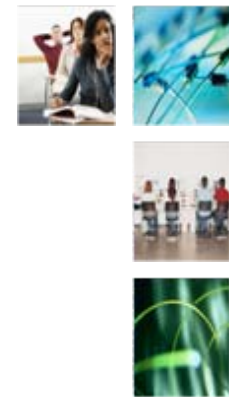
Last year: 46.5G  
This year: 79.5G  
Next year: 105G

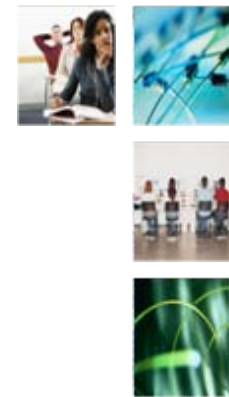


# External Link Usage

TByte

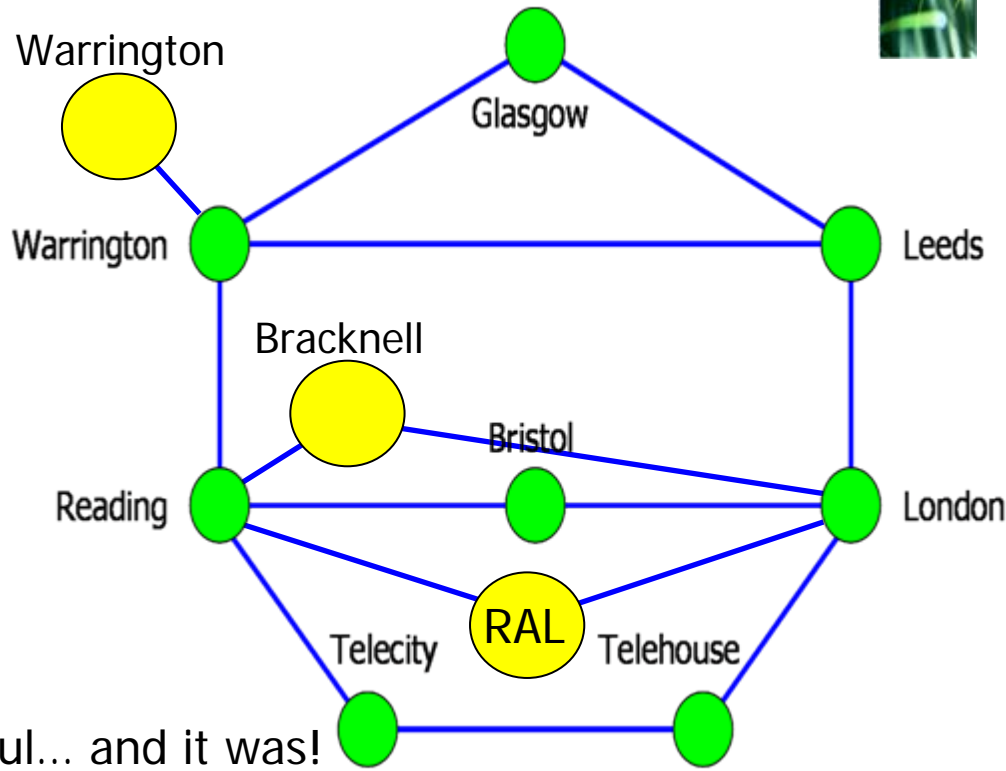
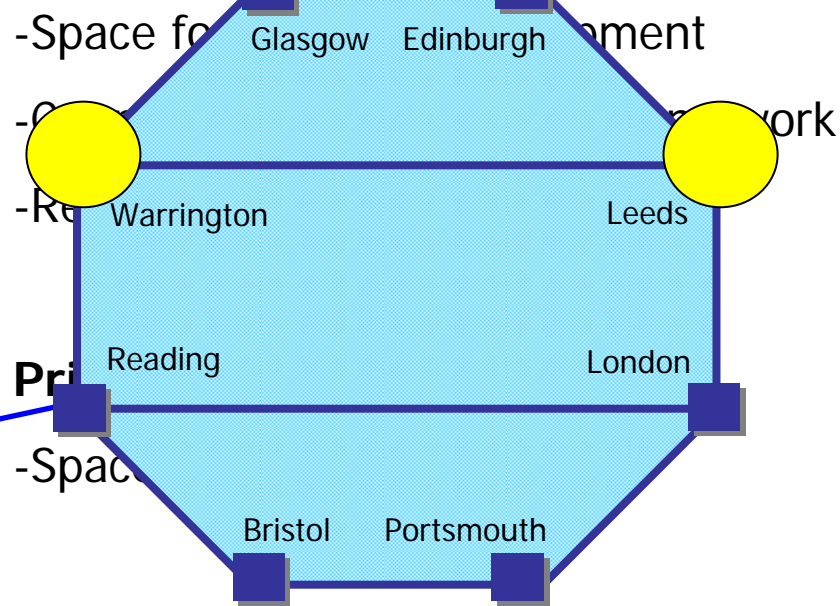




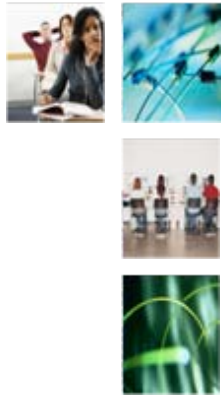


# Co-location Service

## Public co-location:

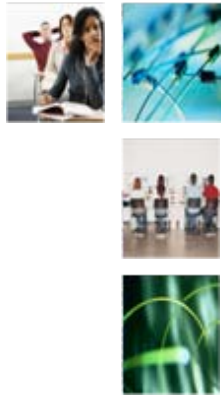


In SJ4, an experiment to see if it was useful... and it was!



# Fibre Faults

- Some problems around the Leeds area:
  - fibre laid in ducts on the surface near railway lines;
  - people “in white vans” strip out tens to hundreds of metres of fibre using the van to pull it out;
  - expect to find copper... a bit disappointed!
- Verizon working with contractors to move the fibre to a more secure duct system.

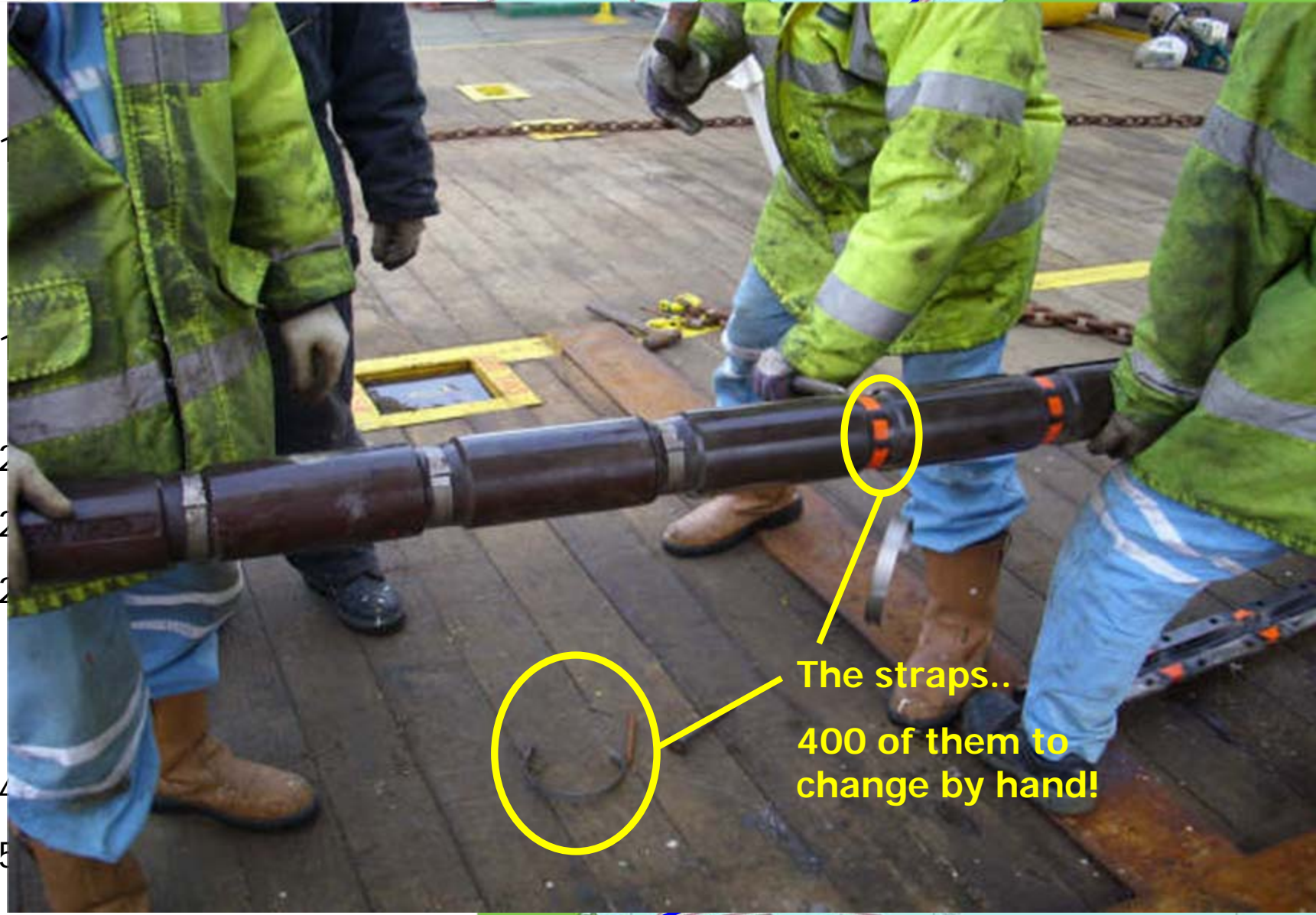


# Undersea Fibre to Ireland

- Submarine Cable Improvement Group  
scig.net
- Since 1986 (courtesy of "Worldwide trends in submarine cable system faults"):
  - 50% faults = fishing
  - 20% faults = anchor



Glasgow

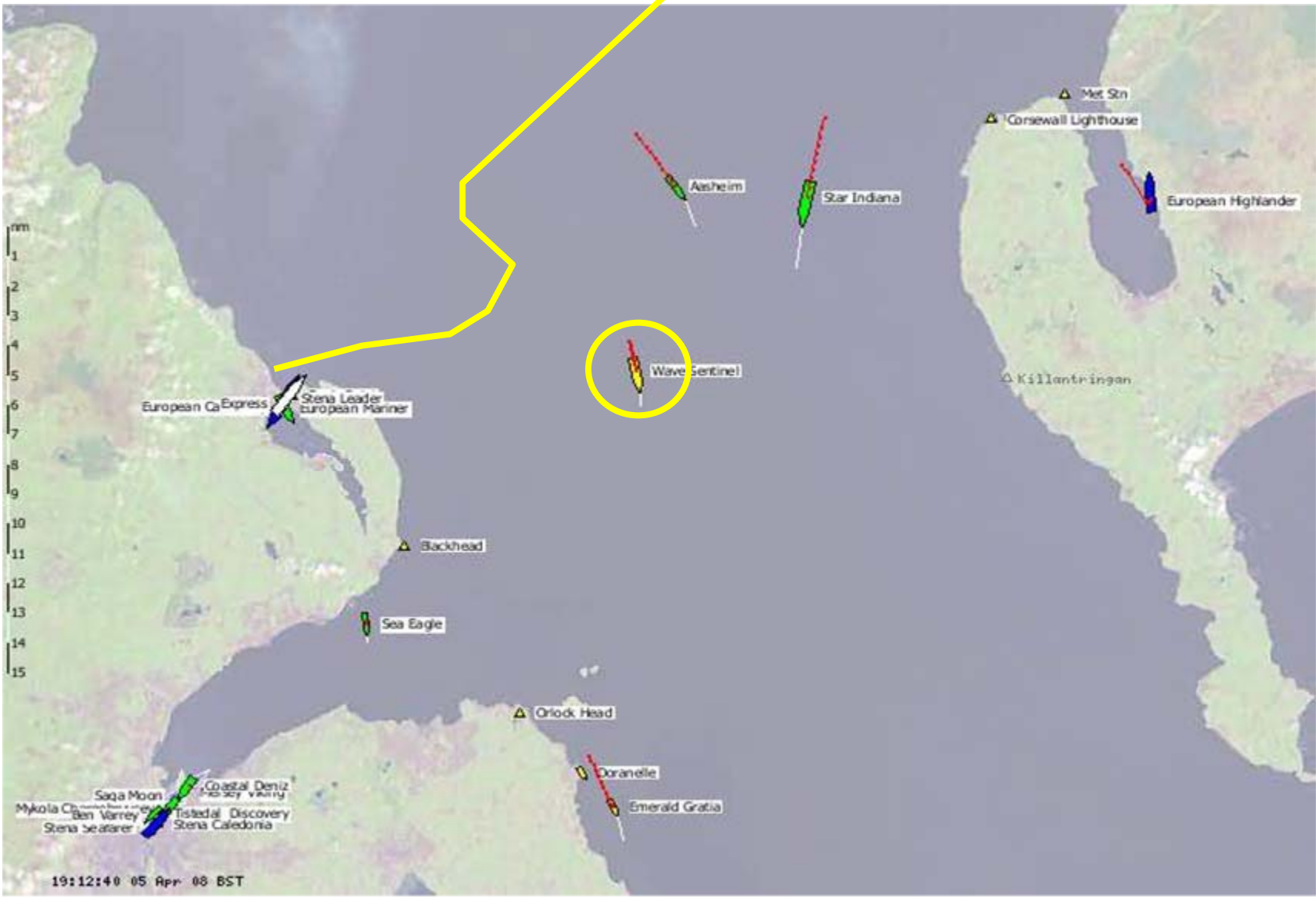
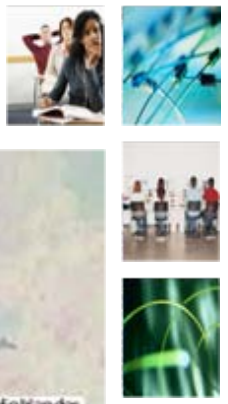


The straps..  
400 of them to  
change by hand!



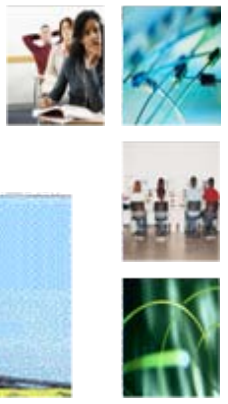
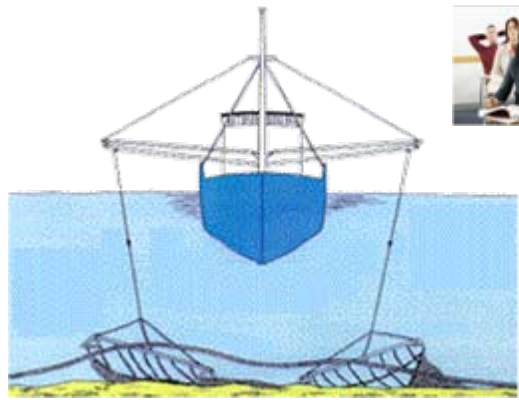
arrington







The following sequence of events shows what can happen if a vessel fouls a submarine cable.



First fouling of cable by fishing gear



Starting to retrieve gear



Submarine cable almost impossible to release

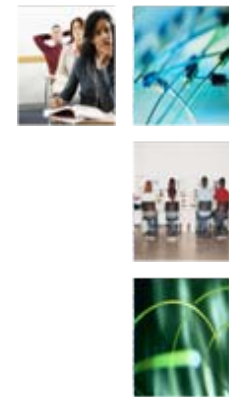


First realisation of fouling a cable

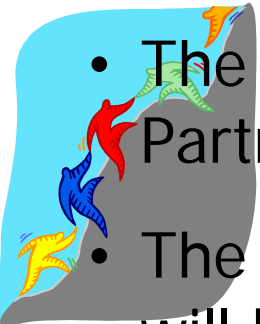


Cable should be lowered to seabed to eliminate danger of capsize





# JANET Partner Agreement



- The **JANET Delivery Team** is the Regional Partner Academic Network (RPAAN) contract. JANET(UK) and regional network staff **working together**.
- The JPA defines how the regional networks will be provided.

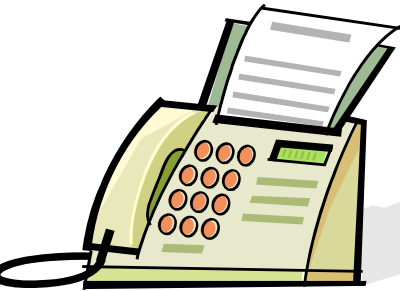
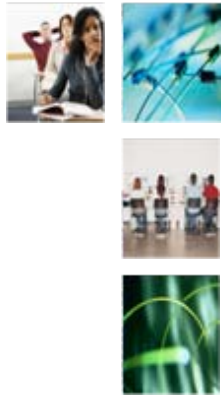
- Briefings
- Promoting services
- Solving problems
- Operations manual

## Technical Design Authority

Ensure **technical compatibility** between the regional network and backbone.



# JANET Partner Agreement

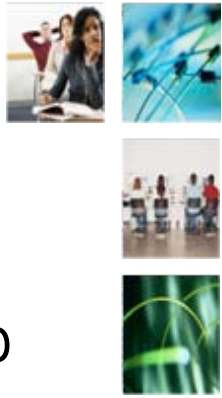


## Operational Cover

Provide cover for more hours to better handle **fault management** – reality and perception.

- RNOs will provide call-out cover until 23:59.
- JANET(UK) will cover the service desk until 23:59.

**The JPA starts in October 2008.**



# FE Upgrades

- LSC will fund **installation** cost of upgrades beyond 10Mb (typically 100Mb).
- College will fund **recurrent** cost.

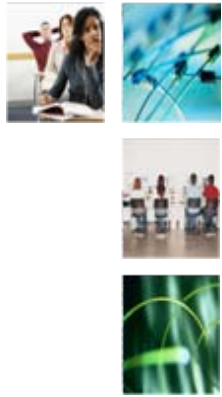
380 colleges in total

115 already upgraded

so only 265 to do...

- Quite a lot of organising to do...
- LSC will refund college for installation costs for those that have already paid for an upgrade ( $\approx 30$ ).

# Using the network Themes



- New applications
- Access Management
- Flexible access

# Application Services

## Voice Collaboration Service

- Trial launching May 2008 - over 7000 users across 105+ sites

## IPTV

- Working with providers on student programming channel & delivery of IPTV across JANET

## Futures

- Investigating “ultra HD” technology

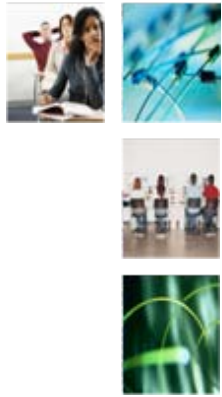




# Authentication, Authorisation & Identity

- UK federation
  - 286 Member organisations as of today
  - Shibboleth 2.0 released 19th March 08
  - Installer for Shibboleth on Windows
  - Widening participation, Gov, Health, Museums
- Roaming
  - 85 Participating organisations
  - Eduroam confederation policy agreed
  - Participating in the Trusted Computing Group
  - Development roadmap



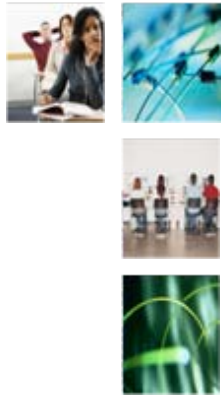


# Authentication, Authorisation & Identity

- OpenSEA 802.1x Supplicant
  - Founder member of OpenSEA Alliance



- Contributing testing and evaluation effort
- Server Certificate Service
  - 276 participating organisations
  - 3163 certificates issued



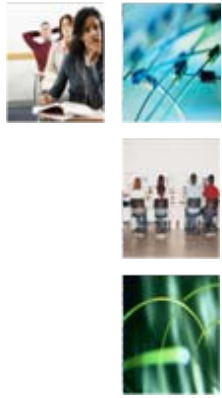
# Beyond the backbone & mobility

- Flexible Network Access

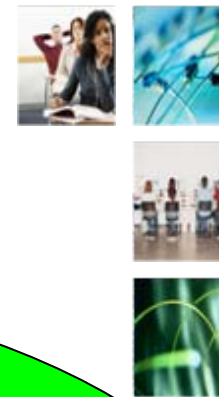
- Mobile IP
- Location awareness
- Local Loop Unbundling
- Access technologies
  - 802.11
  - WiMAX
  - Next generation DSL

Mobile computing has come of age...



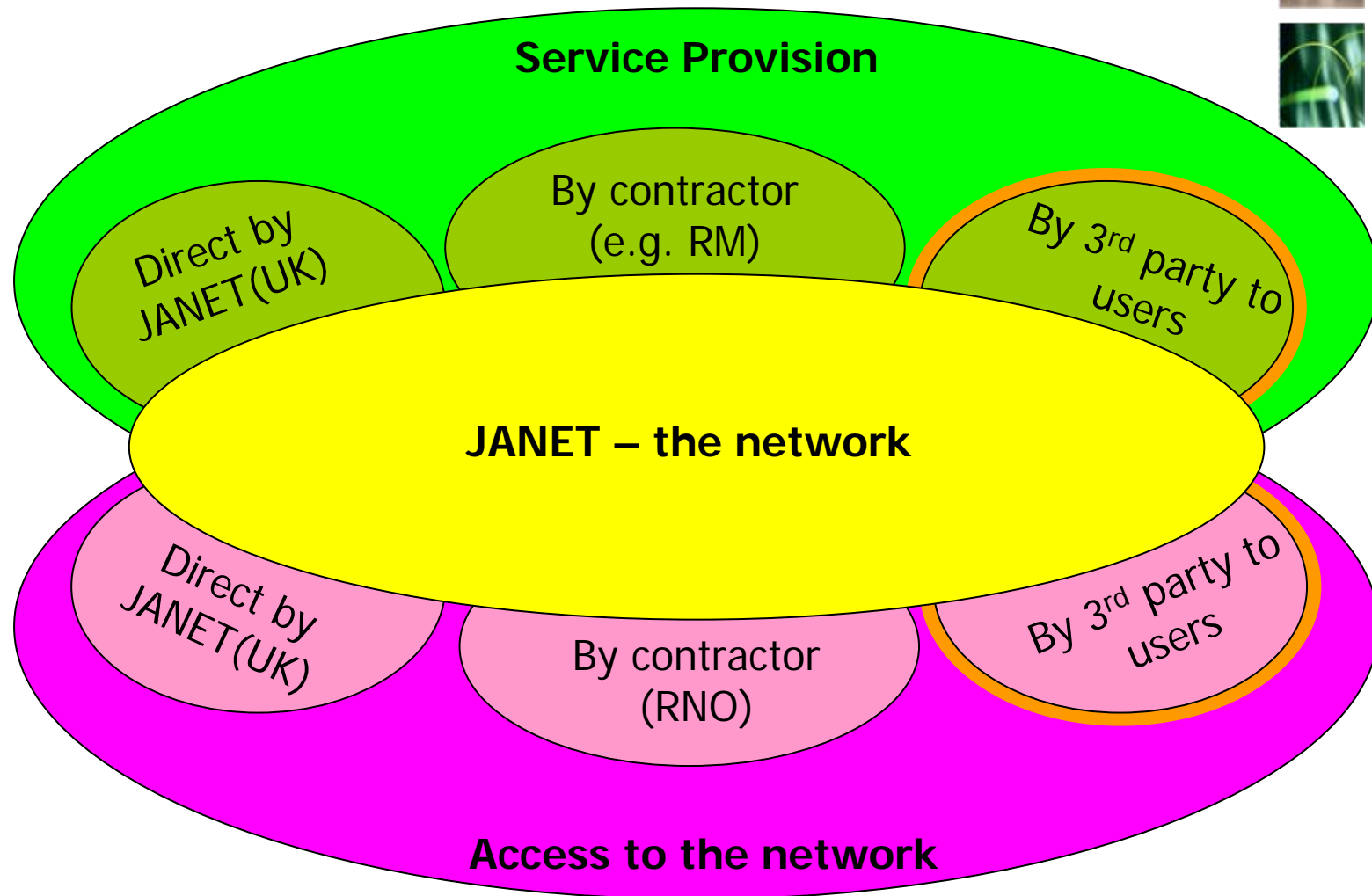


# Using the network: Services Update.

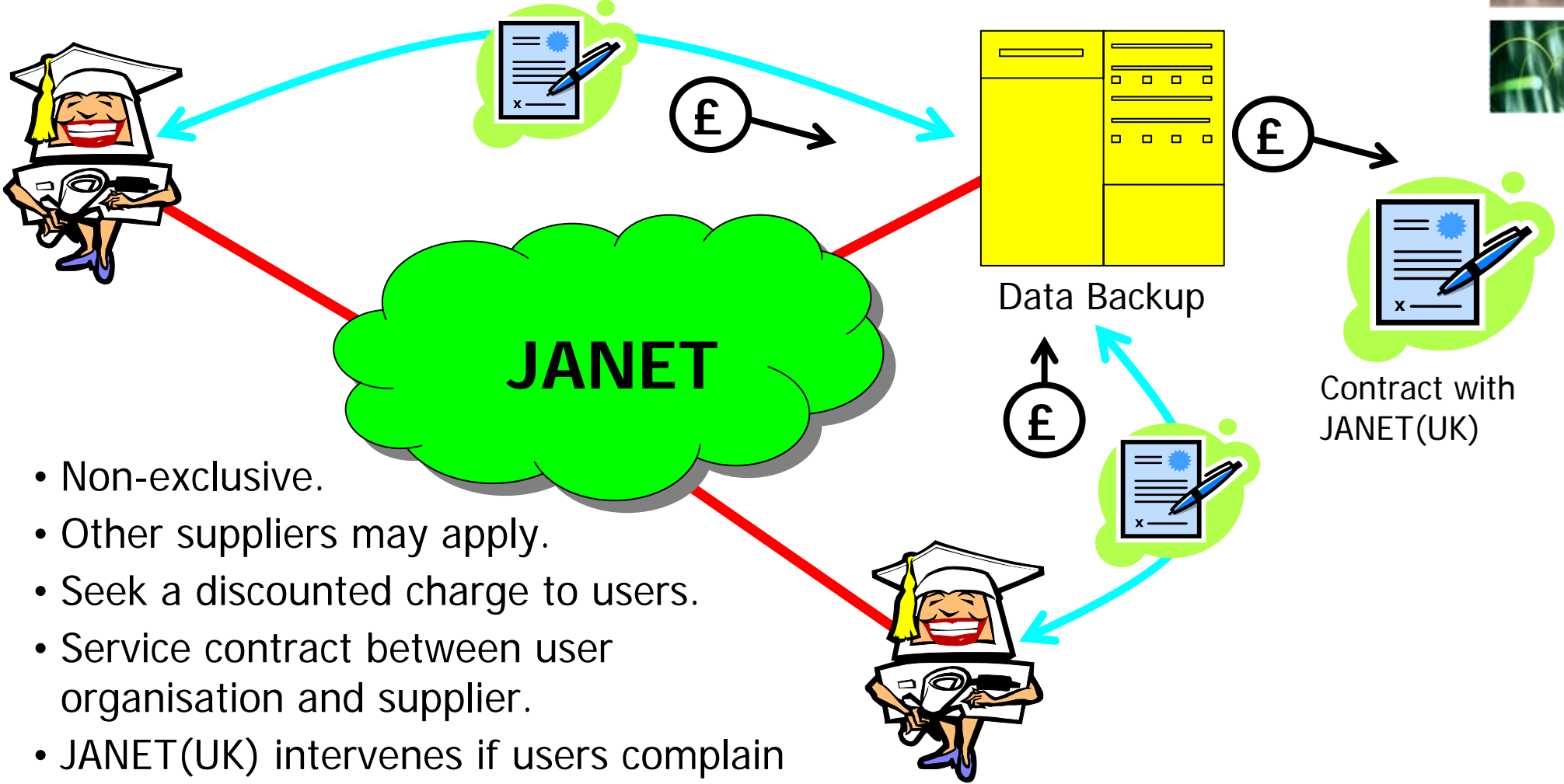
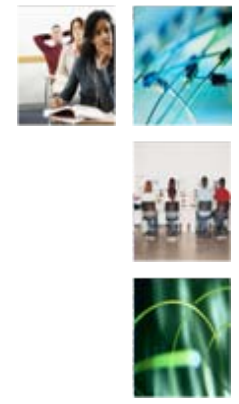


# Network and Service Delivery

- Quicker to respond to changing requirements.
- Diversity with minimum budget risk and burden.



# Type 1: Non-Exclusive

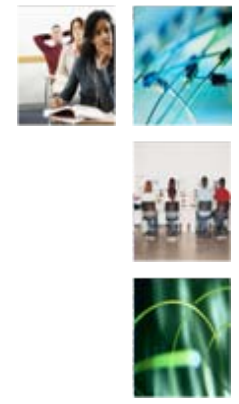
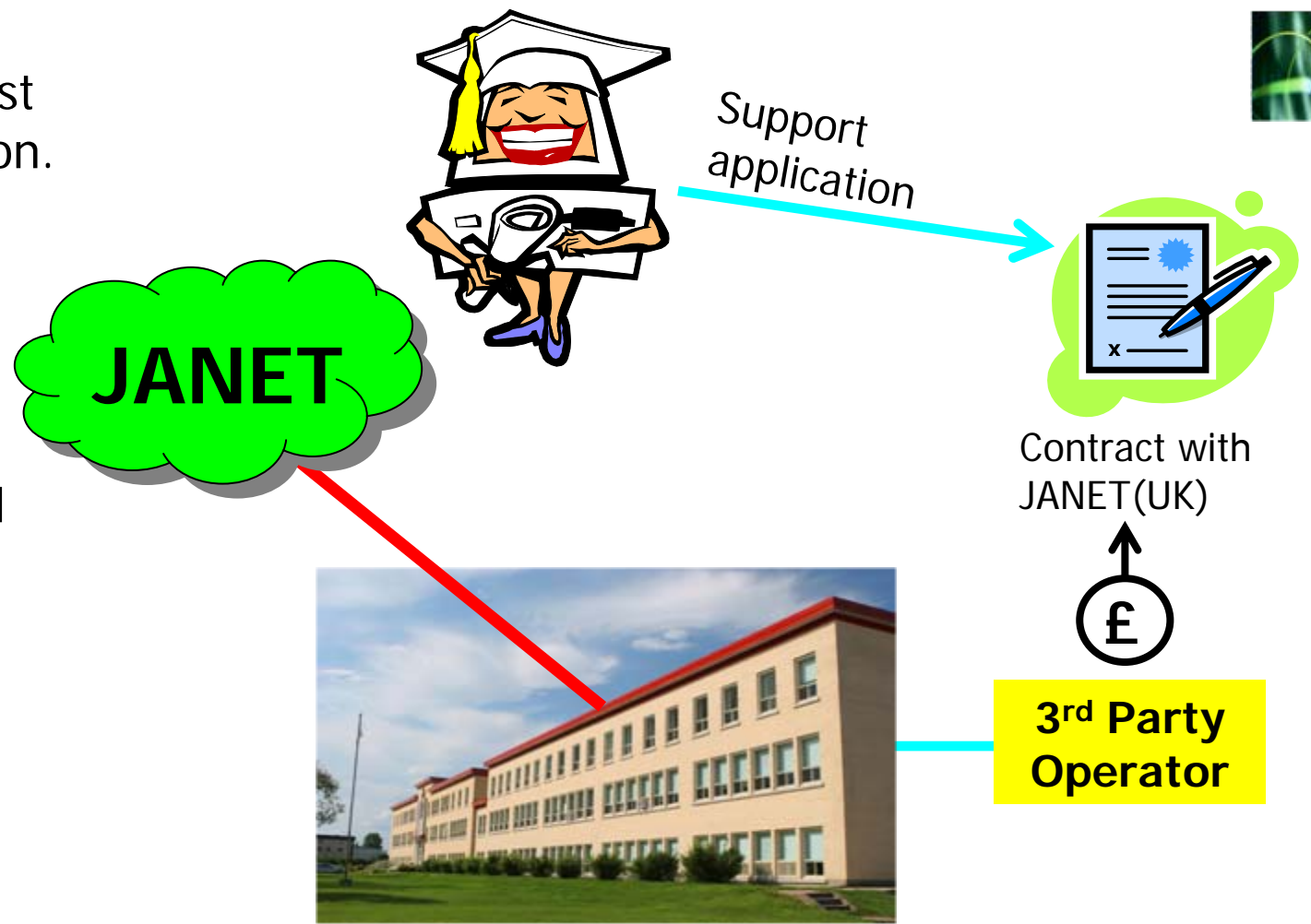


- Non-exclusive.
- Other suppliers may apply.
- Seek a discounted charge to users.
- Service contract between user organisation and supplier.
- JANET(UK) intervenes if users complain about service or charges.



# 3<sup>rd</sup> Party Accommodation

- Permitted users whilst at the accommodation.
- Activities of the university or college at the accommodation.
- Activities of the third party only for the operation of the accommodation.



# NLN Materials



nlN Materials - Home - Windows Internet Explorer  
 http://www.nln.ac.uk/

nlN Materials - Home

**nlN materials** **ja.net**

**Log-in**

User name:

Password:

[Forgotten password?](#)  
[New user?](#)

**Home**

**Materials**

- ACL ▼
- Basic/Core/Key Skills ▼
- Subjects ▼
- Vocational ▼

**Background and Pedagogy** ▲

- [Introduction](#)
- [News](#)
- [History](#)
- [Future](#)
- [About the materials](#)
- [Using the materials](#)
- [Pedagogy](#)
- [Cross-curricula mappings](#)
- [Lesson plans / schemes of work](#)
- [Case Studies](#)

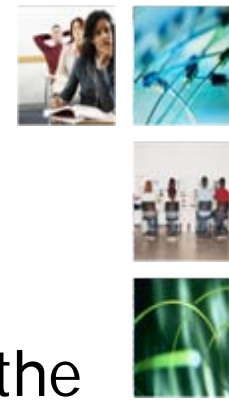
**Support** ▲

- [FAQ](#)
- [User Guide](#)
- [Terms of Use](#)
- [Plug-Ins](#)
- [Tutor documentation](#)
- [Projects](#)
- [Archive](#)
- [Contacts](#)

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Internet 100%



# Framework Agreements



**Videoconferencing**

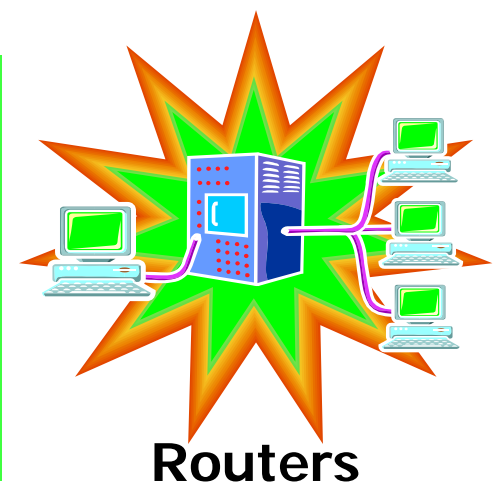
- Equipment
- Maintenance
- Training

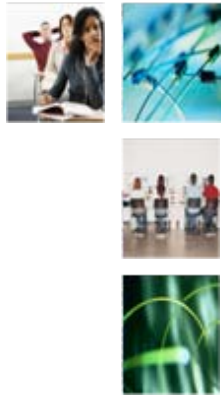
“ any public sector and related organisation in the UK that is eligible for WVN or JVCS support”

<http://direct-visual.com/janetframework.html>

“ regional network operators and all organisations with a JANET primary connection”

- Supply and maintenance of
- Cisco
  - Juniper
  - Alcatel





# Summary

- Growth in traffic high
- SuperJANET5 being exploited
- Service model responding to changing environment
- Potential of the network continues to be unlocked by a range of developments

**JANET - A world class network for education and research**

