

JANET News

Unearthing the past with JANET at BETT 09

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Front cover image: Image from JANET(UK)'s forthcoming stand at BETT 2009. See page 15 for more details.

Editorial

According to the *Daily Telegraph* in April this year, YouTube alone now uses more bandwidth than was available on the entire internet in 2000¹. That statistic accompanied a story titled 'Web could collapse as video demand soars'.

Not if JANET has anything to do with it. JANET routinely spends a great deal of time and effort to make sure scenarios like that do not come true – not because we are worried that they will but simply because it is part of our remit. We take care to be always positioned so that we can meet our customers' needs as soon as they emerge, bringing the latest in network technology and services to our users.

For instance, in the last few months Prince Andrew School on St Helena in the South Atlantic has become possibly the furthest flung user of the JANET Videoconferencing Service, bringing cost-effective teaching to the island's small population of learners via videoconferencing. Meanwhile children at an MOD school in Germany were able to use JVCS to talk to their parents serving in the British Army in Basrah, and South Tees NHS Trust has become the first trust to use videoconferencing across the N3 JANET Gateway, supporting staff and students in undergraduate clinical placements at NHS sites.

With all that going on it is hardly surprising JVCS has doubled its videoconference hosting capacity with the installation of new HD equipment at core locations.

Videoconferencing isn't the only data-intensive need that JANET can supply. Also in this issue you can read about how JANET Lightpath recently established a 1Gbit/s lightpath connection between a music studio at the University of York and a lecture theatre in Edinburgh, to support a high-quality studio recording session. The lightpath carried the audio data back from Edinburgh to York to be recorded.

None of this would be possible without the basic reliability of the JANET backbone and its ability to supply massive amounts of bandwidth when needed. JANET now has one of the largest deployments of 40Gbit/s channel technology on any network in the world, after upgrades were made to key PoPs on the JANET backbone.

Customers are rarely constrained by considerations of what is and isn't technically possible; as they get used to being able to achieve routine feats that would have been miraculous ten years ago, so they expect to be able to achieve even more miraculous feats, even more routinely, on demand. The most successful JANET service of all would be one that was completely invisible to its customers and yet allowed them to achieve feats of awesome technological complexity without even realising.

And, true to this sense of purpose, JANET(UK) is now investigating how it can trial 100Gbit/s provision.

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1. <http://www.telegraph.co.uk/news/uknews/1594230/Web-could-collapse-as-video-demand-soars.html>

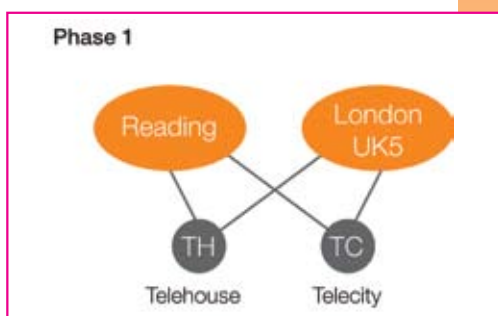
JANET Backbone is World Leader

By the end of this year JANET will, as far as we know, have the largest deployment of 40Gbit/s channel technology on any network in the world. If anybody reading this article knows otherwise then we would be interested to know!

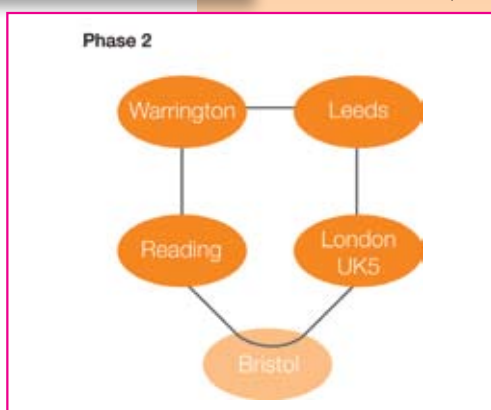
Phase 1 of the project to upgrade eight of the core JANET backbone circuits to 40Gbit/s began early this year and was completed in September 2008, with upgrades to four circuits at the heart of JANET(UK).

'JANET(UK) has worked closely with its industry partners to undertake this important and ambitious next step in the evolution of the JANET backbone infrastructure.'

These were between the JANET Points of Presence (PoPs) in Reading and London Kings Cross and those at Canary Wharf Telehouse and Telecity, to which JANET connects for its external connectivity.



Phase 2, due to be completed by December 2008, will provide 40Gbit/s upgrades to the circuits from the PoPs at Reading and London to Warrington and Leeds, and also between Warrington and Leeds PoPs, plus a direct link from Reading to London routed via Bristol.



JANET(UK) has worked closely with its industry partners to undertake this important and ambitious next step in the evolution of the JANET backbone infrastructure. The industry partners are Verizon Business; Ciena Corporation; Alcatel Lucent; Juniper Networks and Nortel Networks.

And finally, true to remaining at the forefront of network evolution and providing

a network that is fit for purpose and highly reliable, JANET(UK) has started to investigate how it can trial the next step of bandwidth channel provision – 100Gbit/s.

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The Technology

One of the characteristics of the JANET backbone is its ability to scale according to traffic growth demand. The ability to use 40Gbit/s building blocks as traffic on individual links grows beyond 10Gbit/s was a key strategic consideration when building the backbone.

(The alternative would be to add additional parallel 10Gbit/s links, but this is not cost effective and introduces complexity in network engineering terms. With a backbone that is easily scalable using 40Gbit/s channel building blocks, JANET is able to increase bandwidth cost-effectively, providing more capacity, whilst keeping complexity low by aggregating traffic over single large channels.)

At the design stage in 2005 an upgrade path to 40Gbit/s from the 10Gbit/s circuits underpinning the JANET IP service was specified and identified,

correctly, as being required for the latter half of 2008. This was based on analysis of traffic growth at the time. In preparation, a trial of the 40 G b i t / s

technology to be used at both the transmission and IP level was successfully undertaken during 2007 between two key JANET backbone PoPs in London.

For three of the four circuits upgraded in Phase 2, challenges in the design phase were encountered due to fibre quality, specifically the effect of a fibre characteristic called Polarization Mode Dispersion (PMD). At higher speeds PMD in an optical fibre can be critical, and depending on the Wave Division Multiplexing (WDM) transmission systems that are used can prevent higher speed channel working such as 40Gbit/s. PMD is a complex characteristic on fibre systems and can arise due to an asymmetric fibre core (i.e. a fibre that isn't round!) caused through internal stress during fibre manufacture or external stress during installation. On three of the circuits the level of PMD was so high that the WDM transmission systems used on the JANET backbone would not be able to cope with it at 40Gbit/s channel operation. An alternative 40Gbit/s system from Nortel was identified which uses a fibre modulation technique that overcomes the issue of poor PMD at higher speeds. Verizon, which provides the JANET backbone under contract to JANET(UK), therefore decided to use Nortel systems for those links affected by PMD as an alternative approach of replacing the fibre was not economically viable.

The Olympic Spirit



In August JANET(UK) CEO Tim Marshall was in Beijing for the XXIX Olympiad. As a former senior executive in the BBC's Sports and Event department he was called upon to be one of the international panel of quality controllers. This is a small team of experienced executives whose responsibility is to be independent and monitor the quality and integrity of the international broadcast coverage. Based in the hi-tech International Broadcast Centre, a key non-competition venue at every Olympic Games, he was ensconced in

infrastructure comprising power, data and cooling to service the international broadcast operation and facilities for the over 12,000 accredited broadcast staff.

For the first time the Beijing Olympics were captured in High Definition 16:9 format with 5:1 audio. Other new technology at the Games included GPS sensors in athletes' shoes and the super slow-mo which samples at 3000 frames

per second. This was able to deliver the spectacular shots of the arrows flexing through the air or the vivid shots of the race-walkers which allow the viewer at home to make their own mind up as to whether they are running or walking.

The centre itself is a massive 55,000 square metre custom-built complex with a technical

front a myriad of screens keeping an eagle eye out for anything from sub-standard sports coverage to contraventions of commercial awareness policy.

Moreover, this is the future for the moving image in teaching, learning and research.'

'Absolutely fantastic,' said Marshall when asked his impression. 'This new format and fidelity brings about changes to the whole paradigm of sports coverage. Moreover, this is the future for the moving image in teaching, learning and research.'

JANET is today equipped to facilitate the use of high definition which can be used, for example, for student entertainment, teaching medical procedures and undersea research to name but three.

While in Beijing Marshall was also able to visit CERNET, the Chinese national research and education network at Tsinghua University. The Chinese carried the Olympics in HD across their network and with some QoS were achieving high quality results across the length and breadth of China. At Tsinghua is the Network Operations Centre, not only controlling the national network but also TEIN2, a key link between China and the European networks for academic and research traffic.

Asked what the highlight of the visit was, Marshall replied, 'clearly the Games and GB's superb achievements, rowing being a personal favourite. That aside the cutting edge technology was amazing but particularly inspiring were the people. They will always be the heart of any Games, for this is key to the Olympic aspiration.' He continued, 'I particularly remember with affection the three young Chinese people who worked with me, all of whom had been undergraduates in the UK. They had treasured the opportunity to study in the freedom of our higher education system and had an appetite for more. The hustle and bustle of the Games over; I wonder what they are doing now and how they will pursue their careers in all the challenges of post-Olympics China?'



MSc Students to create Location Aware Application for Lumen House

JANET(UK) has partnered with the University of Southampton's Group Design Project (GDP) in working towards a device-tracking interface for the company's newly deployed wireless network in its Lumen House office in Oxfordshire. A team of four final year Masters students will undertake development work in a number of challenging areas across their ten week engagement, with a view to delivering a working prototype that JANET development staff can then use to test a number of location-awareness ideas. The Southampton team will have to solve the problems of privacy protection, multiple platform support, and zero impact on production services in addition to

implementing a location algorithm and a web-based interface to display the data graphically. Their work and approach will be assessed as part of their studies.

Dr Tim Chown, supervisor of the GDP team, said 'We are delighted that JANET(UK) is our "customer" for this activity. The students will benefit from working on this particular scenario, knowing they are part of a wider effort in this technology area. It will test both their computing and business skills to manage their time and effort effectively to deliver the final product.'

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Framework Contracts: Help With Procurement

Framework agreements are agreements with suppliers which set out terms and conditions under which specific purchases can be made throughout the term of the agreement. They are used to purchase products and services where there is a repeat need but exact quantities are unknown. With a framework agreement a single procurement is run rather than each order needing to be procured separately.

A framework can also enable other contracting authorities to call-off under the terms of an established framework agreement, provided that they are mentioned in the scope of the procurement. This prevents duplication of effort by individual public bodies running procurements for the same goods and services.

JANET(UK) has procured a number of services relating to its core business. The scope of these procurements has been extended to enable other JANET-connected organisations to call-off under the terms of JANET(UK)'s

frameworks. The frameworks have been procured for an initial period of three years.

Existing JANET(UK) frameworks are:

- backup services – network based backup and retrieval services
- videoconferencing studio equipment and services
- supply and support of routing and switching equipment (introduced by the short article below)
- Regional Network management, operation and maintenance.

Details of the frameworks are available at: <http://www.ja.net/services/frameworks.html>.

JANET(UK) is keen to collaborate with other procurement bodies in the UK to ensure that procurement effort is used as effectively as possible, and itself uses other contracting authorities' frameworks where



appropriate. We are currently working with JISC's ProcureWeb service to advertise these existing frameworks to all of the JANET-connected organisations that are eligible to call-off under the frameworks.

We are also engaging with UCISA's Procurement Group and other sector purchasing consortia to ensure that our activities can be coordinated with theirs. Given the high cost to both the buyer and supply sides of conducting procurements, such collaboration will increasingly be an important means of ensuring efficient procurement of value-for-money goods and services.

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Framework Agreement: Routing and Switching

Following a recent EU procurement, JANET(UK) has set up a framework agreement for the supply and support of routing and switching equipment from manufacturers such as Cisco, Juniper and Alcatel.

The agreement, available to all sites with a JANET primary connection, utilises individual call-off contracts with four suppliers for the provision of equipment. It also includes, if necessary, an option for the provision of support services – encompassing maintenance, installation and professional services – from

three of the four suppliers, effectively providing a one stop shop for network requirements.

Benefits of the framework agreement include:

- advantageous pricing for a broad range of equipment from different manufacturers
- reduced time and effort – no need for individual procurements or multiple quotations
- full accountability is ensured as each organisation enters into individual contracts with a supplier.

Whilst there are benefits for any organisation utilising the agreement, it should be noted that there is no commitment to purchase either equipment or services through the framework.

The framework agreement will run for an initial term of three years until Summer 2011. Further information is available at <http://www.ja.net/services/frameworks.html>

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JANET Extends the Aurora Network

Work to complete the JANET Aurora infrastructure is underway.

JANET Aurora is a dark-fibre infrastructure to support Photonics and Optical systems research. Around 350km of fibre has been leased. When the project was originally proposed, research groups at five universities were involved in making the case for the infrastructure. However, following approval to proceed with the project, the budget available was not sufficient to provide fibres to reach all five groups and Aurora was built to connect the Universities of Cambridge and Essex, and UCL.

Following exploratory discussions between JISC and JANET(UK) earlier this year, JISC made the case for additional funding for the Aurora project as part of its programme of activities funded by HEFCE. JANET(UK) has now been asked to proceed with the suppliers, ntl:telewest business, to extend dark fibre connections to the Universities of Aston and Southampton and so complete the infrastructure. An agreement has now been reached and, subject to fibre surveys which are now taking place, it is hoped that the new connections will be ready for April next year. The additional funding should also enable a contract extension to the lease for the existing fibres and it is expected that the full five-site network should be able to operate for around two years, up to around April 2011.

Professor David Richardson, Deputy Director of the Optoelectronics Research Centre (ORC) at Southampton University, said, 'This is tremendous news for all involved in photonics and computer science research at the University of Southampton. A direct connection to the Aurora dark fibre network will allow us to work much more closely with our partners around the UK to develop and properly trial the new components, subsystems and network concepts required to support future generations of the internet, and to explore the exciting new services that they will enable.'

'Southampton has made several major contributions to the development of optical fibre communications that span over 40 years. Access to a dark fibre network will help keep both the ORC, and the UK, at the forefront of the field. The news is particularly timely as we move into a fantastic new facility housing state-of-the-art clean rooms and photonics laboratories that will be used to deliver technology to trial on Aurora. We look forward to the exciting times ahead.'

The Aurora infrastructure is also beginning to attract international attention from the communities clustered around research programmes which are considering directions for a future internet. These typically need

deep access to network infrastructures, which is exactly the service that both JANET Aurora and JANET Lightpath provide at their respective levels, so there is a good prospect of interesting collaborations emerging in the next year or two.

Further information can be found on the JANET Aurora web pages at <http://www.ja.net/services/aurora>, including links to the university groups, the infrastructure, supported projects, and related operational information.

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JANET Talk Trial – An Opportunity To Take Part

The JANET Talk Trial was launched earlier this year to understand how this feature-rich platform can fit into organisations' IT strategies. With phase one of the trial now underway we are starting to gain a broader picture of how the collaboration tools from JANET Talk are being used and the benefits they have brought to the participating organisations. Feedback from trial participants will be used as a basis to develop a business model for a potential future service.

The initial call for participation resulted in over 100 organisations taking part in the trial. Participants came from all sectors of the JANET community, ranging across RBCs, LAs, Colleges, Universities, Research Councils and Adult Education Centres.

A few examples of how JANET Talk is being used during the trial include:

- interdepartmental desktop connectivity and application sharing
- connectivity for remote workers and satellite offices
- a communication medium for research teams working in the remotest areas of the UK

- a tool for industrial placement students and international placement students to communicate with their tutors and support staff
- a means to connect project teams based at different organisations, reducing both travelling costs and times.

We are now in a position to extend the JANET Talk trial to JANET-connected organisations that aren't already taking part. Phase 2 of the trial will run until 31 August 2009 and will give participants the opportunity to access the full range of features offered through the standards based collaboration platform.

For more information on the trial, to take part, or simply to learn more about the range of features offered by the JANET Talk platform, please go to: <http://www.ja.net/development/talk.html>

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Distributed Music Recording and Composition using JANET Lightpaths

The JANET Lightpath service was put to interesting and novel use at the recent e-Science all-hands meeting held in Edinburgh during September (<http://www.allhands.org.uk>).

A 1Gbit/s lightpath connection was established between a music studio at the University of York and a lecture theatre at the National e-Science Centre at the University of Edinburgh, to support a high-quality studio recording session including a performance of bagpipe music before a live audience in Edinburgh. The lightpath carried the audio data from Edinburgh back to York to be recorded.

Five high-resolution microphones were lent to the project by the commercial partner DPA (<http://www.dpamicrophones.com>), and these were used to record both sound samples and complete pieces performed by the piper Alex Urquhart-Taylor (http://www.orscotland.com/band_alex.html). The microphone signals were digitised and fed into a software package called Reaper (<http://www.cockos.com/reaper>), which can exchange and process digital audio information between multiple instances of itself distributed on a network. This feature was used during the recording session to interconnect two instances of the software, one in York and one in Edinburgh, to undertake the recording session.

The common perception is that audio data does not require much network capacity but this project used studio recording standards with high sample rates and large bit depths (96kHz, 24bit audio for each of the five channels), taking it well beyond what most of us will be used to in a domestic environment with typical CD quality home hi-fi. Furthermore, the data was exchanged between the two sites in an even higher-resolution 64 bit format, giving sustained data rates of between 30 and 40 Mbit/s during the sessions. For comparison, this was purely uncompressed audio data, with no video content, and these data rates are more than ten times those that are currently used for a typical videoconference over JANET.

The sustained high-quality of the data transfers with low latencies and no data loss show the potential for this kind of distributed real-time work with very successful recording and performance sessions. This in turn may lead to future collaborative work across JANET and international networks. Further information about this project, including links to the partners and people involved, can be found at the project website (<http://www-users.york.ac.uk/~rpf1/AHM/AllHandsAudioDemo.htm>).

The lightpath has been left in place to enable follow-up activities such as an objective study

comparing the use of lightpaths and the IP service for high quality real-time work of this nature. This could examine key network parameters such as latency and jitter. The lightpath capacity was considerably higher than the data rates which were needed for this project, so one aim would be to see how far this over-provisioning can be reduced without impairing the quality of the work undertaken.

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Shibboleth on Windows Installer Completed

The Shibboleth on Windows Installer project, launched earlier this year, has now come to a successful close.

The project developed an installer wizard to simplify the implementation of Shibboleth in a Windows / Active Directory environment. The installer performs 80% of the Shibboleth IdP installation process and has already been used successfully by participating organisations.

Five organisations participated in the project: C2k (Northern Ireland schools network), ETC (Edinburgh Telford College), Coventry University, Swansea College and Swindon College. During the first phase, project participants were asked to test the installer and iron out any bugs. 'We were in a chicken and egg situation,' said Ian Burgess of C2k where they were challenged by having to set up an IdP without any documentation; 'we needed documentation to complete the install but ended up writing it ourselves as part of the project.'

According to Chris Simpson, some of the challenges faced by Swansea College since

implementing Shibboleth include Service Providers who had not yet switched to federated access management and getting the relevant ports opened by on-campus security teams. To help with port security, Colin Bruce from Coventry University has written a document to help with firewall issues such as accessing ports other than 8442, 8443 and use of port definitions.

The role of the test sites also involved delivery of a series of case studies, configuration guides and installation guides for the installer wizard, to encourage a smoother roll-out for potential users and provide an insight into implementation during the process. The case studies can be found on the JANET web site at <http://www.ja.net/development/middleware/shibboleth-on-windows.html>, along with configuration and installation guides (courtesy of Swindon College).

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JANET Lightpath – Service Evolution

Work is underway as part of the JANET Development Programme to investigate how the JANET Lightpath network might be enhanced with additional technologies.

JANET Lightpath provides dedicated bandwidth to projects within the JANET community that have special needs – typically a requirement to send and receive vast amounts of data. The service emerged out of the SuperJANET5 project when the existing UKLight infrastructure was integrated with the new backbone's flexible optical transmission network. This has both extended the reach of the lightpath service to all Regional Networks and expanded the range of options available for providing lightpaths. Creating dedicated lightpath links both satisfies the needs of the projects concerned and protects users of the JANET IP network from any potential adverse effects, such as congestion, caused by traffic from the project.

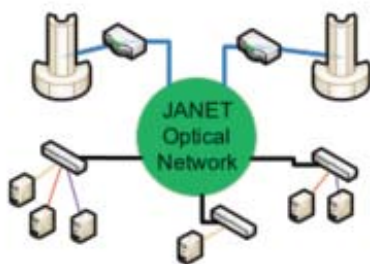
Lightpath Uses

Lightpaths may be configured between two JANET sites or between a JANET site and a site connected to one of JANET's peer NRENs around the world. For example, the Large Hadron Collider (LHC) project uses a 10Gbit/s JANET Lightpath to form the UK part of the link between the LHC data centre at CERN, in Geneva, and the Rutherford Appleton Laboratory in Oxfordshire, which is the distribution hub of LHC data to the project participants on JANET. At the time of writing, 17 projects were making use of one or more lightpaths, both nationally and internationally.

Provisioning a Lightpath

High capacity lightpaths are provided directly over the JANET backbone's optical transmission network. Lower capacity links can be provided in the same way, although this can involve a lengthy lead time. Extra physical components such as interfaces and fibre patching may have to be put in place in multiple remote locations, which can be time consuming and inefficient. Thus the lightpath service also provides an overlay network that

aggregates lower capacity lightpaths onto an infrastructure managed by the JANET NOC. Using this overlay generally makes the provision of lightpaths faster, as no physical work is necessary other than at the two ends of the path.



JANET Lightpath Network (simplified) showing one high capacity lightpath directly over the Optical Network (in blue) and three lower capacity lightpaths via the overlay network (shown in orange, red and purple)

Evolution of the Overlay Network

UKLight was designed to provide both standard circuits, as might be bought from a telecommunications carrier, and point-to-point Ethernet links. As take-up of the lightpath service has progressed, it has become clear that the demand is for Ethernet links only. Thus when the time came to review the equipment inherited from UKLight it was decided to replace it with high-end Ethernet switches. These are cheaper and easier to own and operate and, unlike the UKLight equipment, integrate easily into JANET's existing monitoring and measurement infrastructure, including the new version of JANET Netsight.

The new lightpath overlay network will transport traffic using Ethernet over MPLS (EoMPLS) technology, using the existing lightpath overlay links. Ethernet frames from multiple projects can therefore share the same backbone links without getting mixed up – each lightpath will be switched through the network using an MPLS (Multi Protocol Label Switching) label. In effect, the lightpath overlay network switches Ethernet frames much as the IP network routes IP packets.

At the outset, the lightpath overlay network will not make use of advanced MPLS

features, such as dynamic path routing or re-routing. Instead lightpaths will be configured to follow a pre-determined path through the network, in the same way as they do today. This preserves stable (or 'deterministic') link characteristics such as transit delay so that the user or application can be assured that such properties will not vary significantly once their lightpath is migrated to the EoMPLS network. Admission control will be applied where necessary, to ensure that any one lightpath does not exceed the capacity allocated to it.

Futures

Work is now underway to investigate how the more advanced features of MPLS might be used to enhance the JANET Lightpath network. Any such enhancements will only be made well after the transition to the EoMPLS network is complete, to avoid the risks associated with making too many changes within a short time period.

One MPLS feature of particular interest for the longer-term future is generalised MPLS (gMPLS), which may be a suitable method of permitting a user or middleware to request and receive lightpaths dynamically in real-time.

Carrier Ethernet

The evolution of the lightpath service to EoMPLS takes JANET firmly into the Carrier Ethernet arena (see the article on page 9). This is something of a marketing term for the highly reliable transport of Ethernet frames over a wide area network – as UKLight and other carriers have been doing for many years. The implied difference with Carrier Ethernet today is that the underlying infrastructure is cheaper and more flexible than of old, yet still retains the same high level of service and performance.

The transition to the EoMPLS network is due to start in early 2009.

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Carrier Ethernet: *What is Under the Umbrella?*



Carrier Ethernet is currently a hot term within the telecommunications world, but understanding of this term and even the technology can vary from person to person. This article provides a brief explanation of the term and technologies associated with it, and describes some of the current work being done by JANET(UK).

Carrier Ethernet is in fact an abbreviation of the original name Carrier Grade Ethernet. Carrier Grade or Carrier Class are terms used to refer to technologies and equipment that provide robust, reliable services at a level where a telecommunications carrier such as BT would deploy them on a wide area network. For the most part it is a distinguishing term for high end equipment, or technologies that would typically not feature in a local area network (LAN).

Carrier Ethernet expands Ethernet beyond the borders of LANs and into the territory of wide area networks. The aim is to provide customers with a wide area service to connect sites together in the same way that ATM, Frame Relay and X.25 services have done in the past. Carrier Ethernet is definitely not about Ethernet within LANs which we are used to seeing at our desks and behind the doors of campus server rooms.

The driving force behind this expansion is understandable: Ethernet has become a de facto lower-layer network technology on LANs. Traditionally Ethernet frames were re-packaged into some other format for wide area transmission, just to be reassembled as Ethernet at the destination. So why not have Ethernet everywhere, and not only within LANs?

Another very important reason for the expansion of Ethernet is that its popularity allowed for mass production and therefore cheaper unit prices. Therefore Ethernet interfaces became cheap by comparison to other technologies. This, however, did not come without hidden costs – other technologies previously had far more sophisticated failure and error detection

mechanisms built in, which enabled more accurate and thus faster tracing and rectifying of faults. The development of equivalent mechanisms for Ethernet is part of what spawned the Carrier Ethernet variant of the protocol.

However, we will look at the Ethernet improvements a bit later because it is very useful to understand that there are actually two different areas under the Carrier Ethernet umbrella. One is 'improved Ethernet', discussed further below. The other is 'Ethernet over something' where 'something' is a carrier grade technology other than Ethernet but which a provider 'wraps' into Ethernet so that for end users it looks like Ethernet. This is why you can find traces of other technologies mentioned above under the Carrier Ethernet umbrella.

Ethernet over Transport (EoT)

This is probably the most solid Ethernet implementation as it is based on the traditional telco core technologies which are usually referred to as optical transport; SDH (Synchronous Digital Hierarchy) and DWDM (Dense Wavelength Division Multiplexing) are the best known examples here. Vendors have worked over the last few years to make optical gear Ethernet-friendly and ITU-T developed several recommendations to standardise this process.

Ethernet over MPLS (EoMPLS)

MPLS (Multi Protocol Label Switching) has several features which allow it to be categorised as a carrier grade technology: control over traffic paths, resilience and troubleshooting functionality. As the technology has matured over more than 10 years and the big telcos have used it for massive deployments, this has strengthened the case for it to be used as the chosen packet technology for many provider's services. The IETF, which standardised MPLS, itself has developed several standards describing different applications of Ethernet over MPLS.

Carrier Grade Ethernet Improvements

The process of converting Ethernet into a carrier grade technology is the latest initiative of the network industry. It is still a very young area. Ethernet purists might see it as the only true Carrier Ethernet, as it is Ethernet over Ethernet. The IEEE is the authority which supervises this area; some standards have already been finalised and approved while others are still under development. Provider Bridges (PB) and Provider Backbone Bridges (PBB) are probably the best known IEEE standards in this area.

Besides improvements in troubleshooting, vendors and the IEEE are working on several other strands including separating address spaces for provider and user networks; control over path; and resilience.

Carrier Ethernet and JANET

Both industry and standards bodies are putting a lot of effort into transforming Ethernet into a carrier grade technology, but how can JANET benefit from this?

To explore this further, JANET(UK) has undertaken a number of projects ranging from the deployment of mature technologies such as Ethernet over MPLS on the JANET Lightpath service to the exploration and trialling of newer technologies such as Ethernet over Ethernet under the JANET Optical Development Programme. The latter project currently includes lab trials that will help understand the technology further; however within the coming months JANET(UK) would like to conduct some wide area trials in partnership with regional networks. A call for expressions of interest will be issued during the first quarter of 2009.

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Prince Andrew School and Videoconferencing

One of the further flung users of JVCS is Prince Andrew School, on the Island of St Helena in the South Atlantic. The school registered with JVCS in the summer this year, with the aim of enhancing its course offerings.

Prince Andrew School is the only secondary school on the island and has a student population of 301. The entire island has a dwindling population of about 4000 people. This population has been dropping over the years with people leaving to seek opportunities in other places with more jobs and facilities. As a result of this the school has also been losing teachers and is having difficulty sustaining what it has to offer. It therefore decided to try and bring content in from outside the island and is trailing doing this via videoconferencing in the next semester. It will initially offer a sociology course from Nelson Thornes, a UK-based content provider for schools, with the aim of bringing in more courses if the trial succeeds.

Derek Henry, the school's headteacher, assisted by Jeremy Roberts, the IT manager for the Finance Department on St Helena, worked with the JVCS team to get the videoconferencing

equipment set up and working in the school. He says it was a fairly straightforward set-up, the only unusual elements being the location of the school and the method by which it connects to the Internet. Prince Andrew School is the first JVCS site to connect via satellite. The school had anticipated some latency issues but found that the delay was not noticeably different from that observed with other sites connected via terrestrial links.

Prince Andrew School has now registered its venue with the JVCS conference booking system and passed the periodic quality assessment test that is mandatory for all venues.

Subsequent videoconferences have shown reasonable, though inconsistent, quality which the school attributes to the contended nature of the available bandwidth. The school has a 512kbit/s leased line to the island's only ISP, which in turn connects to the Internet via a link that is shared by everyone. The total



bandwidth available to the ISP is 2Mbit/s up and 4Mbit/s down via satellite, and bandwidth is apportioned to users on a first come, first served basis. Despite these limitations, Derek Henry says the experience so far has met the school's requirements and it views the project as a success.

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The perfect gift for the troops at Christmas

Iraq-based British troops in Basrah recently organised a videoconference to talk to some of their children and families at a School in Fallingbommel, Germany. Technical staff found that the school's IP Broadband system was not compatible with the Basrah Headquarters ISDN system. This is when JANET willingly stepped in to provide a bridging solution between the two systems. As an MOD school, the school is officially in the UK and entitled to use JVCS.

Nearly a dozen soldiers talked to their loved ones during the school's morning assembly and the conference was enjoyed by everyone that took part. The video quality was as good as could be expected and the sound quality was near perfect. Everybody involved in the event really appreciates the

JANET contribution to this event and will look to JANET for any assistance regarding intersystem bridging in future.

One of the school's senior teachers really appreciated the efforts made by all involved. 'The kids were buzzing about the event and haven't stopped talking about it since. It gave the school a real lift.' In Iraq, one of the soldiers from 4 SCOTS taking part said, 'I thought it was awesome, and I wish it could be done more often. From everyone at the Military Service Desk at Basrah, thank you, JANET.'

SSgt Tony Tye
207 Sigs Sqn, 7 ABSS



South Tees Hospitals is the first NHS Trust to use JVCS from N3

South Tees has become the first in the NHS to use H.323 videoconferencing across the N3 JANET Gateway. It is one of four NHS Trusts in the CETL4HealthNE partnership that are due to use the service to enhance teaching and learning, particularly support for students and staff involved in undergraduate clinical placements at NHS sites.

Lesley Scott, CETL4Health Project Manager at the lead University of Newcastle, describes this as a breakthrough: 'an eagerly awaited outcome from partners within CETL4Health. This will now facilitate teaching and increased collaboration across regionally diverse sites and practitioners are keen to try new delivery methods to enhance learning across both the region and disciplines. The rest of our partners are now in the process of trying to replicate the results from James Cook University Hospital in order to start and gain from the benefits that this advancement in resources will mean for both Higher Education and the NHS. This project has been a demonstration of real co-operation and collaboration across the public and private sectors.'

The setting up and testing of the use of JVCS by an NHS Trust has been led by Geoff Constable of the Welsh Video Network, working with Direct Visual who supplied the Tandberg Expressway equipment procured by the CETL4HealthNE project. There have been a series of barriers to overcome but each one has been tackled in a collaborative effort with BT, which supplies N3 and manages the N3 JANET Gateway firewall, and the technical staff at South Tees.

Geoff Constable says, 'Videoconferencing involves live communication across JANET, the NHS network and the local NHS Trust network. Each of these has strict security measures which cannot be compromised, and each is managed by different public and private sector organisations. To engineer a solution that maintains a high level of inter-network security but simultaneously allows for good quality videoconferences presented a challenge which could only be overcome by all of the stakeholders involved co-operating and collaborating to find a solution.'

A series of other Trusts are keen to join in as extra early adopters but if any other NHS Trust is interested too then please get in touch.

There are now six early adopter communities of the N3 JANET Gateway, with the University of York joining in July. It is leading work with the Department of Health in 'Improving Access to Psychological Therapies', otherwise known as the IAPT programme. The University is providing an interactive database for the Primary Care Trusts. Responsive access is essential and will be even more important as IAPT is rolled out fully across the NHS in England.

Future of the N3/JANET Gateway Service

JANET(UK) is working with NHS Connecting for Health on the business case for a jointly funded full N3-JANET Gateway service to follow on from the current early adopter. It is envisaged that this would take all network traffic between N3, which is the core network for the NHS in England and Scotland, and JANET. It will be resilient with an active and standby link. There are however a series of key dependencies to work through, such as finding an appropriate information governance

model for sessions initiated in JANET. The Business Case is planned to be ready by the end of December.

NHS HE Forum News

The next NHS-HE Forum is planned for the spring of 2009. Following the retirement of Roland Rosner, the Forum is to have a new Chair with an NHS background, Ted Woodhouse. Many will know Ted as he was a founder member of the Forum and has been involved in its planning ever since. Ted was formerly Director of IT at Leeds Hospitals NHS Trust. It is also pleasing that Roland is going to keep some involvement during an interim period when the function and form of the Forum are reviewed in light of new developments such as the creation of Academic Health Science Centres and NHS Connecting for Health's Research Capability Programme.

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Professor Roland Rosner

Professor Roland Rosner retired from UCL in September of this year after a long career. On this occasion it is particularly appropriate to thank Roland for his important contribution to the work of the NHS/HE Forum. The idea of a Forum was promoted by Roland in the first instance, in recognition of the strategic importance of collaboration between the higher education and NHS communities in both research and education. Since then and as Chair of the Forum he has guided its work to the stage where the need for this collaboration is now firmly embedded in the networking strategies of both sectors.

Roland's contributions to JANET are of course not limited to the NHS/HE Forum. As

head of the original Joint Network Team back in the late 1970s and early eighties, he was responsible for the strategy that led to the creation of JANET in 1984. Since then he has been a stalwart supporter both of JANET and more generally of collaborative networking within the higher education sector; support for which JANET(UK) is grateful. We all wish him well for a busy and fulfilling life "after retirement".

Bob Day
Chief Technology Officer
JANET(UK)



JANET Videoconferencing Service Upgrades for Next-Generation Capabilities

The JANET Videoconferencing Service (JVCS)'s videoconference hosting capacity has effectively doubled with the installation of new TANDBERG high definition equipment at its Edinburgh and Bracknell core locations.

The two TANDBERG MSE8000 voice and videoconferencing media services engines represent the latest high definition (HD) multipoint technology in TANDBERG's product portfolio. The sites will be able to support a far greater number of high bandwidth multipoint HD conferences simultaneously.

JVCS identified the need for the new technology following massive growth and increased demand by videoconferencing users in the education and research sectors. With HD videoconferencing equipment becoming widely available in primary and secondary schools, further education colleges, universities and scientific research organisations, the new JVCS capability will ensure the very highest picture quality for all end users with HD enabled equipment. Picture quality on existing Standard Definition systems will also be improved significantly.

London Grid for Learning (LGFL) is currently trialling HD equipment with a view to future requirements for the schools in their area. Roger Bloxham, an independent consultant working for Westminster, Kensington and Chelsea City Learning Centre, says that quite apart from the improved definition there are numerous other advantages. 'When conducting videoconferences with multiple attendees, there is less need to move and zoom the camera to individuals as the picture is so much sharper already. You can also show much greater detail when using HD – this is great when showing things like museum artefacts, demonstrations or PC-based material such as spreadsheets. HD videoconferencing can also significantly improve problems with uneven lighting, which is something standard definition equipment finds challenging.'

Commenting on the new installation, Paul Bonnett, video services manager at JANET said: 'JVCS is committed to remaining at the forefront of videoconferencing technology in order to assure our diverse user base, and content providers, the very best quality service.

Apart from picture quality, more capacity has become essential in order to keep pace with the huge increase in demand for our hosted videoconferencing services. In just the last twelve months we have seen the number of conference sessions doubling from ten to twenty thousand. We fully expect this to grow considerably over the next few years.'

Other benefits of the technology include improved interoperability between equipment by different manufacturers; customisable views to allow users to choose who is visible in a meeting; a recording and retrieval facility; and the ability to stream conferences via web addresses, which allows telephone-only participants to use their PC to view other attendees.

JVCS is also planning two further TANDBERG installations at other JANET core locations.

Paul Bonnett
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Bringing the house down... on both sides of the Pond!

Students at University of South Florida will be given a taste of classical British actor training, thanks to JANET videoconferencing technology.

The BRIT programme, established 19 years ago, brings professionals from the London stage to students in Tampa, Florida. A mix of actors, directors, designers and voice coaches provide expert advice to both augment and complement the courses offered by the university. This includes workshops, discussion groups, castings and feedback on performances.

Previously, 3-6 artists would spend eight weeks in Tampa to conduct workshops and mount a production using student actors. As travel costs have grown over the years, comments Marc Powers, Director at the

university's School of Theatre and Dance, the idea of using videoconferencing to reduce those costs has become more and more desirable. 'The possibilities for future videoconferencing for the BRIT programme as well as other projects will increase substantially,' says Marc. 'We have been very pleased by the service provided by JANET Videoconferencing Service, which has made the process easier than we could ever have thought.'

The programme has attracted a number of well-known names, such as Sam Mendes and Donald Sinden. This year, award winning playwright and director James Phillips will conduct a workshop and premier his new play at the university with a student cast. Project organisers will be using videoconferencing for interactive discussions on the play, design

conferences, auditions and even voice lessons. Two master classes are planned to be conducted over videoconference with two well-known actors in February.

'We have so far had three sessions,' says Mathew Gale, who has organised the UK side of the programme for the last three years. 'The equipment is easy to operate and by the third session it was almost as good as being in the same room. I believe that although it cannot replace face-to-face work, it can expand the availability and access to these classes and enable the students to be better prepared for the visiting artists.'

To find out more about the BRIT programme, please visit: <http://theatreanddance.arts.usf.edu/theatre/brit/default.htm>

MoLeNET

The Mobile Learning Network (MoLeNET) is a collaborative approach to encouraging, supporting, expanding and promoting mobile learning, primarily in the English Further Education sector, via supported shared cost mobile learning projects. JANET(UK) is involved with the Project Steering Board and evaluation of submitted bids, to provide support as required to projects and to ensure that we recognize any implications for the network or infrastructure provision.

Collaboration at national level involves colleges and the Learning and Skills Council (LSC) sharing the cost of projects introducing or expanding mobile learning, and the Learning and Skills Network (LSN) providing a support and evaluation programme that includes technical and pedagogic advice and support, materials development, continuing professional development, mentoring, facilitation of peer-to-peer support, networking and resource sharing, research and evaluation.

A Dissemination Conference for the first year of MoLeNET, titled 'Mobile Learning in Practice', took place at the Emirates Stadium in London on 18th September 2008 with over 300 delegates. A detailed conference booklet gives a flavour of the event and summary information about the projects and exhibitors who took part is available at www.molenet.org.uk.

The 32 projects in the first year of MoLeNET received over £7m of funding, involved 136 partner organisations and deployed 9300 mobile devices such as PDAs, mobile phones, smartphones, MP3/4 players, gaming devices, ultramobile PCs and netbooks to over 9000 learners – half of whom were work based learners. The LSC has made available £4 million of capital funding for a further round of shared cost MoLeNET projects and the 111 submitted bids are now being evaluated and short listed.

Research and practice within both educational and commercial environments has found that mobile learning can:

- be used for both independent and collaborative learning
- help bridge the gap between mobile phone literacy and ICT literacy
- engage reluctant learners and young people not in education or employment
- help improve literacy and numeracy and help learners to recognise their existing abilities
- help to raise the self-confidence and self-esteem of non-traditional learners
- take place outside, whilst travelling, in the workplace or in the classroom, and be used to capture evidence and assessment.



Early conclusions are that the use of such technologies improves retention and achievement – important factors for measuring education system success. Learners are increasingly looking for these technologies to be an everyday part of their learning.

UK college tutors taking part in the Mobile Learning Teachers' Toolkit project authored their own mobile learning materials (SMS quizzes, PDA learning games and mediaBoard activities) to cater for the specific needs of their students in their particular context. MoLeNET reports on the impact of these mobile learning activities on teaching, learning and students' interest in learning and on how tutors integrated mobile learning into the curriculum. Examples of the learning materials created and tips for using these tools with students are included to inform teachers who may be considering mobile learning for their students.

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It's Not That I'm Smart!

The JANET Videoconferencing Service recently hosted the 20,000th schools videoconference, a five-way multipoint session on mathematics between the Motivate Team at Cambridge University and Year 8/9 students from four schools in Bradford, Blackburn, Hartlepool and London.

This was the first videoconference for students in the Motivate project 'It's not that I'm smart' (a title taken from Einstein: 'It's not that I'm so smart, I just stay with problems longer'). Alan Parr, former Maths Adviser for Hertfordshire, says 'we plan to have a further five sessions

for students during this school year. During the videoconferences, the schools will be set rich mathematical problems that will form the basis for follow-up sessions in their own classes after each videoconference.'

'We use videoconferencing to bring maths and science to life for school students of all ages. This involves an interactive videoconference which the students can then use to carry out their own work away from the camera. The schools then come together to present an account of what they have done and exchange experiences.'

'JVCS is able to bring schools from across the National Education Network together with schools and content providers globally,' says Rob Symblerist, JANET(UK) NEN Services Group Manager. 'It's exciting projects like this that highlight the benefits interactive learning through video links with experts can bring to the classroom.'

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Worms, Phish and Other Catches at CSIRT Conference

Over 80 delegates from a wide variety of sectors attended the 6th JANET CSIRT conference at Loughborough University on 23 October, to hear six talks on a number of threats that networks face and some of the technologies and techniques that can be used to protect them.

David Phillips of the Open University started the day on the topical subject of securing mobile devices. As well as the risk of lost and stolen laptops and media, a growing risk of profit-driven malware threatens data stored and collected on mobile devices.

Graeme Fowler of Loughborough followed with details of the phishing attacks that many academic sites have suffered from this year, which entice users into divulging their usernames and passwords. Inbound filtering

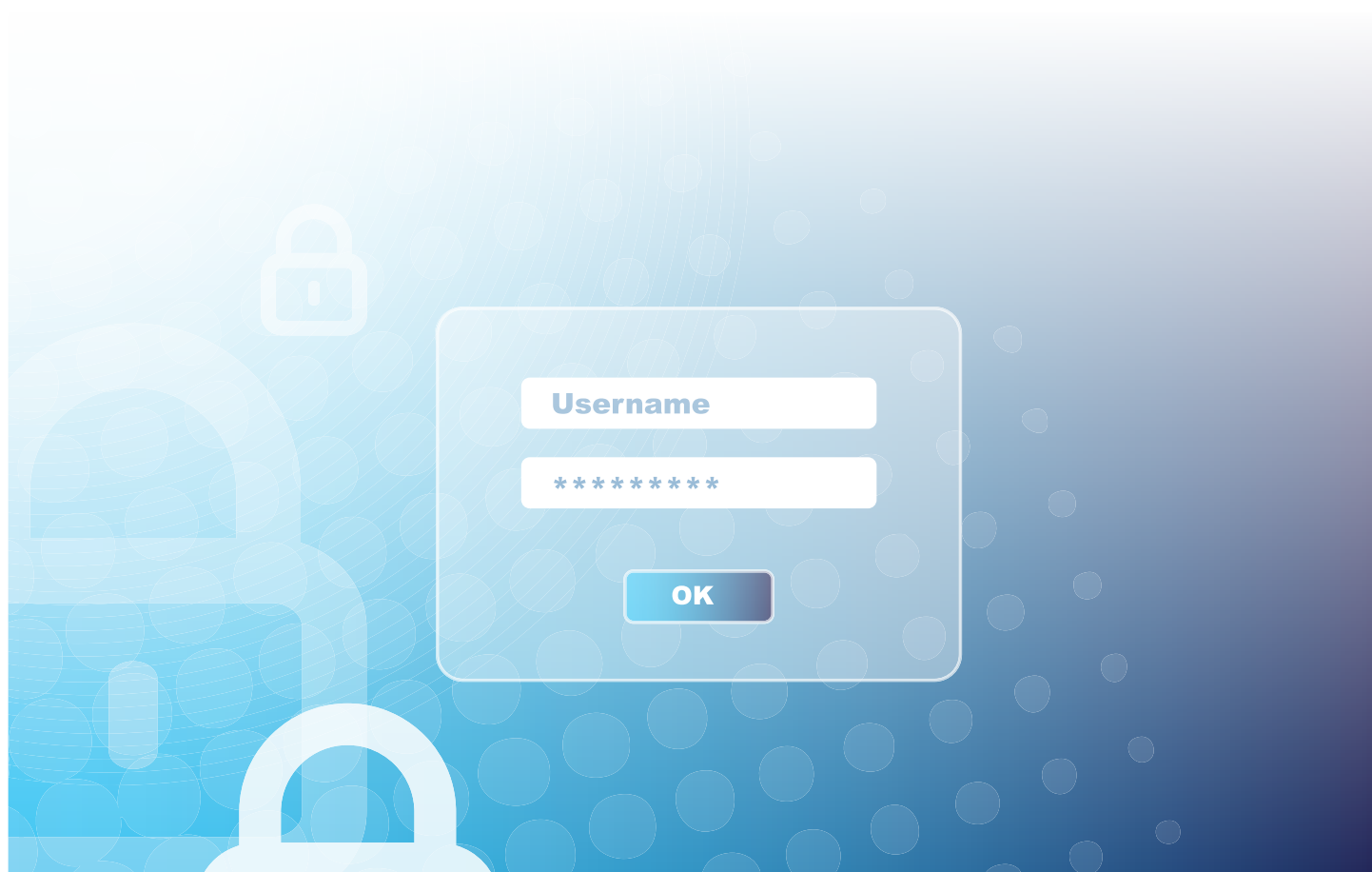
of e-mail offers limited protection. This led to the development of a system where outbound e-mails are checked and filtered for valid credentials in the university's Active Directory system.

The afternoon started with an enthusiastic talk by Chas Tomlin, of the University of Southampton, on the use of network flow data in detecting unwanted network traffic, malware downloads and communications with malicious networks. Paul Kennedy of the University of Nottingham followed this up with a talk on some of the commercial offerings for the processing of netflow data, allowing the creation of a base line from which to detect anomalous behaviour and unexpected traffic. Richard de Feu of Lancaster University gave a short presentation on a relatively unknown

but well written worm called W32.Almanhe, which uses several techniques to spread discreetly and even cooperates between infected hosts on the same LAN to avoid detection. Lewis Honour of Logicalis finished the day with a talk on using virtualization and thin client technology to avoid the problems of giving untrusted workstations access to your internal systems.

Further information on the conference, including copies of the slides used in each talk, is available from <http://www.ja.net/services/events/2008/csirt/programme.html>.

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Forthcoming Exhibitions: BETT Show 2009 14 – 17 January 2009

JANET(UK) will be showcasing the rich and varied videoconferencing content available from providers such as the National History Museum, National Portrait Gallery and the Churchill Museum and Cabinet War Rooms.

We can be found at Stand J50, so why not drop by and find out about the benefits videoconferencing can bring to your teaching and learning.



Forthcoming Courses



JANUARY

Introduction to JANET	January 7th 2009 - Manchester
Introduction to the UK federation	January 13th 2009 - Newcastle
Implementing Shibboleth at your Organisation	January 14th 2009 - Newcastle
Implementing a Shibboleth 2 Service Provider	January 15th 2009 - Newcastle
Using Logfiles for Security	January 15th 2009 - Manchester
Firewalls: Planning and Implementation	January 16th 2009 - Manchester

FEBRUARY

Wireless LAN Fundamentals	February 6th 2009 - London
Introduction to DNS	February 18th 2009 - Bristol
Managing IT Security	February 19th 2009 - Belfast
Introduction to JANET	February 20th 2009 - Belfast
Basic Networking	February 24th 2009 - Manchester
IP Fundamentals	February 25th 2009 - Manchester

JANET Training will be running the following courses on Monday 30th March 2009 in Cambridge (as part of the pre-Workshop events)

- Implementing a Shibboleth 2 Service Provider**
- Computers, Privacy and the Law**

Dates and online booking for all courses are available on our website.

A mailing list is available for the distribution of information regarding JANET training courses. Discussion of training requirements relating to the JANET network, suggestions for new courses, locations or course frequencies are also welcomed. To join this list, access the JISCmail site at: <http://www.jiscmail.ac.uk/lists/janet-training.html>

Forthcoming Events

JANET Optical Event

28 January 2009
ICO Conference Centre
22 Berners Street
London
W1T 3DD

BETT Show 2009

14 -17 January 2009
Come and see the JANET stand J50!
Olympia

Moving Towards Implementation – UK Access Management Federation

11 March 2009
Jurys Bristol Hotel
Prince Street
Bristol
BS1 4QF

Workshop 37

Workshop 37 will be held at the University of Cambridge from 31 March to 2 April 2009.

The main conference and exhibition venue will be the West Road Concert Hall located on the Sidgwick Site. The parallel sessions will be held in the Law Faculty Building which is only a very short walk from the West Road venue.

Events Calendar

<http://www.ja.net/services/events/calendar-2009.html>

Reports

JANET Report 2007-2008 027 (10/08)

<http://www.ja.net/documents/publications/reports/janet-report/report2008.pdf>

Quarterly Report to the Community (August-October 2008)

<http://www.ja.net/services/publications/reports/quarterly-report/qr-autumn08/index.html>

Newsletters

JANET News 5

<http://www.ja.net/documents/publications/news/news-5.pdf>

Factsheets

PlanetLab & JANET PB/INFO/030 (11/08)

<http://www.ja.net/documents/publications/factsheets/030-planetlab-&-janet.pdf>

Technical Documentation

Network Access for Guests 029 (10/08)

<http://www.ja.net/documents/publications/technical-guides/network-access-for-guests.pdf>



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Availability

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