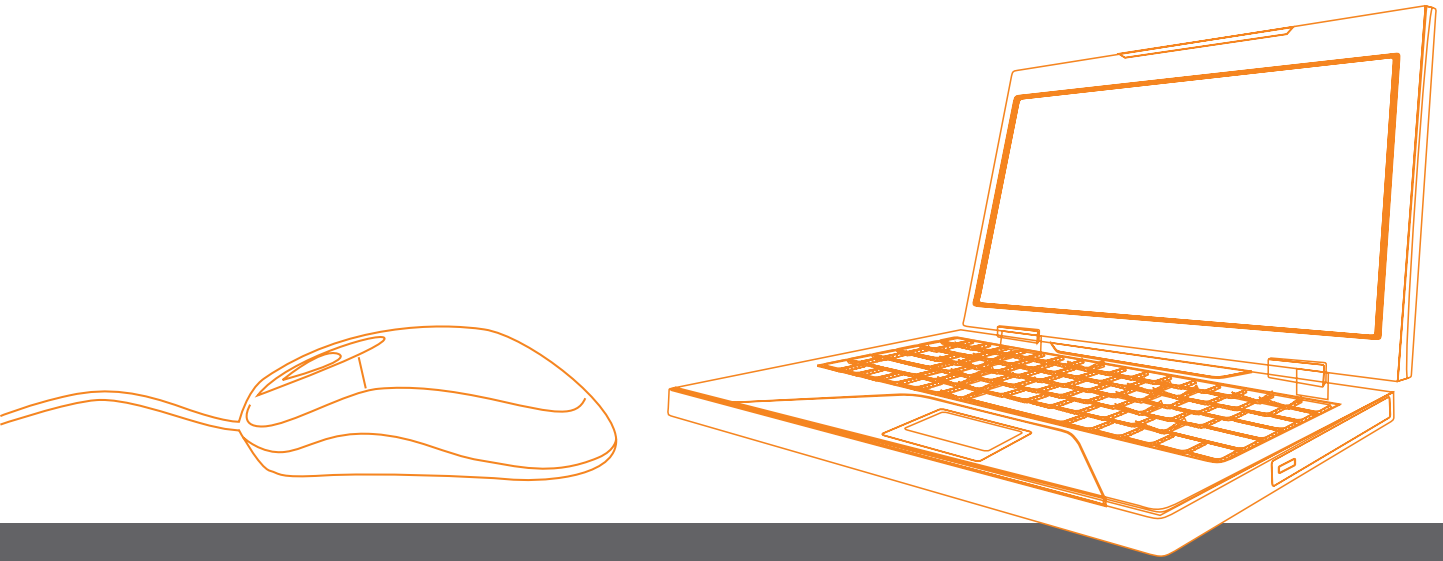
janet

JANET REPORT

2011



FOREWORD

In the past year, Janet became the first national research and education network in the world with 100Gbit/s on the backbone, exceeding our first two corporate objectives of delivering essential services efficiently and a world-leading infrastructure. Over the last year, our customers have been paramount in helping us define the shape of the next generation of the Janet network. Due for delivery in 2013, Janet6 will be capable of handling the huge growth expected in research data and the increasing shift towards the use of the cloud for outsourcing and data storage requirements.

Just as important are our third and fourth corporate objectives: developing people and influencing policy. We've invested in our team at all levels, seeking to embed a real ethos of care for our customers. And when it comes to influencing those who make policy, including ministers, politicians, academia, stakeholders and the commercial world, we have pursued this with vigour.

Janet puts UK universities at a level where they can compete globally. As they do so, their results shine as a beacon to the world, boosting the economy and attracting international talent. These institutions are driving innovation at a time when they are being asked to do more with less. We're helping them do so with a network that has dramatically increased speed and capacity at a competitive cost. This not only makes vital economic sense but has led to innovations that were unimaginable before, as you'll read within this report.

We continue to support innovative collaborations across sectors and worldwide through both our services and a network infrastructure that can handle quantities of data greater than any seen before. Meanwhile, changes in funding coupled with the general economic outlook mean we must all find savings and better ways of working. At the core of our business model is the ability for institutions to gain economies of scale through the deployment of shared services crafted specifically for our sector. We will extend our role in aggregating requirements and continue to act as a trusted advocate for the sector by providing brokerage, procurement and framework agreements.

The wider education community can tap into the infrastructure we provide and exploit a number of cross-sector opportunities. More and more schools are bringing the world to their classrooms. Our network lets students collaborate on science projects, or work with musicians or actors in real time from anywhere in the world—without leaving their school grounds. And just as research in 'big science' eventually trickles down to GCSE textbooks, so these children will be inspired to pursue learning to the highest levels and progress to become the scientists of tomorrow.

Education is becoming a changing paradigm with institutions across sectors working together much more closely. We see colleges expanding their remit to provide degree and foundation courses, in close collaboration with HE partners. They are also playing a pivotal role in building the workforce of the future, through the provision of national diplomas and work-based training. All of this has been made possible by the national resource that is Janet.

As the balance of funding for Janet services begins a shift towards greater contributions from institutions themselves, we'll bring ever more clarity and transparency to the cost of our provision as well as helping users combine our specialised services with ones available on the market; working to enable Skype as an integrated feature of Janet Videoconferencing is just one example. Our new Brokerage service brings others.

In his report on JISC to HEFCE last year*, Sir Alan Wilson noted that Janet is a major source of competitive advantage for the UK and a key enabler for the UK's knowledge economy. Janet is a national asset—not a 'nice to have' but a 'must have'. In the coming year we anticipate the conclusion of the JISC Transition process and whatever the shape of "new JISC" and our relation to it we look forward to developing further synergies for the benefit of all our customers.

Tim Marshall
Chief Executive Officer, Janet

* The Janet Board published its response to the review at: **www.ja.net/company/board-response.html.**

A NETWORK EVOLVES

THE JUMP TO LIGHT SPEED

University researchers across the UK now enjoy unprecedented network speeds and capacity thanks to Janet. From the vast data sets that zip between CERN and Oxfordshire physicists to the immense number crunching required by climate change work. Such projects would be pipe dreams without a fast enough network.

Fortunately, Janet is supplying the pipe. And, at 100Gbit/s, it's fast—16,000 times faster than the average home broadband connection. That's several orders of magnitude greater than the jump from dial-up to broadband. Such a leap enables whole new classes of research, changing how colleagues and whole institutions can collaborate.

One project to hit the headlines is the Large Hadron Collider (LHC), established to further mankind's understanding of the origins of the universe by recreating the conditions seen shortly after the Big Bang. The LHC's own explorations come from colliding sub-atomic particles at extremely high energies to probe ever smaller distances and examine structures that previously only existed in scientists' imaginations and calculations. Said to be the largest scientific endeavour in history, the LHC's experiments are generating some 15 Petabytes (15 million Gigabytes) of data annually.

Yet whatever pops into existence when hadron beams collide would remain a mystery without the means to get the results into the hands of those who can work with them. Huge amounts of data are distributed to 11 primary processing centres around the world, where they are accessed and pored over by thousands of scientists, engineers and support staff. In the UK, the Rutherford Appleton Laboratory in Oxfordshire connects to CERN via Janet's high-capacity Lightpath service into London and from there across the pan-European research and education network GÉANT.

COMBINING FORCES

While the LHC aims to make visible—even for a fraction of a second—something that was hitherto only theoretical, such research would remain stalled at the thinking stage without networks like Janet to deliver it. The keyword here is networks. If a rising tide lifts all boats, you need to make sure your boat is not anchored to the seabed with a short rope. Janet helps UK research by making sure there's always enough capacity in the network so that the UK is never constrained. In fact, by going further, Janet encourages other networks to extend their own capabilities.

But it's not only outside networks Janet collaborates with. For many years, we've connected with networks around the country and we continue to develop new collaborative and delivery models with the aim of generating cost savings, and service improvements at central, regional and local levels.

LIGHTING THE WAY

We're immensely proud that the Janet infrastructure underpins the UK's research and education sector. The institutions we serve have taken up technology in ways we couldn't have imagined when we first created the network. Although this justifies the initial investment in the network, growth in bandwidth demand brings the need to upgrade.

Anticipating sector demand and working in partnership with suppliers, and at the leading edge of technology, we were able to implement a step change in delivery from 40Gbit/s to 100Gbit/s and become the first NREN to do so.

From the responses we received from our consultation, one signal came through loud and clear for the next generation of the Janet network. Respondents volunteered their time and expertise with an enthusiasm that reassured us that we are part of a community that values our network. As Mark Batho, chief executive of Scottish Funding Council, puts it, 'Janet has been a quiet success story for over 20 years now, providing a reliable service to staff in colleges and universities that is essential to the effective operations of these institutions and to the delivery of high quality teaching and research.'

VLBI

CAPTURING SUPERNOVAS

The most powerful telescopes on earth are still limited by their physical size. But what if you could join them up around the world? In effect, you'd get a giant virtual instrument that could see the same bit of sky from different angles.

This was the goal of a three-year project funded by the European Commission. Using a technique called Very Long Baseline Interferometry (VLBI), astronomers can gain rapid insight into the nature of the universe and dark matter using multiple radio telescopes. The data collected from 16 telescopes on all corners of the globe is synchronized and correlated. Sampling data at very high rates generates images of cosmic radio sources with up to one hundred times better resolution than images from the best optical telescopes.

The challenge was getting such large amounts of data from the telescopes to the Joint Institute for Very Long Baseline Interferometry in Europe without disrupting normal internet traffic. Interconnected lightpaths provided the answer. Janet's Lightpath service enabled Merlin (Multi-Element Radio Linked Interferometer Network) and e-merlin at Jodrell Bank to connect with GÉANT to form part of the international e-VLBi activity.

By analysing data as it comes in, such unpredictable, transient events as supernova explosions were captured as they happened—reliably, quickly and in great detail. The EXPReS Project (Express Production Real-time VLBI Service) concluded this year and has enabled astronomers to gain insights into the nature of the universe and dark matter. The European Commission in their final review of EXPReS called the project "extraordinarily successful" and encouraged the team to "explore any opportunity for further development."

RESEARCH & EDUCATION

MISSION CRITICAL

'Big science' deals in big questions. In fields from biomedicine and genomics to particle physics and climate science, today's research will shape our future for generations.

The scale of output is world class; the UK research community ranks third globally, behind only the US and China. The fruits of their labour bring an estimated value of up to £4.2 billion to the UK economy, as well as generating significant challenges, in terms of competition, information and e-infrastructure.

Several years ago the tipping point was reached. The data generated by scientific instruments from that point onwards exceeded the volume of all technical and scientific data collected in the history of research prior to it. The data bonanza is set to continue exponentially as ever more machines capable of generating massive data sets come online. Big science essentially means e-science. It is unthinkable without the high-speed, high-capacity network that Janet provides.

LIFE-CHANGING COLLABORATIONS

These are vital projects, not just for the economy but the future of our world. And they're happening because of collaboration on an unprecedented scale. Janet continues to work with the GÉANT research network and the European Molecular Biology Laboratory's European Bioinformatics Institute (EMBL-EBI), to help biologists share vital data across the globe.

'Research as we know it would not exist if there was not a network such as Janet.'

Professor Peter Clark, National e-Science

'Biology has moved from a small science to a large science,' says Professor Janet Thornton, Director of EMBL-EBI. 'Many of the recent projects are international, crossing countries and continents. We're currently facing a tsunami of biological data. Data generated by biological experiments is doubling every five months, driven by leading-edge initiatives such as the 1000 Genomes Project.'

The institute hosts the world's largest public collection of molecular biology databases and receives more than 3.5 million information requests every day. More than 80 terabytes of data are transmitted every month by EMBL-EBI over the high-speed, high-bandwidth Janet and GÉANT networks. (Janet transports EMBL-EBI information within the UK; GÉANT then communicates it to national networks around Europe, to the US and the rest of the world via global links.)

EMBL-EBI is a key partner in many global initiatives. One of these, the 1000 Genomes Project, is sequencing the genomes of 2500 people around the world and studying the minute differences that make people unique. The knowledge generated in this project is being used to advance our understanding of human health by explaining genetic susceptibility to disease or responses to particular drugs, for example.

The pilot phase of the 1000 Genomes Project, completed in 2010, created 4.9 terabases of DNA sequence and uncovered 8 million variations that had never been seen before. By its completion in 2012, the project is expected to produce between 60 and 80 terabases of data—the equivalent of around 250,000 gigabytes of data.

'The 1000 genomes project was envisioned before we even knew if the network would do what we needed it to do,' said Dr Paul Flicek, Head of Vertebrate Genomics at EMBL-EBI. 'Some people on the project encouraged us to send hard disks around the work. The networks have been critical to making the data freely available to the scientific community wherever they're located,' says Dr

Flicek. 'Our close working relationship with the Janet and GÉANT networks delivers the speed and capacity that we need, giving us confidence and allowing us to focus on sharing data that pushes forward scientific progress. As we gain more experience with the networks, we can contemplate ever bigger projects.'

By 2020, biological data generation is expected to reach thousands of times the current rate, far exceeding previous storage capacity predictions. ELIXIR, an ESFRI (European Strategy Forum on Research Infrastructures) project of global significance, aims to address this issue by creating a stable infrastructure for biological data in Europe. ELIXIR is coordinated by EMBL-EBI and is currently entering its construction phase. Once created, ELIXIR will rely on high-speed networks such as Janet to deliver data in real-time to scientists wherever they may be.

VIRTUAL PRESENCE

Collaboration with Janet extends beyond data sharing. Videoconferencing allows colleagues to interact in ways a simple voice call cannot match. Janet Videoconferencing lets people feel they are in the same room wherever they are. Using the IOCOM AG technology, they can also share presentations and use online chat, all in real time. Beyond the ease of use and richness of features, institutions and individuals can make great savings on travel, which is also good for the environment.

Videoconferencing has the power to extend learning in many ways, enabling multiple participants to take part in a lecture or seminar regardless of their physical location. One example is the development of the South East Physics Network (SEPnet), which promotes the teaching of physics through collaboration. Six universities set up the network across South East England and with help from the Janet support team, can now share resources, expertise—and costs—to teach physics to a high standard across the region.

It's not only universities who are taking advantage of crisp video and clear synchronised audio. Schools are using it to bring experts in many fields to the classroom. This has obvious appeal to scientists, artists, actors or business people who would like to volunteer their expertise to schools but can't afford to spend time travelling to schools outside their area. The network offers such high speed that it's possible for students to play along with professional musicians in another city, live with no significant sound delay.

Museums and other institutions are also realising the potential of bringing some of the experience they offer to the classroom. 'Videoconferencing takes students to places they wouldn't normally get a chance to visit,' says Jacqui Johnson, a teacher in Derbyshire. 'It's nice to be taught by different people and of course it's a cost-effective way of bringing these experts to the classroom.'

VIDEO CONFERENCING

REMOTE HIGHLANDS, REMOTE HEALTHCARE

Many chronic diseases can be relieved with proper rehabilitation. Typically, a group of sufferers gathers in a hospital or clinic to undertake a regime of physical exercise supervised by a clinician. But what if the patients live in a remote location?

Chronic Obstructive Pulmonary Disease (COPD) is a debilitating illness that includes chronic bronchitis and emphysema. Affecting at least 900,000 people in the UK, it's inevitable that some of those affected won't live close to city clinics.

Distance Labs is a content provider who, via videoconferencing, enabled a handful of elderly patients in the NHS Highland Board area to take part in a rehabilitation group from their own homes. For eight weeks, a physiotherapist led them through an exercise programme in twice-weekly sessions. Participants could see and hear each other while real-time pulse data from the patients was relayed to the physiotherapist.

The system combined off-the-shelf hardware with commercial and custom software with patients dialling in from their home PC. Initial doubts about older patients' unfamiliarity with computers and the internet were quickly allayed. A program was developed to allow participants to join the videoconference at the touch of a single on-screen button.

All patients involved in the trial showed clinical improvements comparable to a conventional programme. Apart from a single internet connection failure in one household, satisfaction was high. The fact that video quality was good in an area with the slowest broadband speeds in Scotland is testament to the possibilities of the service.

Paul Bonnett, Janet's Videoconferencing Technical Co-ordinator, says, 'We've been working with content providers like Distance Lab to reduce the cost and time overhead of providing specialist courses to groups that are often remote or for whom travel poses problems. These groups have found our desktop facility to be a real benefit.'

It's not just remote locations that can benefit from remote conferencing. Patients in urban settings can be put off attending rehabilitation by the demands of local travel. So there's plenty of scope for videoconferencing to grow within healthcare nationwide.

EXTENDING OUR INFLUENCE

GREATER EXPECTATIONS

'A resilient and robust data network is vital to research-led universities like Cardiff. I welcome the development of Janet's higher capacity network to support and enable the ever-increasing expectations of students and researchers throughout UK education.'

Martyn Harrow, Director of Cardiff University's Information Services Directorate

Janet has been promoting the adoption of wireless networks in universities for many years, but sometimes you can have too much of a good thing. The proliferation of local task-specific wireless offerings risks creating confusion for both users and operators. With eduroam, you can deliver the breadth of service without the uncertainties.

The management overhead of maintaining multiple separate wireless services is stretching the capabilities of many organisations. However, there is a simple solution to hand. Janet is supporting the community trend towards deploying eduroam as a single converged network that answers the needs of both local infrastructure and provides a means to support visitors from other sites. Staff and students need only a single wireless profile on their device to gain access wherever they may be, and their IT department has only one common network design to deploy.

More and more members of our community are using eduroam to deliver a superior mobile broadband experience to their campuses. In the last 12 months, our development programme has delivered improvements to the coverage and usability of eduroam, and reduced barriers to adoption of eduroam both within and outside the Janet community.

To keep pace with demand – recent international conferences suggest that Europe-wide delegates expect to find eduroam connectivity - we are developing the UK eduroam infrastructure to extend the service to environments where less technical expertise is available, for example by offering consultancy services to support eduroam deployment. We are also helping users find and log in to eduroam wherever it is available, by offering a mobile device application that serves as their 'eduroam companion'. We have further secured the availability of the national eduroam infrastructure by trialing and introducing support for the RadSec, a secure and scaleable variant of the protocol on which eduroam depends.

GOING OFF CAMPUS

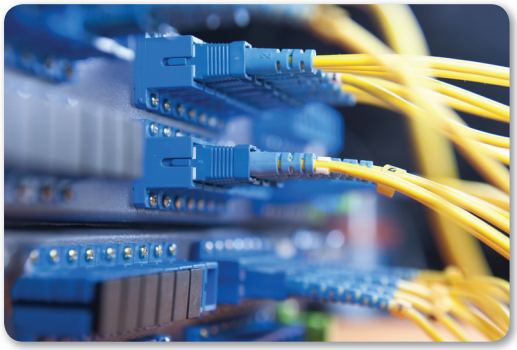
It's one thing to deliver a high-quality mobile experience to a closed community. But an ever-increasing number of academic and support staff are living their lives on the move which—coupled with an increase in distance learning, homeworking and workplace learning—means Janet needs to reach beyond the confines of a traditional campus.

Our 3G data service is providing data-only SIM packages specifically designed for academic communities. For example, along with a range of bandwidth options there is a machine-to-machine option to connect devices to sensors in a fieldwork experiment, sending their data back to the lab with no additional human input. To help our customers keep control of costs, we offer a range of pricing options through a dedicated online portal. So an organisation's administrative staff who, say, only travel a couple of times a month pay a suitably small monthly fee for 3G.

This is all part of our commitment to enable working and studying with any device, at any time and in any location. Using a standard, well known authentication mechanism enhances both familiarity with the service and the organisation's own security.

NETWORK OF NETWORKS

Although Janet's network operates within the UK, our community extends far beyond these shores. Janet is one of the 36 national networks that make up the GÉANT service area creating a 'network of networks' within Europe. This major collaborative project, in which Janet has played a key role, has become the world's most advanced international research network providing capacity for lightpaths that permit huge amounts of data to zip back and forth between researchers in many different countries on projects such as the Large Hadron Collider (see story 'the jump to lightspeed') and the VLBI radio astronomy system (see 'capturing supernovas').



We work closely with DANTE, which operates GÉANT, and with other National Research & Education Networks (NRENs) to develop, operate and improve connectivity and middleware services that facilitate international interoperability. Janet's CTO, Bob Day, is currently the Chair of DANTE, a critical position at this time.

The GÉANT network is in its third generation (GN3) and Janet staff are contributing to three key projects. eduPKI makes the adoption of digital certificates more cost effective; eduroam lets users roam securely at hundreds of institutions across Europe; and eduGAIN is establishing a group of identity providers to enable member organisations from different federations to interoperate. The eduGAIN service has now reached production after a successful pilot in which 13 of the 19 eligible federations within GÉANT took part (the target was five). We'll continue to extend the scope of the service, primarily to the e-Science communities and other internal GÉANT services.

Besides international collaboration among researchers, university teaching also happens across borders. Many institutions in our community have campuses abroad and we often use our relationships in these countries to help bring them cost-effective 'remote' connections, often by aggregating procurement.

'The digital network provided by Janet is crucial to the university, college, schools and research sectors, and is a genuinely world-leading facility.'

Professor David Eastwood, Vice Chancellor, University of Birmingham

GREATER PUBLIC SECTOR COLLABORATION

We continue to work on the provision of shared network services with the public sector which is already awash with networks, each built to different standards and catering to different needs. Janet is a partner in the UK Cabinet Office's PSN (Public Services Network) initiative to bring common standards to this multiplicity. PSN is seeking to create common standards working with industry to help standardise the provision of network and networking services to the public sector. The initiative will also allow industry to build innovative products only once, rather than one per network. The Cabinet Office estimates that PSN will make savings for the sector of up to £500m per year.

Our involvement positions us responsibly, giving us influence in policy and access to decision makers in a way that complements our core mission of delivering universal network infrastructure, ensuring the needs of research and education are represented within the heart of government developments. It also enables us to work more efficiently with wider public sector networks to help derive cost savings.

Our ongoing work with the NHS is another project close to government. The gateway between Janet and N3, the private network for the NHS in England and Scotland, went live this year. It brings together NHS and Higher Education networks and ensures good access from the NHS to services on Janet. A further project is underway to allow secure anytime, anywhere access for users who may belong to both camps, such as medical and nursing students or clinical teachers and researchers. It is planned that this development will reduce the current need for many users to have two PCs on their desk, one connected to each network, which makes a nonsense of cost and efficiency for their organisations.

In separate local developments Janet has become aware of Universities extending the reach of eduroam out into the wireless networks of their partner NHS organisations, bringing eduroam and the NHS closer. The NHS in Oxfordshire, including at the Oxford Radcliffe Hospital, is a particular example in association with Oxford University, and similar arrangements exist at the Royal Cornwall Hospital in Truro with the University of Plymouth and for NHS Grampian in association with the University of Aberdeen.

MOONSHOT

AIMING HIGH


Photo: Michael Jones

Our experience of operating the world's largest research and education access management federation has made us a leader in authentication and authorization services.

The loss of the UK Access Management Federation was a significant disappointment, however, we have supported our customers and the new operators to ensure a successful transition.

The Moonshot project is our response to our community's request to develop a single sign-on technology across the entire network. These include cloud, high-performance computing and grid infrastructures, and other commonly deployed services including mail, file store, remote access and instant messaging.

Named to reflect the scope and aspirational challenge of the task, Moonshot aims to bring the benefits of federated access management to more customers and services than is presently possible by removing the constraints imposed by contemporary technology. Through unifying technologies it has the potential to reduce the operational complexity of our existing AIM service portfolio (eduroam, Janet certificate service). It will also drive down operational costs for both us and our customers by removing redundant infrastructure and by simplifying configuration requirements.

The project has reached out to potential users and the e-Science community has shown particular interest, as a well-attended workshop in July proved. A number of sites volunteered to participate in testing a prototype system. The standardisation process is now largely complete. In the coming months the first user trial with the High Performance Computing (HPC) community will commence. By any standard this has been a rapid development of something our hyper-connected world urgently requires. Delivering it reinforces Janet's position as a leading NREN for middleware.

INNOVATION

CHARLATANS PROVE THE REAL DEAL

If you thought HDTV was the last word in television, think again. Super Hi-Vision TV is around the corner, opening up possibilities that go way beyond the sofa.

Super Hi-Vision TV, developed by Japanese public broadcaster NHK, is 16 times sharper than HDTV—a quantum leap in quality that's enabling new visions of all kinds to take shape.

To showcase the technology's potential, Janet collaborated with BBC and NHK for a first-of-its-kind Super Hi-Vision TV broadcast. The trial in September 2010 streamed a live gig by indie group The Charlatans direct from London to fans in Tokyo watching on a massive screen. The show was made possible by high-speed connections to Tokyo that used parts of the Janet, GÉANT and NTT (Japanese) networks. Attempting the same feat by conventional satellite transponder would take up a lot of bandwidth and be very expensive.

The image quality makes it ideal for giant public viewing screens, and in a joint project with the BBC Janet is planning exactly that for the London 2012 Games. Huge BBC screens in Glasgow, Bradford and London connected over Janet will enable the Games to be displayed in Super Hi-Vision. 'We are extremely pleased to play a key role in enabling such an historic event,' says Roger Bolam, Janet's Voice and Video Product Manager, 'and we're looking forward to working with the BBC and other organisations to trial this technology in the run up to London 2012.'

While sports and the performing arts might drive widespread take-up of the technology, the implications for science and research are also considerable.

FROM STAGE TO (OPERATING) THEATRE

Super Hi-Vision lies at the edge of what is currently possible. The trial has helped us understand how our network can be engineered to support this technology in the future as members of the Janet community find ever more ingenious uses for it.

At the infrastructure level, Janet's Lightpath Service has helped with medical visualisation. In a recent medical demonstration, visualisation models were created with real-time data of blood-flow within a patient's brain. The aspiration was for images to be relayed within minutes to the operating team, letting the surgeon model the effects of his proposed interventions before carrying them out on the patient in real life.

LOFAR

ILLUMINATING THE UNIVERSE

An international astronomy project is mapping the origin of high-energy cosmic rays to reveal how the first large-scale structures in the universe came into being.

A grid of telescopes called LOFAR (Low Frequency Array) is studying the lowest frequency radio waves detectable from Earth. To connect stations in the Netherlands, Germany, France and Sweden with the LOFAR radio observatory at Chilbolton in Hampshire, Janet set up a 10Gbit/s lightpath.

The project is capturing images of the bright radio quasar 3C196, located in a galaxy so distant that light takes 6.9 billion years to reach the Earth. In visible light, even through the Hubble Space Telescope, 3C196 is just a single point. But the combined international stations of LOFAR have already been able to reveal more structure.

LOFAR is a very cost-effective method of gathering vast amounts of data. A typical station consists of around 100 antennae constructed from everyday mass-produced components with no moving parts. Unlike a conventional dish-shaped radio telescope, which can only be pointed at one part of the sky at a time, LOFAR can be configured electronically to look into many parts of the sky simultaneously. Ultimately the grid will have 5,000 antennae spread across Europe.

The field of view captured by LOFAR covers an area of the sky equivalent to 1,000 full moons, and objects are studied with a resolution as fine as 0.2 arcseconds, close to 1/10,000 of a full moon's diameter. Real-time flows of data from the antennae are gathered on-site and then passed via our lightpath to the data correlation centre at University of Groningen in the Netherlands to produce a detailed image of the sky. The rapid and reliable transmission of data is therefore crucial to the operation.

'The connection between the Chilbolton telescope and the supercomputer requires an internet speed of 10 gigabits per second, over 1000 times faster than typical home broadband speeds,' says Professor Rob Fender, LOFAR-UK Leader from the University of Southampton. 'Getting that connection working without a hitch was a great feat requiring close collaboration.'

To give an idea of the sheer quantities of data, the Chilbolton site alone is producing seven petabytes of raw data every year. (One petabyte is approximately 1 million gigabytes.) As well as being a self-sufficient project in its own right, LOFAR is an ideal testbed for methods of processing the vast amounts of data expected to flow from the even larger project SKA (Square Kilometre Array), scheduled for completion around 2022. It is estimated SKA will produce 1 terabyte—1000 gigabytes—of data every minute (more than 500 petabytes per year).

TRUSTED ADVISORS

PEACE OF MIND

In any community some people stand out as figures others turn to for advice and assistance. Such people have experience and a certain willingness to look objectively at the facts rather than jumping to conclusions.

This is a position we would like to earn as an organisation within our community. At Janet, we have a desire to help our customers and play advocate for the sector as a whole. We've developed a range of initiatives to ensure that we are the first port of call for our customers on any number of issues.

OPEN FOR BUSINESS

Although Janet is a publicly funded network with a public sector remit, the lines between our sectors and the business world are becoming blurred, even redrawn. While our infrastructure supports the UK's research base, much research is privately funded.

We've therefore helped our community to use Janet to engage with the business community. In the past 12 months, we have actively reviewed and liberalised our connectivity and eligibility policies to better reflect the sector needs. The fact that we've always had an architecture built to meet the demanding needs of research, ensures that it also supports a range of education and other services.

It's essential we keep pace with the way our customers work in reality as they themselves engage with other organisations in both the public and private sectors, including enterprise and industry. Much of our activity involves laying down groundwork such as defining how a publicly funded network can operate within EU competition law.

Our community has welcomed new business and community engagement guidelines to support these new forms of collaboration. Our guiding principle is that Janet will always be 'open for business' supporting partnerships and collaboration with the right requirements. And we'll be ready to adapt management models to keep our customers competitive.

LAW AND ORDER

Security on our network is a high priority for all our customers. Through our Computer Security Incident Response Team (CSIRT) we've been working closely with UK law enforcement agencies. We look beyond the closed walls of academia to the wider issues affecting web users everywhere. For example, we were approached by CEOP, the Child Exploitation and Online Protection Centre, for assistance with implementing 'panic button' alarms for children who feel they might be the target of online abuse. As we manage the network, if someone flags a query with one of the ac.uk domains, it is directed to the CSIRT team who pass on the contact details for that institution.

Perhaps the most obvious type of security risk is an attempted breach of a network. Hackers today go to extraordinary lengths to gain access to a system and there's something of an arms race with the advance of preventative measures and attempts to defeat them. We keep a careful eye on developments of intrusion detection systems. These inspect all network activity and look for suspicious patterns that may indicate a network or system attack.

We hosted a webcast on this topic in conjunction with members of the security services at Reading University and the University of Oxford. Webcast events are proving to be a very successful way of sharing information and promoting discussion with minimum disruption to the working day for the people involved.

Another of our community roles is to monitor and, if possible, influence the development of law and regulation as they apply to the operators of computer networks. The UK Government has sought our input on three legal areas: copyright enforcement, criminal web activity; and information sharing between security teams.

First, copyright enforcement, the Department for Business Innovation and Skills requested evidence for its growth review of the digital and creative industries; we also submitted evidence to the Culture, Media and Sport Select Committee's review of the Digital Economy Act; and we have provided further information to the Ministry of Justice on the revision of the European Data Protection Directive, and to the House of Lords European Affairs Select Committee on European plans for improving cybersecurity. We also contributed to the Home Office's consultation on amendments to the Regulation of Investigatory Powers Act to cover unintentional interception, and submitted evidence to a Nominet working group on a policy for suspending domains that are involved in criminal activity.

Discussions have also taken place with Ofcom on deployment of the DNSSec protocol. Projects have begun on legal issues around sharing of information between incident response teams (with ENISA and TERENA's CSIRT Task Force) and on approaches to attribute release among federated access management systems. A paper comparing the European Data Protection Directive and the US Family Education Rights and Privacy Act has been published by TERENA.

DILIGENCE PAYS DIVIDENDS

Our community trusts us to help them get the best deal from commercial suppliers. We research and listen to our customers' needs and articulate them to providers. Every year we reprocure half our global transit, continually going to market to drive down costs to the benefit of our users. In this way we have reduced the unit cost of global transit to less than 5% of what it was eight years ago. We aim to be a mediator, acting for the benefit of both sides, so we talk to our suppliers and help them understand our needs more clearly so that we can work together for the benefit of the sector as a whole.

Our new telecommunications framework agreement for the provision of transmission services benefits not just members of our immediate community but also organisations further afield. Eligible users—Janet-connected organisations, Regional Network Operators, members of the Purchasing Consortia and members of the Regional Broadband Consortia—can easily meet their own requirements with a chosen list of suppliers via a dedicated website, knowing that all due diligence has been performed and compliance with EU and UK procurement law is guaranteed.

The framework runs for four years until 16 July 2014, and we estimate that some £80m could be spent through this agreement in its lifetime. The agreement has already helped London Grid for Learning (LGfL) make substantial savings of both time and money in reprocuring its entire

infrastructure: LGfL expects the levels of savings which will be enjoyed by the schools and Councils over a five-year period to be in excess of £30m.

Our framework agreement for videoconferencing has been used extensively by the community who can expect to save not only the cost of procurement but obtain a bespoke installation tailored to individual needs.

Similarly customers can save on the cost of routing and switching equipment from manufacturers such as CISCO, Juniper and Alcatel using our framework agreement.

ALL PART OF THE SERVICE

Through the Janet Certificate Service we continue to help the sector save money whilst providing secure online communications to their users.

The numbers to date are impressive with more than 22,000 certificates issued—an increase of over 7,000 since the start of the year—to over 500 organisations. Very positive feedback suggests this rate of take-up will continue. The benefits of this service now extend to customers in local and unitary authorities who can request certificates on behalf of schools under their authority. Staffordshire Local Authority, a participant in a successful pilot of the new offering, estimates savings of almost £50,000 through obtaining server certificates on behalf of its schools over the next three years.

Since the beginning of 2010, we have made it easier for users to request certificates, with the launch of an online interface. The new system automates the processing of certificate requests for all .ac.uk and gov.uk domains, as well as monitoring and managing new certificates. This includes certificate revocations and automated alerts when certificates are close to their expiry date.

Following a recent security alert relating to certificates we acted quickly to help customers implement additional security procedures. Although all applications for certificates are now subject to additional checks, certificates are still issued in a matter of hours.

SAVINGS ON ANTI-SPAM

We have responded to our customers by subscribing to a new DNS whitelist from dnswl.org on behalf of the our community which reduces the false positives of legitimate email being caught in spam filters and speeds up the filtering process generally. We also now include whitelists from Spamhaus in our data feed service. As a single subscription can serve the entire community, rather than individual organisations each having to subscribe themselves, the combined effect of whitelists and blocklists made available through Janet will save over £4m p.a.

BROKERAGE

AHEAD IN THE CLOUD

Moving data centres off campus and into the cloud makes sense on so many levels—financial, technological and environmental—it has the air of inevitability that comes with all paradigm shifts.

Yet the cloud is growing so fast that fixed standards and delivery models have yet to catch up. Moreover, each organisation has different perspectives, priorities, timescales and levels of readiness.

Janet Brokerage was set up to define and build requirements for the sector as a whole, acting as a one-stop shop for coherent offerings, while recognising that there's no 'one model fits all' approach. We bring to the new service our existing expertise of assessing, aggregating and articulating demand to commercial providers.

Funded initially by HEFCE's University Modernisation Fund, we work to match organisations to data centre and cloud computing solutions that can then be tailored to their needs. With our deep understanding of sector requirements, the brokerage service aims to bring cost savings, efficiencies and improved services to the research and education sector. At the same time, of course, moving to the cloud reduces risk and the environmental impact of proliferating data centres.

The Brokerage team is now in place and available to answer technical, financial, regulatory and organisational questions and is setting up the sector and commercial advisory boards critical to taking it forward. We are pioneering dynamic purchasing systems for data centre services and have established an initial service menu. The Brokerage team also engages with related areas within Janet such as Development, Regulatory, CSIRT and Moonshot.

EFFECTIVE COMMUNICATING

ENGAGING OUR COMMUNITY

'You can't just ask customers what they want and then try to give that to them,' Steve Jobs once said in an interview. 'By the time you get it built, they'll want something new.'

In many ways that's true for our work, too. We build the fastest, most reliable and secure network that technology can allow then open it up to our customers and see what they make of it. As we've seen, Janet is used for everything from discovering the origins of the universe to saving lives in surgery.

But in truth we're engaged in a constant feedback loop with our customers. Big science and other such projects operate on long timescales. We have to make sure that when they start a new endeavour we'll still be there supporting them at the finish line.

So in the past year we set up two groups to engage our community at all levels. The stakeholder consultative panel addresses strategic developments such as clarifying how our network can be better used for business. The people we consulted across our community welcomed our questions and gave insights that fed into our ideas on Janet and business. The panel's next task will be to ask them what sort of organisation they would like Janet to become in the light of the Wilson report.

This second group is our customer engagement team that interacts directly with our customers. We've filled six out of nine places on the team and everyone has been busy travelling the country, talking to people and gathering requirements. Most recently, the team has been discussing the needs of institutions involved in the 2012 Olympics, whether as training camps, hosting support services or student villages. Working directly with our customers helps foster closer relationships that in turn lead to better intelligence for future product development.

TRAINING & CONFERENCES

GETTING THE WORD OUT

Networkshop, our annual conference, brings together experts from all fields of networking in a three-day programme filled with workshops that cover everything from security and network access to data services and the cloud.

Despite the financial squeeze, 270 delegates made it to Networkshop 39. The top reason people give for attendance is, appropriately enough, networking. The forum provides an unrivalled chance to catch up with peers, get up to speed on emerging technologies and, of course, keep updated on developments at Janet.

This year included a focus on IPv6, cloud computing and shared data centres. For the first time we invited a student to present to the group. Andy Baker, an undergraduate from Southampton University's computer science programme, gave delegates the 'student's point of view', shedding light on the issues affecting this core part of our community who will also go on to become key players in the industry.

An impressive 98% of attendees felt that they had achieved their objectives for attending the conference. As one put it, 'Networkshop continues to be a very important date in the calendar, [...] essential for finding out about new developments and how other institutions are solving the same problems.'

JANET TRAINING WIN ACCREDITATION

A few months later, in July, Janet Training was awarded Learning & Development Provider Accreditation by the prestigious Learning & Performance Institute (LPI). The team was commended on the high quality of learning materials, thorough development of courses and their review procedures. While continuing to deliver and develop its extensive portfolio of face to face training courses the team is also working on the production of online courses. The lunchtime online briefings have been very well received and these will also be developed in the forthcoming year.

FUTURE FOCUS

THE ROAD AHEAD

This report has already talked about many things in the pipeline. From 3G and brokerage services to public service networks and how we engage with business, there's a lot coming up. But we'll wrap up with a return to our core focus.

Research and education institutions are looking closely at how to save money and, in some cases, refocus their activities. One way of making efficiency savings is through outsourcing or sharing services. This trend, combined with increased collaboration and consolidation within sectors, requires a modified approach on our part, too.

Many other disciplines have a real appetite to use the network and we must support creative collaborations across sectors and throughout the world. These innovations build the reputation of individual institutions and of the UK's research and education sector internationally.

Education itself has become much more competitive nationally and globally. Students increasingly see themselves as 'customers', with expectations around where, when and how they learn that challenge traditional methods of delivery.

Taking all this into account, we have identified the requirements that will guide the next version of Janet.

- **A highly reliable network service**
- **Anyplace, anytime network connectivity**
- **An increased range of network connectivity products**
- **Greater use of partnerships (see sidebar story)**
- **Support for third-party service providers**
- **Support for carbon reduction commitments facing Janet-connected organisations**
- **Maintaining the requirements of the previous backbone**

We are already planning to meet all these requirements, both through the architecture and design of the next stage of Janet's evolution and via the broader services portfolio.

There will be significant additional demands on the network to support institutions' research, teaching and corporate requirements. These include the move to more pervasive research grids, exponentially increasing quantities of research data, and the move towards outsourced and shared services enabled by the cloud. For each of these, Janet will provide the essential underpinning infrastructure. Meanwhile, in recognition of greater uncertainties in public funding over the period, we must adopt a more agile and flexible approach to backbone capacity than needed in previous years.

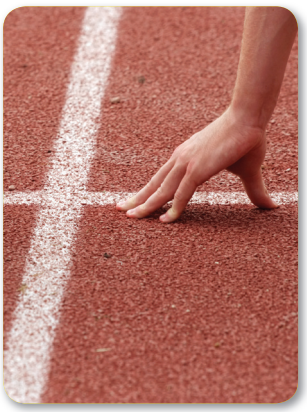
Procurement activity will commence in late 2011. An Advisory Group consisting of representatives from a broad range of sector groups that use Janet will continue to engage with the funders and all those in positions of influence to support the necessary funding of the new backbone which will be provisioned by October 2013.

The requirements analysis and further details are available from **www.ja.net/six.**

PARTNERING BUSINESS

ON YOUR MARKS...

The London 2012 Games are giving a boost to many parts of the economy. The education sector has received the promise of funds from an unlikely source.



Cisco, a multinational tech firm headquartered in the US, has already pledged $500m to foster entrepreneurship within the UK and ensure a lasting legacy from the Games. Recently, Tim Marshall has been talking with the company to understand how Janet can help with their latest initiative, called the National Virtual Incubator (NVI).

The idea is to get innovative ideas out of the ivory tower and into the real world. The NVI programme will set up 20 physical incubator sites around the UK to encourage the Higher Education community to develop their own start-up companies. The NVI will then help commercialise their ideas so they can hit the ground running.

The scheme is a natural fit for us as the majority of the incubator sites will be hosted on HE campuses which already have access to a Janet connection. Beyond supplying the network, our main role will be to provide videoconferencing services to connect the sites to each other and help get the ideas flowing.

KEEPING IN TOUCH

Our website www.ja.net is the primary source for tracking Janet's progress. Below is a collection of links to specific projects and initiatives.

REGULATORY DEVELOPMENTS

Keep informed on current legal developments and our relation to them on our Regulatory Developments blog, maintained by the Chief Regulatory Advisor: **http://webmedia.company.ja.net/edlabblogs/regulatory-developments/**

DEVELOPMENT

Follow the Janet Development Team's progress on Development Eye at:
http://webmedia.company.ja.net/edlabblogs/developmenteye/
To receive regular updates, sign up at **www.jiscmail.ac.uk/lists/Janet-development.html**
You can also follow various members on Twitter: **twitter.com/#/list/JANETDev/team.**
An RSS feed is also available.
Keep informed on current developments to the Brokerage service: **www.janetbrokerage.ac.uk**
The Brokerage team also tweets: twitter.com/JANET_Cloud

NEWS

Follow general Janet news at **www.ja.net/Janetnews/** and get back copies of our newsletter, Janet News, at **www.ja.net/services/publications/news.html.**

TRAINING

Two Twitter accounts keep you posted:

- **@Janettraining for news and comment on courses available**
- **@nwsonline to discuss Networkshop**

REQUIREMENTS GATHERING

The Janet Network: Help Plan the Future
www.ja.net/documents/development/Janet-six/Janet-network-requirements.pdf
The Janet Network: Requirements Summary
www.ja.net/documents/Janet-network-requirements.pdf

TECHNICAL GUIDE UPDATES

IPv6
www.ja.net/ipv6
Logfiles
www.ja.net/documents/publications/technical-guides/logfiles.pdf

KEEPING IN TOUCH

FACTSHEETS

Email Addresses for Alumni
www.ja.net/documents/publications/factsheets/081-alumni.pdf
Managing Safety for Children and Other Vulnerable Guests in HE
www.ja.net/documents/publications/factsheets/080-children-and-vulnerable-guests.pdf
Penetration Testing
www.ja.net/documents/publications/factsheets/082-penetration-testing.pdf

PUBLICATIONS

Janet: The First 25 years, by Christopher Cooper

Back in 1973 and 1975 when the internet was still barely a glint in academics' eyes, the two Wells Reports recommended the setting up of a national university network. Janet was the result. Cooper's book presents the organisation's definitive history, from the Flowers Report of 1965 that led to the setting up of the Computer Board, through the technological and political challenges that led to the creation of Janet in 1984, the launch of the SuperJanet project in 1990 and the unveiling of the SuperJanet5 backbone in 2006 that finally realised the SuperJANET goals. Printed copies can be ordered from any bookseller. ISBN-10: 0954920724. An eBook is also available **http://www.ja.net/services/publications/history/index.html**

JANET(UK)
Lumen House
Library Avenue
Harwell Oxford
Didcot
Oxfordshire
OX11 0SG
Tel: 01235 822200
www.ja.net

050 (07/11)