# Summary of Business Case for an N3 JANET Gateway Service

## 1 Introduction

There is a long standing issue of suitable joint access of systems for the many staff and students that work and are directly involved in both NHS and Higher Education (HE, University) organisations. Overcoming such issues in the UK is the objective of the NHS-HE Connectivity Project:

**”To achieve good inter-operability between NHS and Higher Education (HE) networks that enable secure anytime, anywhere access by medical, nursing and allied profession students, clinical teachers and researchers”**

Previous work between NHS Connecting for Health and JANET(UK) has delivered an early adopter N3 JANET Gateway for some trial communities since November 2007. This business case is to take this forward with a joint funded resilient and responsive N3 JANET Gateway as an operational service for all NHS (England and Scotland) and Education and Research network traffic.

In recognition that the requirement is wider than Higher Education, where appropriate the term “Education & Research” is used in this document to incorporate the additional requirements of Schools, Further Education, Special Schools and Adult Community Learning. Indeed with many Local Authorities connected to JANET for these purposes there is the possibility of the Gateway supporting Social Services but this is not the focus of this proposal.

## 2 MANAGEMENT SUMMARY

The proposal is to procure and implement a resilient and responsive N3 JANET Gateway service on a five year contract as follows:

- Two Gateways at 250 Mbps capacity using the BT Etherflow technology
- The active Gateway in London and the standby Gateway in Manchester
- The Gateways to support all traffic between N3 and JANET for sessions initiated in N3 (and later sessions initiated in JANET).
- To implement the Gateway as soon as possible for the use of sessions initiated in N3 and in parallel undertake further work on the information governance and technical options to support sessions initiated in JANET.

The N3 JANET Gateway service will be funded jointly and equally by Connecting for Health and JANET(UK). There is a 90 working day lead time from order to delivery from BT N3SP.

The outline timetable is as below:

| Milestone | End date |
|---|---|
| Business Case formally agreed | 31st July 2009 |
| Order placed with BT | 7th August 2009 |
| New Gateways in place (90 working days) | 14th December 2009 |
| Set up and testing | 22nd January 2010 |
| Live Service | 29th January 2010 |
| Cancellation of early adopter N3 JANET Gateway | 5th February 2010 |
| Early adopter N3 JANET Gateway ends | 10th March 2010 |
| PID for Sessions Initiated in JANET parallel project | 30th September 2009 |

## 3 Strategic Case Overview

NHS connectivity with Education and Research networks has been a longstanding issue. An early adopter N3 JANET Gateway was implemented in November 2007 and this has further substantiated the requirement for this facility. There are strong drivers for clinical education, clinical research and joint working between the NHS and education and research sectors. The early adopter N3 JANET Gateway identified five areas of direct benefit:

i. Removing the need for University lease lines to NHS Trust sites
ii. Removing Traffic from the N3 internet Gateway with extra resilience and response through a dedicated channel for education and research use.
iii. More Flexible Firewall Rules for the Relationship with Education and Research, making the most of a higher level of trust between the two sectors.
iv. Co-ordinated Service Over-lay, such as the JANET Videoconferencing Service (JVCS) for H.323 videoconferences.
v. Sessions Initiated in JANET, the development of a service at a later date not currently supported e.g. to give NHS clinicians at a JANET connected site access back to his or her systems on N3.

A range of benefits and drivers can be listed. The more recent significant ones are:

- The Darzi Review proposals on Academic Health Science Centres (AHSCs) and "Health Innovation and Education Clusters"
- The National Institute of Health Research's investment in co-ordinated research networks, centres and systems to support health research
- The NHS Connecting for Health's Research Capability Programme to improve access to NHS clinical data for research.

The investment objectives of improved NHS and Education and Research Connectivity to be furthered by the proposed investment are:

i. To improve the experience of staff and students involved with health related education, learning and research for all staff and students who need it.

ii. To improve learning outcomes through improved access to relevant systems and records
iii. To improve Health research through increased availability, quality and speed of retrieval of data and by improved mechanisms for research data capture and analysis.
iv. To reduce the IT and administrative effort involved in achieving systems interoperability between the Education & Research and NHS sectors
v. To reduce the overall costs of NHS-Education & Research connectivity through improved value for money by achieving economies of scale.
vi. To improve compliance with security requirements and reduce the financial and other risks involved with any non-compliance.

## 4 Learning from the Existing Early Adopter N3 JANET Gateway

JANET(UK) funded an early adopter N3 JANET Gateway that was implemented in November 2007. The Gateway was purchased from BT as a “bespoke gateway” catalogue item from the NHS England’s N3 contract with BT. It is a 100Mb link between BT’s N3 POP at Kingston Telephone Exchange and the JANET POP at Telecity. The firewall is housed at Kingston Exchange and, along with the intrusion protection service, is managed by BT N3 Service Provider.

The objectives of the early adopter N3 JANET Gateway are:

a. Promote and assist the early adopter projects
b. The discovery of the practical issues and implications of a National N3 JANET Gateway to inform the case for potentially extending the early adopter service to a fully resilient on-going national facility.
c. Provide a quantification of data-flows from the early adopters which can be used to scale the design of the N3 JANET Gateway service in the future
d. Provide a practical demonstration of collaborative work between the Health and the Education and Research sectors.

The Early Adopter N3 JANET Gateway has demonstrated the business need for a number of services for sessions initiated in N3. It has not been possible to demonstrate this for sessions initiated from JANET in terms of a working system although two early adopter schemes are currently being investigated. The early adopter H.323 videoconferencing bridge, that has recently gone live, is of interest to other NHS Trusts and demonstrates the need for nationally coordinated services where none have existed previously.

A series of generic benefits have been identified by using the early adopter N3 JANET Gateway:

### 4.1 Removing the need for University lease lines to NHS Trust sites

This was the case for the first two early adopter communities to go live:

- University of Bristol and University of West of England have implemented dedicated lease lines (2 to 10 Mbps) to their eight new Clinical Academies at NHS Trust sites in Avon, Gloucestershire, Somerset and Wiltshire to support their placement students at these sites. They did this to ensure fast response and robust access to their Citrix based student systems at the Universities. The N3 JANET Gateway offered a different route using the NHS sites' N3 access and this has been successfully implemented at three out of seven Clinical Academies so far. Others would have been implemented previously but it involved significant work that they would only undertake if the N3 JANET Gateway becomes a longer term solution. The lease lines that could be terminated with the most savings with an N3 JANET Gateway service are to:
    - Yeovil
    - Weston-super-Mare
    - Swindon
    - Gloucester & Cheltenham
- University of Newcastle is the lead partner for the Centre of Excellence in Teaching and Learning project CETL4HealthNE. This is a partnership involving the five Universities in the NE of England (Newcastle, Durham, Sunderland, Teesside and Northumbria) and NHS Trusts in the NE (7 sites in the first instance). Until the early adopter N3 JANET Gateway became a possibility, the CETL4HealthNE project was going to fund University lease lines to the NHS Trust sites. So this expenditure was avoided.

Related benefits in moving to the N3 JANET Gateway are:

- All PC support at the NHS sites becomes NHS-owned rather than a mixture from NHS and University IT support teams
- The service can be extended to other staff on N3 when not restricted to those connected to the University lease-line.

### 4.2 Removing Traffic from the N3 internet Gateway

It is known that the N3 internet Gateway has struggled to keep pace with the growth in its use. Upgrades are also relatively expensive because of the filtering requirements. Thus response times can be particularly difficult at peak times e.g. during the middle of the day Monday to Friday.

In this situation the N3 JANET Gateway offers dedicated bandwidth for education and research websites connected to JANET. This was made most clear by the Wellcome

Trust Sanger Institute who asked to become an N3 JANET Gateway early adopter. Their conclusion is:

*"……there were many speed issues hindering effective use of the DECIPHER website for Clinical centres in the NHS rendering this web-based tool ineffective. With the adoption of the N3 JANET gateway for DECIPHER very tangible improvements have been evidenced allowing the full potential of DECIPHER to be realised in clinical practice in the NHS.*"

The University of York became an early adopter to ensure their service in a similar way for the interactive website as part of the Improved Access to Psychological Therapies (IAPT) programme. This provides an information service to Primary Care Trusts and it is important that it is responsive.

The University of Salford is the latest early adopter to help improve access to the University systems for nursing students on placement in the NHS. They have received complaints from the tutors representing the students that access has been poor to their key University systems. Most if not all Universities now use Virtual Learning Environment software to support student's learning and as the main route of communication and these have become crucial to access from wherever the student happens to be.

### 4.3 More Flexible Firewall Rules for the Relationship with Education and Research

It was established in the early-adopter work that the information governance rules could be kept high level for sessions initiated in N3 targeting JANET IP addresses. These high level rules are:

- The session can be initiated at any N3 IP address (the risk is with the education and research partner)
- A session initiated in N3 can go out through the firewall in the N3 JANET Gateway through any port (again the risk is with the education and research partner)
- If there are sessions initiated in N3 involving Patient Identifiable Data then this is something expected to be agreed by the local organisation and anyway this traffic can pass through the N3 internet Gateway

In the early adopter programme then the JANET IP addresses have been kept at specific agreed ranges for each early adopter University but the same principle can be applied to the JANET IP addresses for JANET connected public organisations.

The above policies have allowed the following services to be more easily supported as early adopters:

- e/pop web based videoconferencing for the University of Bristol
- access to the Lectopia streaming system for recorded university lectures
- firewall traversal for H.323 based videoconferencing (see next section)
- web streaming in general e.g one of the aims of the University of Bristol early adopter.

These are examples of the increased flexibility required of the N3 JANET Gateway that is difficult to incorporate within the N3 internet Gateway.

### 4.4 Co-ordinated Service Over-lay

The existence of the N3 JANET Gateway gives the opportunity to coordinate services between the NHS and education & research sectors. The early adopter example is the H.323 videoconferencing firewall traversal and bridge at the Gateway and management of the service by the JANET Videoconferencing Service (JVCS). The use of H.323 videoconferencing across the Gateway is a particularly important milestone as it is something that is not possible through the N3 internet gateway. This involves hardware (Tandberg Expressway boxes) being sited at Kingston Exchange with the Gatekeeper box on the N3 side of the firewall in a DMZ and remotely managed from JANET by the Janet Videoconferencing Service (JVCS).Through the CETL4HealthNE project, 7 NHS Trusts will be able to videoconference with their University partners or anyone else registered with JVCS (all Universities, FE Colleges and an increasing number of schools). This has already been used by South Tees Hospitals NHS Trust and North Tees and Hartlepool NHS Trust although there is a quality issue currently being resolved.

It is understood that N3 are introducing a videoconferencing bridge and management service to be piloted in late 2009. Discussions have started on how it might be possible to "link" this new service for N3 with JVCS to give seamless booking and support for IP based videoconferences involving NHS and education and research sites.

Another service that could be coordinated across the N3 JANET Gateway is the use of JANET Roaming at NHS sites for mobile access back to University Services. This is actively being pursueded with a new education and Research Centre at South Devon Healthcare NHS Foundation Trust in Torbay.

### 4.5 Sessions Initiated in JANET

Although it has not been possible to yet implement an example of sessions initiated in JANET, it has been come clear where such a facility would be of benefit. Two use cases are for instance:

- South Birmingham Primary Care Trust and the South Birmingham Dental Hospital where clinical dentists at the Dental Hospital need access to new NHS systems from their University-connected PCs.
- University of Birmingham's primary care research developments have ethical approval to try direct access to a primary care system on N3.

The best approach to the information governance, and hence technical set-up, is currently being sought for these early adopter proposals. The highest priority for this is to allow NHS smartcard access to national NHS applications from a JANET-connected device.

Also the plan is to work with the Research Capability Programme to see whether collaborative research can be supported by University research groups being given access to NHS patient identifiable data where research ethic approval has been given and the University has the appropriate information governance in place and signs a Statement of Compliance.

## 5 Options for the N3 JANET Gateway Service

The following options were considered:

Option 1: Bring the Early Adopter N3 JANET Gateway to an end and revert back to local organisations having to implement local schemes.
Option 2: Carry forward the early adopter gateway with specific N3 JANET traffic (do nothing)
Option 3: Upgrade the N3 JANET Gateway to a fully service managed and resilient facility taking all N3 JANET traffic

Option 3 is recommended. Option 1 would clearly be a backward step from the experience from the Early Adopter Gateway. However Option 2, carrying forward the early adopter Gateway is not viable long term as it was not designed as a full service, is not resilient, and could only ever partially support N3 JANET traffic i.e. for selected applications and user communities.

### 5.1 Technical Outline Requirements

A Proposal Working Group developed the technical requirements for a N3 JANET Gateway service between April and September 2008. The requirements specified are as in the table below in italics with their status in this proposal shown next to them:

| Outline Requirement: | Inclusion in the Proposal |
|---|---|
| *"The proposed principle for a future N3 JANET Gateway service is that it would be the main infrastructure for communications between the health and education and research sectors in England and Scotland. This will facilitate NHS liaison and collaboration with health education and research. It will take away this traffic from the N3 internet Gateway and remove the need for many local NHS JANET interconnections. The specification would build on the learning from the early adopter N3 JANET Gateway.……..……..*<br><br>*The outline requirements are currently thought to be for the future N3 JANET Gateway:* | This in the principle of this proposal. |
| 1. *To support sessions initiated in N3 from any N3 IP address through any port, whether or not it involves Patient Identifiable Data (PID):*<br>a. *To take all N3 to JANET IP address range traffic*<br>b. *In such a way that the traffic does not travel to the N3 Internet Gateway first (now clarified that this doesn't happen with the early adopter gateway either).* | This is part of the proposal and the value of this has been demonstrated by the early adopter Gateway. |

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| 2. *To support sessions initiated in JANET, whether or not PID is involved. This to include:*<br><br>a. *Use of NHS smartcards and related devices and software for access to compliant NHS clinical systems*<br>b. *Use of N3 remote i.e. requirement for NHS users with N3 remote access VPN services connecting from within JANET to establish a VPN directly through the N3 / JANET gateway*<br>c. *A ssl VPN solution that extends in to N3 i.e. enables an end to end secure encrypted tunnel through the JANET / N3 gateway to services within the NHS. It is recognised that this creates the need for significant work around the appropriate security processes.*<br><br>*This implies the N3 JANET Gateway leading to the "internal" rather than external view of N3 eg for the purposes of DNS. It is believed that the generic services listed above will support, within an information governance framework to be further developed (see "key dependencies"), access to for instance:*<br><br>i. *The "spine" applications*<br>ii. *The 2,700 or so "nww" sites used for national and local intranets*<br>iii. *Any systems developed by the Research Capability Programme and the National Institute for Health Research.*<br>iv. *Any local NHS organisation systems where the necessary approvals are in place.*<br>v. *Services run at the N3 JANET Gateway such as the H.323 videoconference bridging and central management.* | The proposal will support this but as yet the information governance and technical options have not been worked through. Initially BT offered the use of the N3 VPN options but these are available to NHS organisations only at present. It is recommended that this is pursued in parallel to the establishment of the N3 JANET Gateway for all N3 sessions initiated in N3 to start with. |

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| 3. *Provision for resilience, responsiveness and 24/7 support. It is envisaged that there will be at least 2 Gateways in separate locations. In order to simplify the set-up and management it is proposed that the second gateway will be a "stand-by" rather than "active". This avoids the complexity of load balancing and the reduction in the predictive nature of the flows that could be a problem for the firewalls. It is also less complicated for the set-up of services at the N3 JANET Gateway such as H.323 videoconferencing. Each gateway should be capable of scaling to 1Gbps and a cost model provided at a range of capacities starting with a Committed Data Rate (CDR) of 100Mbps. The actual CDR will be determined by assessment of the traffic flowing between N3 and JANET, this will involve N3SP Capacity Management. It is anticipated that a CDR in the range of 100-150Mbps is likely at launch of service. London would be the natural base for the active Gateway. The second standby Gateway is likely to be best sited at one of:*<br>• *Manchester*<br>• *Leeds*<br>• *Glasgow*<br>*In addition the costing model should provide as an option the use of the London location only but with in-built resilience (two circuits, terminating on separate rack units with separate power supplies - and if possible the circuits going into the single building through separate ducting)* | The proposal includes 24 x 7 proactive management of the Service by BT, the active Gateway at Kingston Exchange and the standby Gateway at Manchester. These are offered by BT using their new Etherflow products at a current limit of 250Mbit/s. So the proposal does not include capacity up to 1 Gbit/s at this stage as this would have to use the less cost effective MPLS offerings. |

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|---|---|
| 4. *Application Hosting. The generic requirements are expected to host many applications but some that will need to be included in the development are:*<br>*a. H.323 videoconference bridging with related booking between registered NHS and JANET sites. This will require suitable interoperability between the JANET Videoconferencing Service (JVCS) and the planned bridging arrangements for N3. Of specific concern will be the inter-operability of booking systems and dialling schemes as an NHS end-point will only be able to register with one service.*<br>*b. Voice over IP services between NHS and JANET organisations when such solutions are sufficiently developed in future.*<br><br>*NB One solution not envisaged here is secure email that would allow emails containing PID to be transferred between NHS and JANET email accounts. JANET users can gain NHS sponsorship for an NHSmail account and this service is designed for this purpose.* | The rack space for such hosting is available at Kingston Exchange and Manchester to support these services. |
| 5. *Service levels and business processes at the site of the Gateway so that JANET(UK) or associated staff can be chaperoned to the site in a timely manner. This is to trouble-shoot occasional problems with the equipment provided at the Gateway to support central services where this cannot be done remotely. Such equipment and services are likely to include:*<br><br>*a. Equipment to bridge H.323 videoconferencing, such as the Tandberg Expressway*<br>*b. Radius servers to support JANET Roaming (Eduroam)*<br>*c. Connection Agreement System or similar e.g. as in Denmark*<br><br>*It may not be required that there is a duplicate* | The proposal includes a third party access process to the N3 POPs for this purpose. |

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| | *for all such services although this is the initial assumption.* | |
| *6.* | *Full In-life service management. It is important that the services and infrastructure associated with the N3 / JANET Gateway that are directly under the management of N3SP, are managed as an N3SP In-life service. This needs to include configuration changes to firewalls and routers both centrally and at local N3 ingress points. N3SP In-life management must fully comply with all existing NHS Connecting for Health service management arrangements e.g. for change control and impact assessment. However a new change control process needs to be developed for this application that reflects the differing roles of BT, JANET(UK), the individual education and research organisations using the Gateway, Connecting for Health, Information Services Division in Scotland and the individual NHS organisations in England and Scotland. "* | The proposal includes full in-life service management. The issue of the change management process is wider than the proposal and is being pursued separately between NHS Connecting for Health and BT N3SP. |

## 6 Information Governance for Proposed Solution

The solution must be delivered in accordance with the security requirements of all parties involved. For the NHS in England then this involves compliance with the:

- NHS Statement of Compliance
- Guidance in the NHS Information Governance toolkit, expanded as necessary through this project (the toolkit being itself compliant with BS 7799)

In addition in practice there will also need to be compliance with other elements of the N3 contract. JANET(UK) was assessed with the Information Governance Toolkit and signed the NHS Statement of Compliance to manage the early adopter N3 JANET Gateway.

The security requirements on Education and Research are less onerous but nevertheless any solution will need to comply with JANET(UK) operating policies and acceptable use policies.

## 7 Scope of Proposed Solution

The geographical scope for the proposed service includes those home countries covered by N3 i.e. NHS in England and Scotland and any organisation connected to JANET in the UK. This means that if a University in Wales or Northern Ireland has a relationship with

the NHS in England and Scotland then they too could use the N3 JANET Gateway for communications and system access.

A parallel initiative is exploring the potential for a similar gateway to be built as part of the Wales public service broadband aggregation network. There are no immediate plans in Northern Ireland but discussions are continuing there.

All applications and services that generate traffic between N3 and JANET are in scope. The extent of applications used across the proposed Gateway will be only limited by the information governance requirements.

## 8 Outcome of Initial Quotations from BT

The above requirements were passed to BT and a quotation requested for a “Bespoke Gateway” solution under the N3 contact.

The first indicative quotation identified that if a solution was needed for 1Gbps was required then they would have to offer the prices for existing MPLS services. If the quotation could be for a service up to 250 Mbps then it would be possible to offer use of the new “Etherflow” services in London, and also Manchester which was agreed as the best second Gateway site. A second quotation was provided on the basis of Etherflow and this proved to be an order of magnitude less than using MPLS. So it was decided to take this route for affordability and to keep in line with the technical strategic direction of the N3 service. An analysis of current use showed that 250 Mbps was sufficient for likely use, even allowing for suppressed demand.

## 9 Transition

The implementation of the new N3 JANET Gateway service can be built and established before the early adopter N3 JANET Gateway has to be turned off. This assisted by the early adopter Gateway being on 30 days notice for termination. In addition the fall-back position for existing services run over the N3 internet Gateway is to fall back to that service. So it should be possible to plan for continuity of service through the implementation.

## 10 Resilience

The following options were considered for resilience:

a. Should the resilience be based on geographical separation of the Gateways or was it sufficient to have separate fibres and building entry points?
b. Should the Gateways be active/standby or active/active with different types of traffic routed across the two active Gateways?

On the first it was agreed that geographical separation was preferred if possible as it then helps to mitigate the risk of a major general outage in London as well as localised

outages affecting Kingston Exchange or Telecity. There was also little to be gained on cost.

On the second it was agreed that active/standby was less complex to implement and manage. Also since each Gateway had to be able to take all N3 JANET traffic in the event of one going down then having two active Gateways offers little if any advantage on capacity for the extra complexity involved.