

Enabling Digital Requests and Results for all 29 UK Pathology Networks



1 This report

This report describes how the NHS National Pathology Exchange can be used to quickly and effectively enable digital requests and results for all 29 UK Pathology Networks. The National Pathology Exchange (NPEX) is provided by The Health Informatics Service and is the national NHS solution to the challenge of connecting all pathology laboratories to each other. To date, the service has been adopted by 70 of the 133 laboratories in the English NHS. Most of the 29 Pathology Networks have NPEX at one or more sites and five networks have achieved 100% adoption.

This report describes the NPEX solution, the benefits of accelerating adoption and exploitation by the 29 Pathology Networks, the technical solution, governance and future plans. The Appendices include a list of all 133 English laboratories organised in Pathology Network order showing which laboratories are digitally enabled through NPEX and which still use paper to manage patient requests and results for external referrals.

The Health Informatics Service are keen to support the Pathology Networks in moving to digital requests and results and this report forms one starting point for discussion on how the existing solution for the NHS can best be used to achieve the strategic aims of the Networks.

2 What is The National Pathology Exchange?

The National Pathology Exchange (NPEX) is the NHS lab-to-lab messaging solution that connects Laboratory Information Management Systems (LIMS) together across the UK to digitise the transfer of pathology test requests and results. The solution was conceived in a Department of Health funded national stakeholder workshop in 2001 and went live across the Greater Manchester Pathology Network in 2008. NPEX eliminates expensive, unsafe paper-based lab to lab processes and gets results to patients quickly and accurately. It supports rapid and very flexible rationalisation of pathology services.

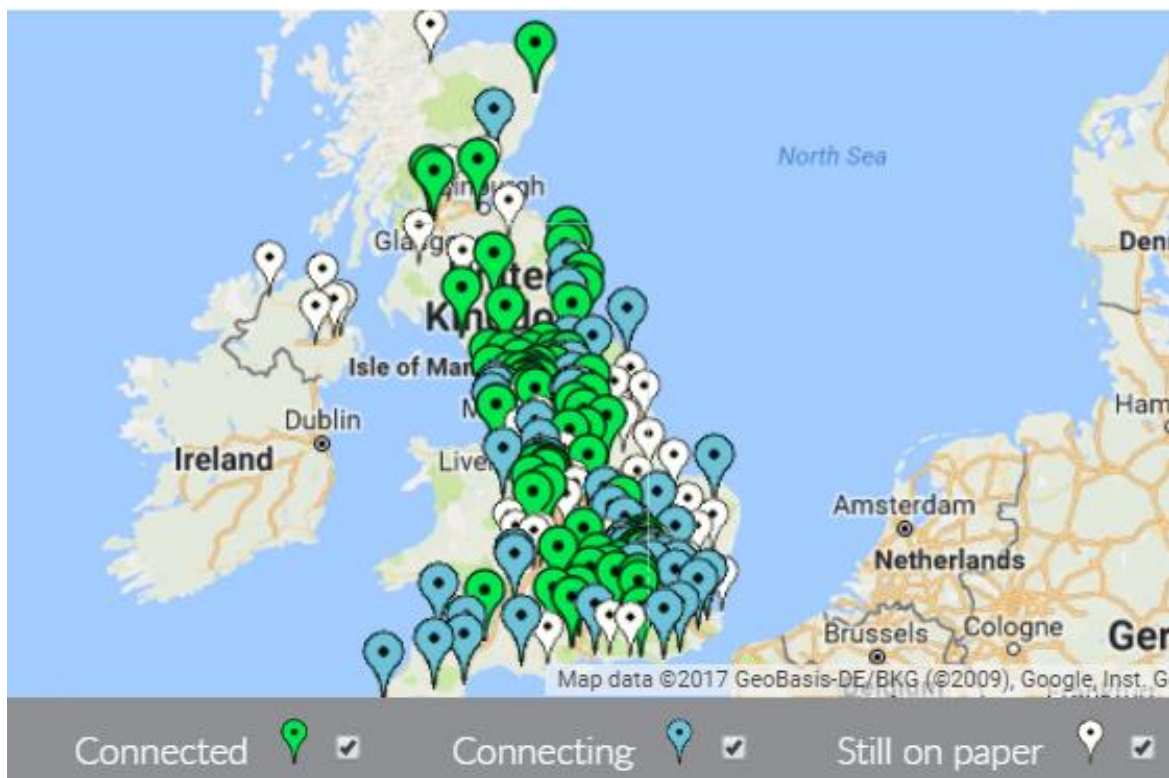
The solution is based on NHS Digital standards and connects to a large number of LIMS regardless of supplier and vendor. The system means every single NHS laboratory can send and receive lab tests and results to every other laboratory whether NHS or private, across the whole country. NPEX is already in use by most of the 29 Pathology Networks and is already helping many laboratories provide the most cost effective and efficient service for their patients and the NHS.

The NPEX service now covers the UK from as far north as Aberdeen and as far south as Southampton. There are currently 70 English Hospital Trusts / Foundation Trusts in the UK connected to, or developing connections to NPEX (as at October 2017, see Appendix A for a complete list). Five Scottish laboratories have signed up to NPEX and there are ongoing discussions with Northern Ireland, Welsh and Channel Island labs. Those laboratories that have not yet adopted NPEX still use very expensive paper-based processes to manage lab to lab requests and reports but many are actively evaluating NPEX and around two new labs per month join the NPEX service. The service was designed for and aims to achieve 100% UK coverage.

NPEX is unlike any other lab to lab system in the world in terms of both scale and success. It has been cited as one of the most transformative new initiatives in laboratory medicine globally (Jones, R.G., Johnson, O.A. and Batstone, G., 2014. *Informatics and the Clinical Laboratory. The Clinical Biochemist Reviews, 35(3), p.177*). NPEX has been demonstrated in Europe, Asia, America and Australia as an exemplar of NHS innovation and an NPEX based solution was previewed at the WHO World Diagnostics Forum in Geneva in May 2017.

In essence the NPEX service works like a *telephone exchange* – it connects pathology laboratory systems to a central hub located within a secure NHS datacentre so that requests and results flow electronically to and from any laboratory which is also connected. NPEX can also be used in a similar way to a *stock exchange* for pathology tests, where commissioners and laboratory managers review business intelligence data on price, quality and performance to decide which laboratories to send work to. They can then decide to re-route that work using the NPEX user interface and switch between service providers within minutes, which serves as an effective disaster recovery solution to ensure continuity of service. NPEX creates financial savings by eliminating handling costs & effort associated with slow and expensive paper processes and is achieving transformational change by supporting highly flexible service reconfiguration.

The map below provides a visual representation of all laboratories in the UK connected or connecting to NPEX and those still using paper. The map is available online at www.npex.nhs.uk.



NPEX adoption by the UK NHS (October 2017)

3 Why should the 29 proposed pathology networks adopt NPEX?

Rationalisation across the 29 Pathology Networks will see the volume of lab-to-lab communications growing significantly and it will not be acceptable, practical or financially sensible to attempt this rationalisation using paper based approaches. In addition, digital volumes are set to continue to grow with the consolidation of specialist services, the rapid growth in point of care testing and the opening up of the marketplace for laboratory services. The NHS NPEX service is already well established across the UK as the de facto solution for these issues in lab-to-lab communications.

Most of the 29 proposed pathology networks have already adopted NPEX at one or more sites and five networks have achieved 100% adoption. Crucially, NPEX is an NHS service. It can be procured through the NHS, requires minimal costs and can be done quickly. Endorsement and then adoption by each network will ensure a proven NHS technology is used to quickly strengthen and establish each network's strategic aims. This allows the Networks to focus on business change and patient benefits and avoiding getting bogged down in what might otherwise prove to be a highly expensive and high risk technology procurement that may delay financial savings by two-three years.

NPEX adoption creates direct financial savings which will result in rapid return on investment. Though the majority of laboratories are well automated and computerised, the referral of samples to laboratories that do not have NPEX is still paper driven. For those laboratories without NPEX it is estimated that around six million pieces of paper are still sent by post. These pieces of paper are used to manually input patient data consuming around around 300 resource years in the process, introducing risks of transcription errors and causing long delays in patients receiving results and treatment. The elimination of paper for patient results is in line with the NHS Five Year Forward View and trusts are expected to be implementing initiatives like NPEX which provide digital alternatives to using paper.

NPEX delivers the following key strategic benefits:

- **Cost Reduction** - Laboratory managers see significant cost savings by eliminating data entry, handling and posting of paper when they switch to using NPEX to automate the sending and receiving of referred samples. Sending laboratories do not have to re-key results, wade through the various catalogues and manuals used to record existing service agreements and do not have to store paper records of samples' whereabouts, whilst receiving laboratories do not have to re-key sample details.
- **Clinical Safety** - Increasing clinical safety is always a high priority but finding reliable and cost effective solutions to do so is not always easy. NPEX eliminates the manual transcription of requests, photocopying of request dockets and mailing of paper copies of results.
- **Reduction in Working Time Equivalent (WTE) costs** - NPEX can drastically reduce the human effort needed to send and receive referred samples, allowing staff to concentrate on the more important matters of sample processing and testing.
- **Faster Turnaround Times** – In addition to improving data quality, NPEX significantly increases the speed at which clinicians and patients get their results. Currently it can take over 5 weeks to return results to the requester; NPEX can reduce this to less than 48 hours, laboratories have reported an average of 2.5 times reduction in turnaround time. With the

entire referral process digitised and tracked through its lifetime, results can be back and available in a local system the moment they are ready at the reference laboratory.

- **Improved Laboratory Performance** – Being part of a national network removes IT barriers and enables laboratories to digitally refer work to any connected referral laboratory. This opens an opportunity to challenge existing contracts and focus on value add, to yield the benefits list above at a lower cost for a more sustainable laboratory medicine service. Business intelligence on laboratory performance enables better management and commissioning decisions.

Additional benefits of NPEX include:

- Ability to track the progress and physical location of tests and results.
- Provision of a view of tests offered by other labs including, pricing model, and turnaround times for pathology managers to more flexibly & effectively commission specialist services.
- The sharing of marketplace information which helps drive improved service performance, leading to more intelligent pathology commissioning, for example outsourcing tests where they can be processed more efficiently and effectively.
- Capability to switch traffic between laboratories for the purposes of business continuity and disaster recovery.

4 Technical Solution

The NPEX architecture is based on a national hub and spoke infrastructure that supports any node on the network also operating as both a hub and spokes. For example one site can operate as a regional hub for haematology testing while also referring on some specialist haematology and acting as a spoke in other disciplines. Once a laboratory's lab system is connected to NPEX the routes for tests and results can be easily and immediately reconfigured to switch pathology tests to the best performing laboratory. The sending of the requests and the results takes place digitally in seconds through a direct interface between the laboratory systems and the national hub, creating a streamlined, paperless process.

The NPEX service is standards compliant. It uses a messaging engine, which converts local codes to HL7 messaging and the UK NHS National Laboratory Medicine Catalogue (NLMC) and/or SNOMED coding standards. NPEX enables inter-operability between LIMS such as CliniSys WinPath (see Appendix B for a complete list).

NPEX currently enables requesting and reporting, with no volume limitation, for the following disciplines:

- Haematology
- Biochemistry
- Transfusion (second phase pilot in 2017 with NHS Blood and Transplant Service)
- Bacteriology
- Virology

- Serology
- Immunology

Additionally, NPEX enables External Quality Assessment (EQA) through the digital reporting of EQA results through selected UK NEQAS schemes.

NPEX also supports the transmission of free text results for those laboratory medicine disciplines where a lack of standardisation is a major challenge. For example free text is used for reporting of Cellular Pathology results because the relevant LIMS suppliers cannot receive structured messages. We continue to work collaboratively with NHS laboratory customers and the major national bodies to develop standards-based solutions.

6 Provision of the NPEX service

NPEX is provided through a unique NHS / commercial partnership between The Health Informatics Service (THIS) and X-Lab. Deployments are managed through a well established methodology (Appendix C) and the service is governed by a joint management board. Service development is informed by an annual user group attended by more than 50 NHS organisations.

The Health Informatics Service

The Health Informatics Service (THIS) is hosted by Calderdale and Huddersfield NHS Foundation Trust (CHFT) and supplies Information Management and Technology (IM&T) services to around 100 NHS organisations.

With an annual budget of £10m and over 220 members of staff, THIS is the largest Health Informatics Service in the UK. There are circa 30,000 users of the services provided by THIS with over 18,000 devices attached to the supported Community of Interest Network (CoIN). The THIS IT service methodology is Information Technology Infrastructure Library (ITIL) certified, its Service Desk is accredited by NHS Digital and it holds ISO 9001 (Quality Management System), ISO 20000 (IT Service Management) and ISO 27001 (Information Security Management).

A comprehensive range of high quality, customer focused IM&T services is offered, which includes front and back office technical services, information governance, information management and analytical services alongside a project, programme management and training capability, including many specialist products only found in an organisation of this type. Services are predominantly delivered to other NHS organisations and the related public sector market throughout the UK, with their main user base being within the Yorkshire and Humber region. Many THIS customers utilise the full product range, while others select specific products according to their needs.

X-Lab Ltd

THIS has a commercial NHS partnership and long standing collaboration with X-Lab Ltd for the provision of NPEX Lab-to-Lab messaging services for NHS pathology services throughout the UK. X-Lab has been established for more than 10 years and specialises in building highly scalable solutions

which are firmly at the leading edge of healthcare technology. It has built a strong national reputation as an innovative e-health systems development organisation.

7 Future plans

The Health Informatics Service and X-Lab have a strategic commitment to grow NPEX to cover the whole of the UK NHS. This includes working with NHS Digital, NHS Improvement, NHS trusts, the supplier community and the professional bodies to ensure the service is and remains world class.

NHS adoption of NPEX is consistent with the strategic drivers that have been identified in the Five Year Forward View. Specifically, the commitment in the Five Year Forward View was for the NHS to be paper free at the point of care by 2020. This has been endorsed locally through the development of the Local Digital Roadmaps. Delivery of electronic diagnostic laboratory test results in short timeframes through NPEX will ensure that patients avoid generating extra Acute based demand through anxiety (visits and phone calls) and also ensure that extra Acute demand is not generated through lost or incorrectly transcribed results.

Plans for the future include:

- 100% coverage of the UK NHS and other supporting UK laboratories
- Full coverage of all Laboratory Medicine disciplines (over and above those listed in Section 4)
- PDF/RTF reporting capability
- Increase the ability of NPEX to support emerging disciplines, e.g. genetic testing
- Full support for integrating with digital Point of Care Testing (POCT) cloud solutions
- Provide NPEX solutions to key European markets (Eire, France, Sweden)
- Demonstrate international NHS leadership in digital laboratory medicine

The Health Informatics Service are keen to support the Pathology Networks in developing their strategies and is committed to working with the Networks help them achieve their strategic goals quickly and cost effectively. This report forms one starting point for discussion on how best NPEX can help to ensure each Network's success.

Appendix A NPEX adoption status across the 29 networks

| Trust | Live/deploying NPEX | NHSI network | Percentage adoption |
|--|---------------------|--------------|---------------------|
| Blackpool Teaching Hospitals NHS Foundation Trust | Y | North 3 | 100% |
| East Lancashire Hospitals NHS Trust | Y | | |
| Lancashire Teaching Hospitals NHS Foundation Trust | Y | | |
| Chelsea and Westminster Hospital NHS Foundation Trust | Y | London 1 | 100% |
| Imperial College Healthcare NHS Trust | Y | | |
| The Hillingdon Hospitals NHS Foundation Trust | Y | | |
| Bolton NHS Foundation Trust | Y | North 5 | 100% |
| Central Manchester University Hospitals NHS Foundation Trust | Y | | |
| Pennie Acute Hospitals NHS Trust | Y | | |
| Salford Royal NHS Foundation Trust | Y | | |
| Stockport NHS Foundation Trust | Y | | |
| Tameside Hospital NHS Foundation Trust | Y | | |
| University Hospital of South Manchester NHS Foundation Trust | Y | | |
| Wrightington, Wigan and Leigh NHS Foundation Trust | Y | | |
| Taunton and Somerset NHS Foundation Trust | Y | South 2 | 100% |

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|---|---|---------------------|------|
| Yeovil District Hospital NHS Foundation Trust | Y | | |
| Ashford and St Peter's Hospitals NHS Foundation Trust | Y | South 5 | 100% |
| Frimley Health NHS Foundation Trust | Y | | |
| Hampshire Hospitals NHS Foundation Trust | Y | | |
| Royal Berkshire NHS Foundation Trust | Y | | |
| Royal Surrey County Hospital NHS Foundation Trust | Y | | |
| Aintree University Hospital NHS Foundation Trust | Y | | |
| Countess of Chester Hospital NHS Foundation | Y | | |
| Royal Liverpool and Broadgreen University Hospitals NHS Trust | Y | | |
| Southport and Ormskirk Hospital NHS Trust | N | | |
| St Helens and Knowsley Hospital Services NHS Trust | Y | | |
| Warrington and Halton Hospitals NHS Foundation Trust | N | | |
| Wirral University Teaching Hospital NHS Foundation Trust | Y | | |
| Chesterfield Royal Hospital NHS Foundation Trust | Y | Midlands and East 2 | 71% |
| Derby Teaching Hospitals NHS Foundation Trust | Y | | |
| Kettering General Hospital NHS Foundation Trust | N | | |

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|--|---|----------|-----|
| Northampton General Hospital NHS Trust | N | | |
| Nottingham University Hospitals NHS Trust | Y | | |
| Sherwood Forest Hospitals NHS Foundation Trust | Y | | |
| University Hospitals of Leicester NHS Trust | Y | | |
| Guy's and St Thomas' NHS Foundation Trust | Y | London 4 | 66% |
| King's College Hospital NHS Foundation Trust | Y | | |
| Lewisham and Greenwich NHS Trust | N | | |
| Airedale NHS Foundation Trust | Y | North 2 | 66% |
| Bradford Teaching Hospitals NHS Foundation Trust | Y | | |
| Calderdale and Huddersfield NHS Foundation Trust | Y | | |
| Harrogate and District NHS Foundation Trust | N | | |
| Leeds Teaching Hospitals NHS Trust | Y | | |
| Mid Yorkshire Hospitals NHS Trust | N | | |
| Buckinghamshire Healthcare NHS Trust | N | South 4 | 66% |
| Great Western Hospitals NHS Foundation Trust | Y | | |
| Oxford University Hospitals NHS Foundation Trust | Y | | |

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|---|---|---------|-----|
| Plymouth Hospitals NHS Trust | Y | South 1 | 60% |
| Royal Devon and Exeter NHS Foundation Trust | Y | | |
| Royal Cornwall Hospitals NHS Trust | N | | |
| Northern Devon Healthcare NHS Trust | Y | | |
| Torbay and South Devon NHS Foundation Trust | N | | |
| Gloucestershire Hospitals NHS Foundation Trust | N | South 3 | 60% |
| North Bristol NHS Trust | Y | | |
| Royal United Hospitals Bath NHS Foundation Trust | N | | |
| University Hospitals Bristol NHS Foundation Trust | Y | | |
| Weston Area Health NHS Trust | Y | | |
| City Hospitals Sunderland NHS Foundation Trust | N | North 1 | 60% |
| County Durham and Darlington NHS Foundation Trust | N | | |
| Gateshead Health NHS Foundation Trust | N | | |
| North Cumbria University Hospitals NHS Foundation Trust | Y | | |
| North Tees and Hartlepool NHS Foundation | Y | | |
| Northumbria Healthcare NHS Foundation Trust | Y | | |

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|--|---|---------------------|-----|
| South Tees Hospitals NHS Foundation Trust | Y | | |
| South Tyneside NHS Foundation Trust | N | | |
| The Newcastle Upon Tyne Hospitals NHS Foundation Trust | Y | | |
| University Hospitals of Morecambe Bay NHS Foundation Trust | Y | | |
| The Royal Wolverhampton NHS Trust | Y | Midlands and East 1 | 60% |
| Shrewsbury and Telford Hospital NHS Trust | N | | |
| The Dudley Group NHS Foundation Trust | Y | | |
| Walsall Healthcare NHS Trust | N | | |
| Sandwell and West Birmingham Hospitals NHS Trust | Y | | |
| Heart of England NHS Foundation Trust | Y | Midlands and East 3 | 50% |
| University Hospitals Birmingham NHS Foundation Trust | N | | |
| Bedford Hospital NHS Trust | Y | Midlands and East 5 | 50% |
| East and North Hertfordshire NHS Trust | N | | |
| Luton and Dunstable University Hospital NHS Foundation Trust | N | | |
| Milton Keynes University NHS Foundation Trust | Y | | |
| Barnsley Hospital NHS Foundation Trust | N | North Mid 1 | 50% |

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|---|---|----------|------|
| Doncaster and Bassetlaw Hospitals NHS Trust | Y | | |
| Sheffield Teaching Hospitals NHS Foundation Trust | Y | | |
| The Rotherham NHS Foundation Trust | N | | |
| Brighton and Sussex University Hospitals NHS Trust | Y | South 7 | 50% |
| East Sussex Healthcare NHS Trust | N | | |
| Surrey and Sussex Healthcare NHS Trust | Y | | |
| Western Sussex Hospitals NHS Foundation Trust | N | | |
| Dorset County Hospital NHS Foundation Trust | N | South 6 | 40% |
| Isle of Wight NHS Trust | N | | |
| Poole Hospital NHS Foundation Trust | N | | |
| Portsmouth Hospitals NHS Trust | N | | |
| Salisbury NHS Foundation Trust | Y | | |
| The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust | N | | |
| University Hospitals Southampton NHS Foundation Trust | Y | London 1 | 100% |
| Chelsea and Westminster Hospital NHS Foundation Trust | Y | | |
| Imperial College Healthcare NHS Trust | Y | | |

| | | | |
|--|---|--------------------|-----|
| The Hillingdon Hospitals NHS Foundation Trust | Y | | |
| Croydon Health Services NHS Trust | N | London 5 | 25% |
| Epsom and St Helier University Hospitals NHS Trust | Y | | |
| Kingston Hospital NHS Foundation Trust | N | | |
| St George's University Hospitals NHS Foundation Trust | N | | |
| Hull and East Yorkshire Hospitals NHS Trust | N | | |
| Northern Lincolnshire and Goole NHS Foundation Trust | N | North Mid 2 | 25% |
| United Lincolnshire Hospitals NHS Trust | N | | |
| York Teaching Hospital NHS Foundation Trust | Y | | |
| Burton Hospitals NHS Foundation Trust | N | | |
| George Eliot Hospital NHS Trust | N | Midland and East 4 | 16% |
| South Warwickshire NHS Foundation Trust | N | | |
| University Hospitals Coventry and Warwickshire NHS Trust | N | | |
| Worcestershire Acute Hospitals NHS Trust | Y | | |
| Wye Valley NHS Trust | N | | |
| Cambridge University Hospitals NHS Foundation Trust | Y | | |

| | | | |
|---|---|---------------------|----|
| Colchester Hospital University NHS Foundation Trust | N | | |
| Hinchingbrooke Health Care NHS Trust | N | | |
| Ipswich Hospital NHS Trust | N | | |
| Peterborough and Stamford Hospitals NHS Foundation Trust | N | | |
| West Suffolk NHS Foundation Trust | N | | |
| Barking, Havering and Redbridge University NHS Trust | N | London 3 | 0% |
| Barts Health NHS Trust | N | | |
| Homerton University Hospital NHS Foundation Trust | N | | |
| James Paget University Hospitals NHS Foundation Trust | N | Midlands and East 7 | 0% |
| Norfolk and Norwich University Hospitals NHS Foundation Trust | N | | |
| The Queen Elizabeth Hospital, King's Lynn, NHS Foundation Trust | N | | |
| Basildon and Thurrock University Hospital NHS Foundation Trust | N | Midlands and East 8 | 0% |
| Mid Essex Hospital Services NHS Trust | N | | |
| Southend University Hospital NHS Foundation Trust | N | | |
| The Princess Alexandra Hospital NHS Trust | N | | |
| East Cheshire NHS Trust | N | North Mid 3 | 0% |

| | | | |
|---|---|---------|----|
| Mid Cheshire Hospitals NHS Foundation Trust | N | | |
| University Hospitals of North Midlands NHS Trust | N | | |
| Dartford and Gravesham NHS Trust | N | South 8 | 0% |
| East Kent Hospitals University NHS Foundation Trust | N | | |
| Maidstone NHS Foundation Trust | N | | |
| Medway NHS Foundation Trust | N | | |

Appendix B Connected LIMS

The Laboratory Information Management Systems (LIMS) currently supported by NPEX are:

- Clinisys Winpath
- Clinisys Labcentre
- iSoft Telepath
- iSoft Apex
- Technidata
- Roche Swisslab
- Omnilab
- Sunquest
- MediTech
- Cerner PathNet
- EPIC
- InterSystems
- NHS BT Hematos

NPEX interfaces are based on implementing international and national standards for health data interoperability and we have a well defined protocol to work with LIMS vendors to develop and test interfaces. Vendors, and clients with LIMS systems not listed above, are encouraged to contact us to discuss requirements and a development plan.

Appendix C NPEX deployment

Deployment of NPEX at a Trust is not a complicated project; however communication needs to be managed effectively by a Project Manager due to the number of stakeholders required to be engaged at each stage.

In order to minimize project management overhead, but retain sufficient control, the project is organised into several activities. For simplicity, these are treated as work packages within a single project stage. In the table below, you will find some indicative timescales for each project stage in the deployment. Typically, NPEX assumes that a deployment project will be completed between 4 and 8 months from project initiation.

| Work package | Duration | Stakeholder involvement | Sign Off |
|-------------------------------------|----------|-------------------------|-------------|
| Kick-off | 30 Days | All Parties | All Parties |
| VPN set-up | 10 Days | NHS Trust, THIS | NHS Trust |
| TEST Installation and Configuration | 10 Days | NHS Trust, LIMS, X-Lab | NHS Trust |
| Pipe Clean Testing | 20 Days | NHS Trust, LIMS, X-Lab | NHS Trust |
| User Acceptance Testing | 60 Days | NHS Trust, LIMS, X-Lab | NHS Trust |
| LIVE Installation and Configuration | 5 Days | NHS Trust, LIMS, X-Lab | NHS Trust |
| LIVE Pipe Clean Testing | 10 Days | NHS Trust, LIMS, X-Lab | NHS Trust |
| Project Closure | 5 Days | All Parties | All Parties |