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Life knowledge park

L2L - a pragmatic solution to the exchange of sample data

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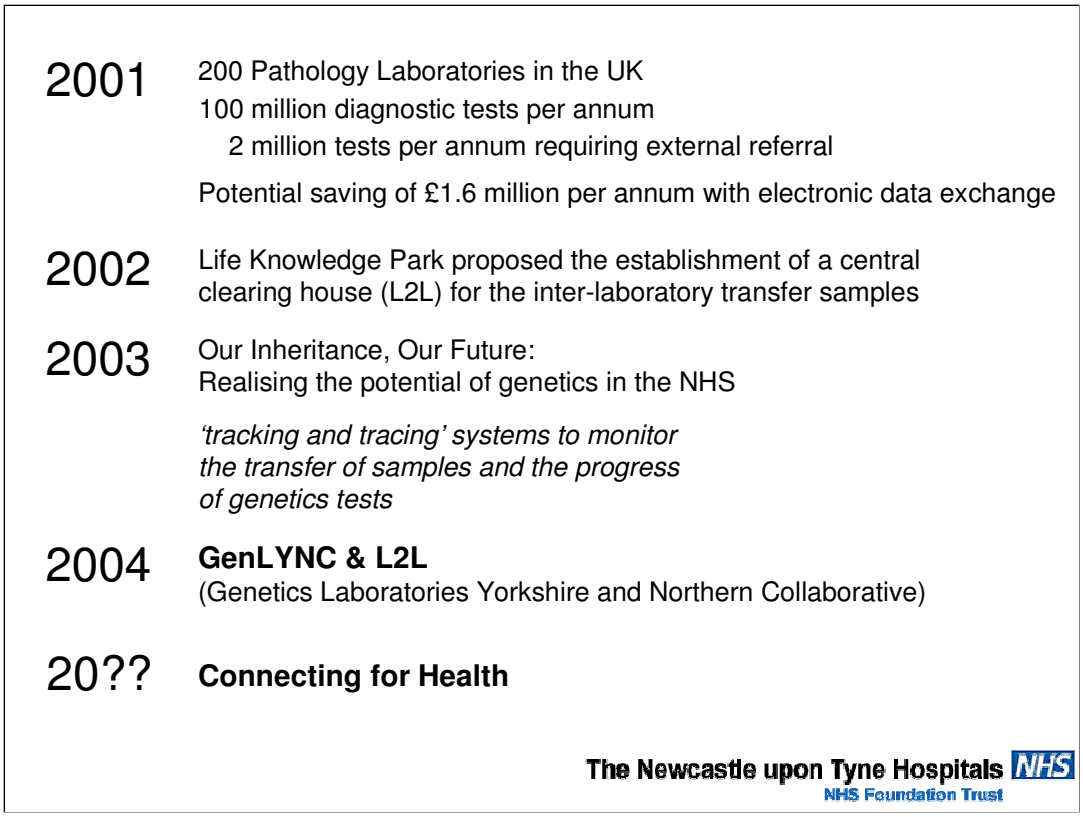


It has been estimated that the 200 plus pathology laboratories in the UK deal with around 100 million diagnostic tests each year and that external specimen referrals accounted for 2% of that total.

Much of the management of inter-laboratory referrals is entirely paper based, with the referring laboratory having to reproduce the necessary paperwork to accompany the sample, and the receiving laboratory having to re-enter patient, sample and test details into their own data management system.

It was suggested that replacing the manual systems of sample data exchange with an electronic one would have the potential to save somewhere in the order of £1.6 million per annum.

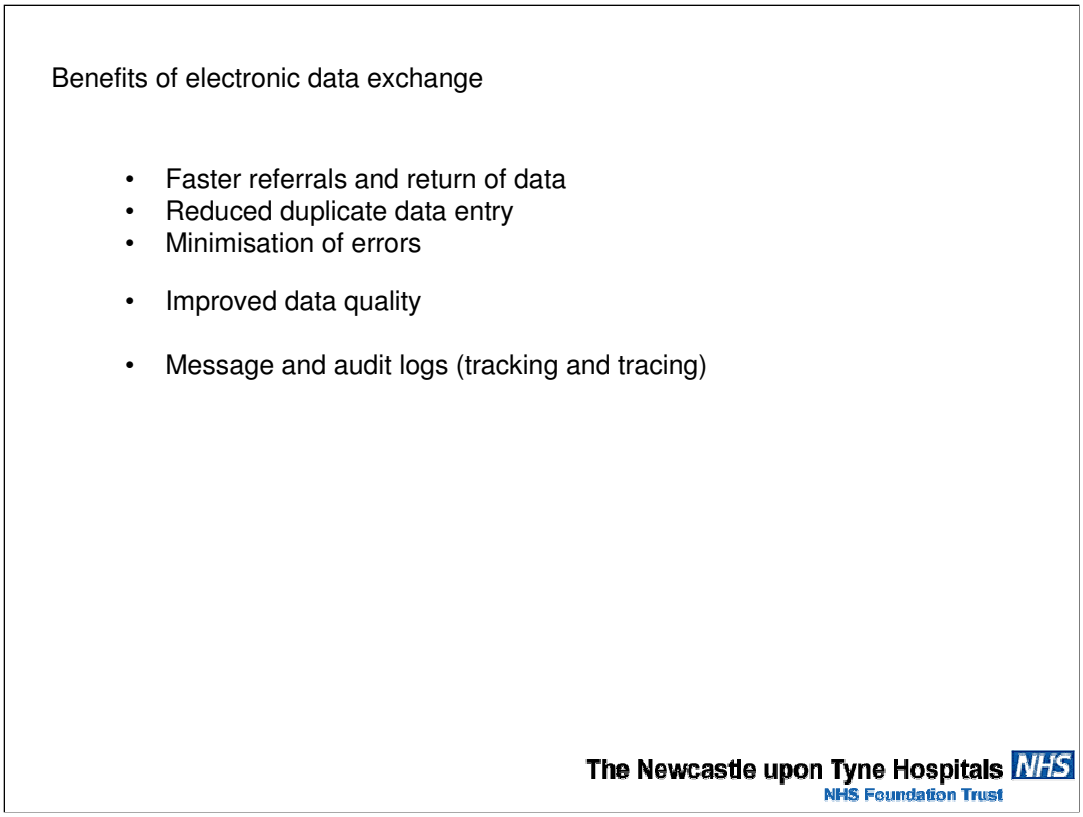
The L2L project itself started life a little over 4 years ago with a proposal for a 'clearing house' service that would act as a single coordinating centre for access to the UK genetic testing network.

Although this concept of a centralised clearing house was never realised, a method of electronic data exchange remained firmly on the genetics IT wish list.

The government White Paper published in 2003 placed a great deal of emphasis on the need for 'tracking and tracing' systems to monitor the transfer of samples and the progress of genetics tests.

Request and Order Comms systems remain one of the cornerstones of Connecting for Health and projects to modernise Pathology IT systems.

However, the delivery of such systems into practice seems as far away now as it did two years ago.



In 2004, the genetic testing workload between the Leeds and Newcastle laboratories was reorganisation and rationalisation to ensure the delivery of the White Paper targets and to efficiently accommodate current and future service expansion.

The collaboration was built on existing partnerships and clinical expertise in the two centres and was christened GenLYNC.

Key to the success of GenLYNC was a method to facilitate the exchange of sample and test data between the two centres.

The preliminary work on data exchange had already been undertaken by the Life Knowledge Park and their fledgling L2L system gained a new lease of life.

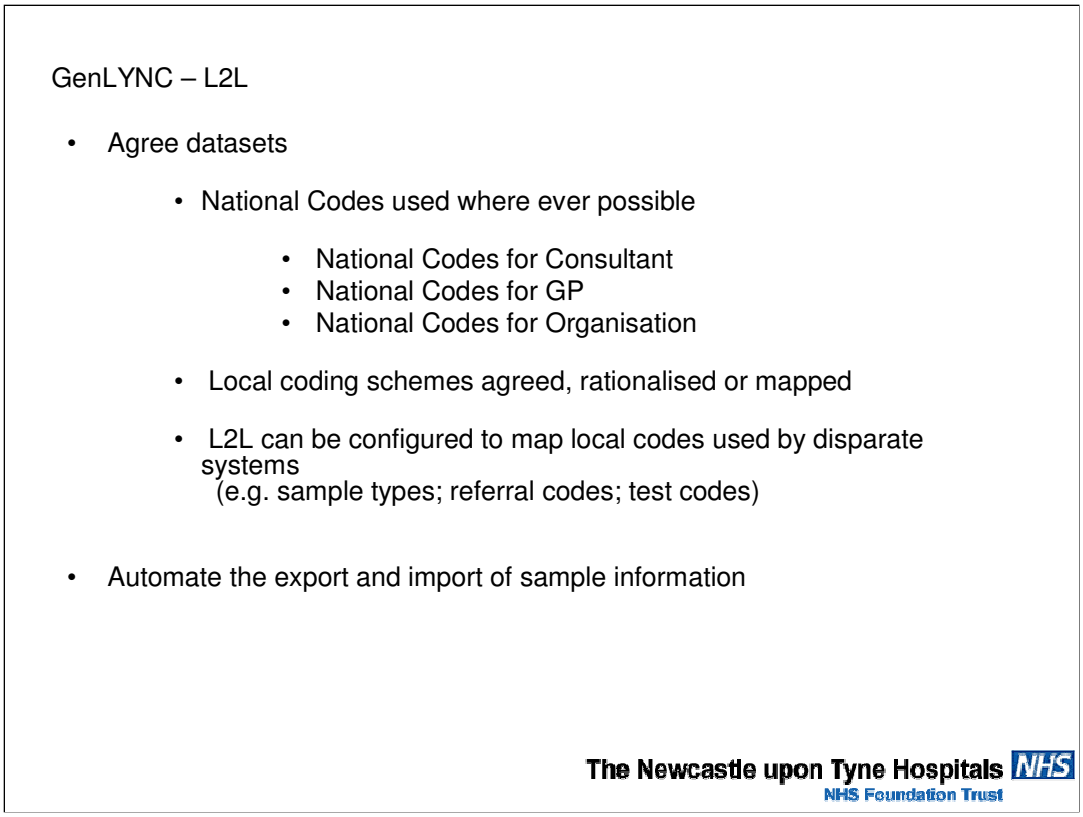
The objectives of this and any system of electronic data exchange are that it achieves:

Faster referrals and return of data.

Reduced duplicate data entry

Minimisation of errors

The consequential benefits of such system are improved data quality and automation of message and audit logs that will provide a real-time tracking and tracing service.



For the initial stage of the GenLYNC L2L project we had two main issues to deal with.

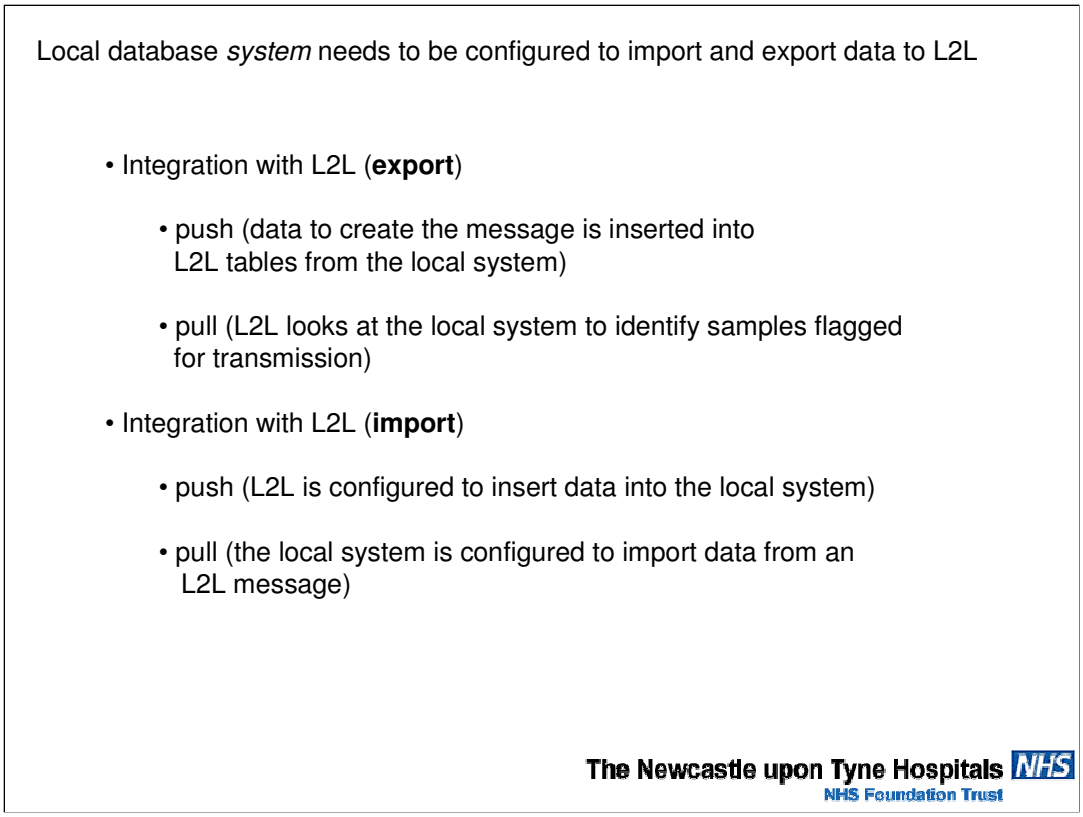
What data are we going to send

How can we automate the import of the data into our data management systems

Datasets were based on the referral cards used by Leeds and Newcastle. We also included information relating to the laboratory processing of the samples (such as local references for sample, patient and pedigree as well as test codes, referral reasons and even DNA concentration).

Wherever possible, and available, we agreed to use national codes from the NHS data dictionary.

Where non standard local coding schemes were used a function to cross reference or map the codes was added to the L2L implementation.

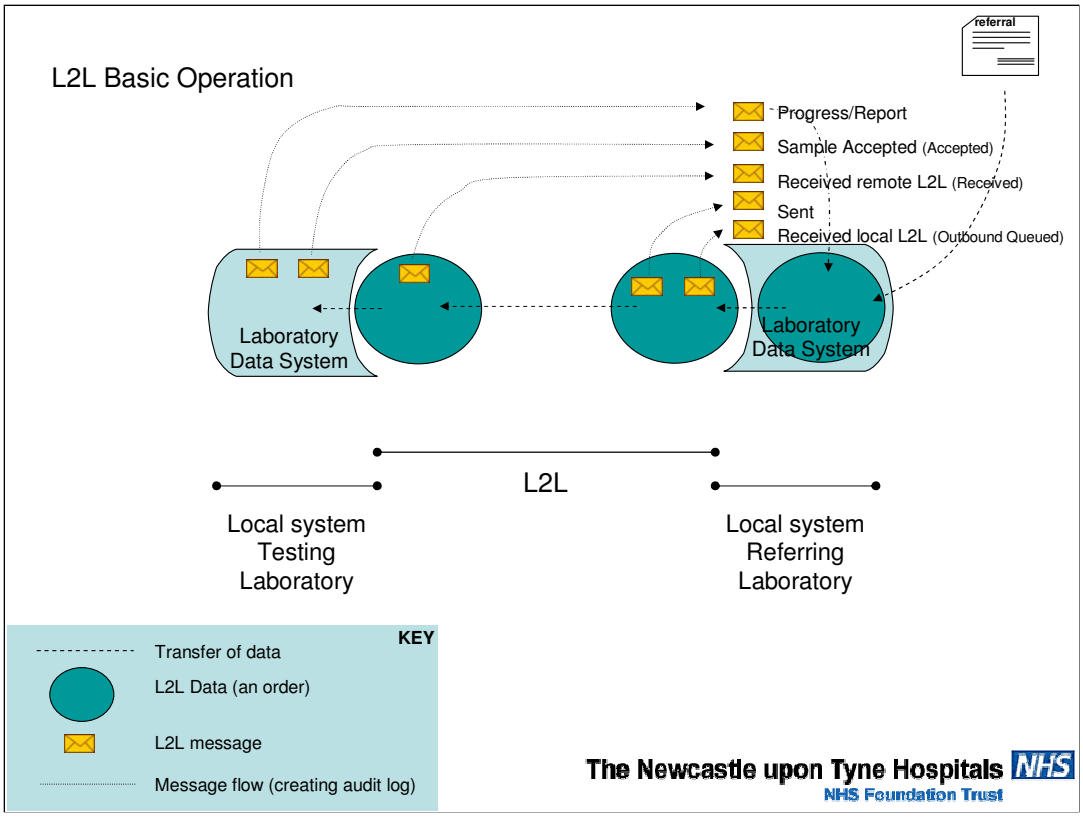


(L2L Integration Slide)

Automation of the data export process was relatively straightforward. Data was either sent to the L2L system in the form of an XML message generated by the local system or L2L could be configured to pull the required data out of the local database.

Importing information could also be achieved by either pushing or pulling the data.

The L2L system is not groundbreaking, its not massively sophisticated and its not particularly complex.



The L2L process overview

L2L is sometimes referred to as middleware – it is a service that sits between two different databases that facilitates the exchange of data between them.

Sample is received at the referring laboratory (may even be referred electronically)

Information entered into the local data system

If an inter-laboratory referral is needed, the data to accompany the transfer is identified

This information is exported to the L2L system (L2L confirms that a message awaiting transmission)

Information is encrypted and packaged for transmission

Information is securely transmitted across NHSnet (and L2L confirms that the message has been sent)

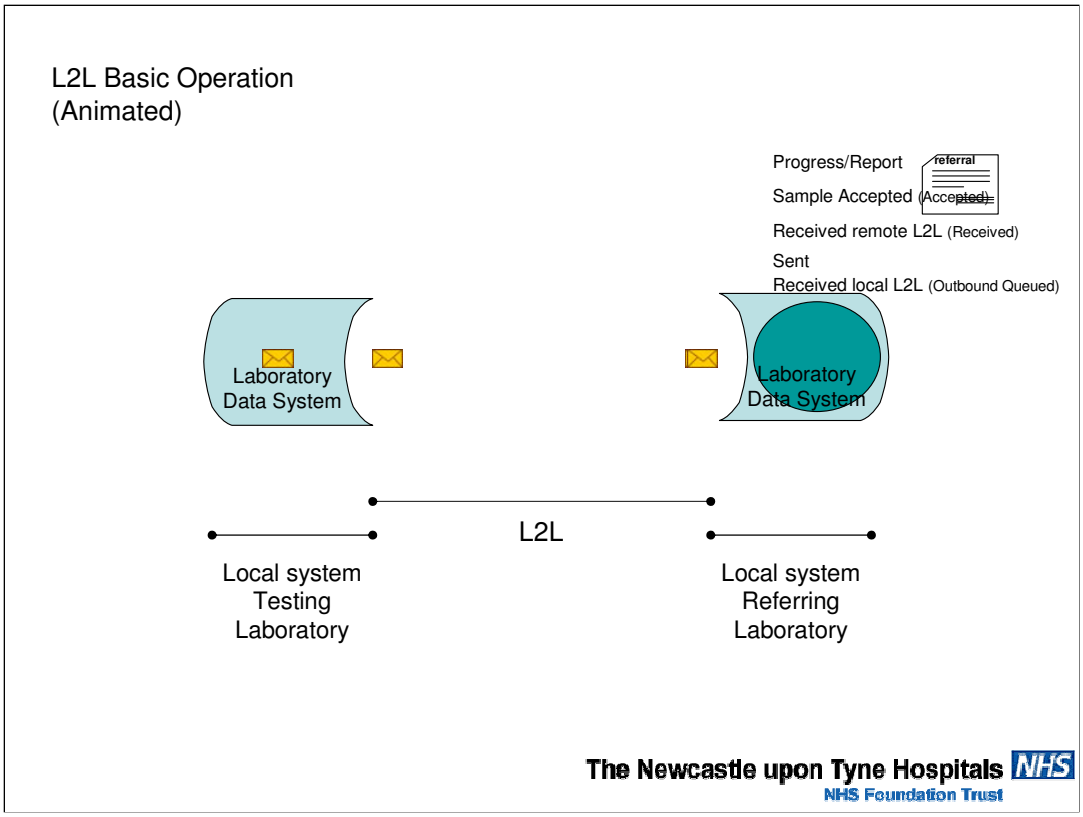
The message is received by the remote L2L system (this L2L confirms the receipt)

Information is un-packaged

Information is entered into the local data system (L2L confirms data acceptance by local system)

Sample Progress and Reporting can also be messaged back to the referring system

The referring system could then be configured to import the outcome data



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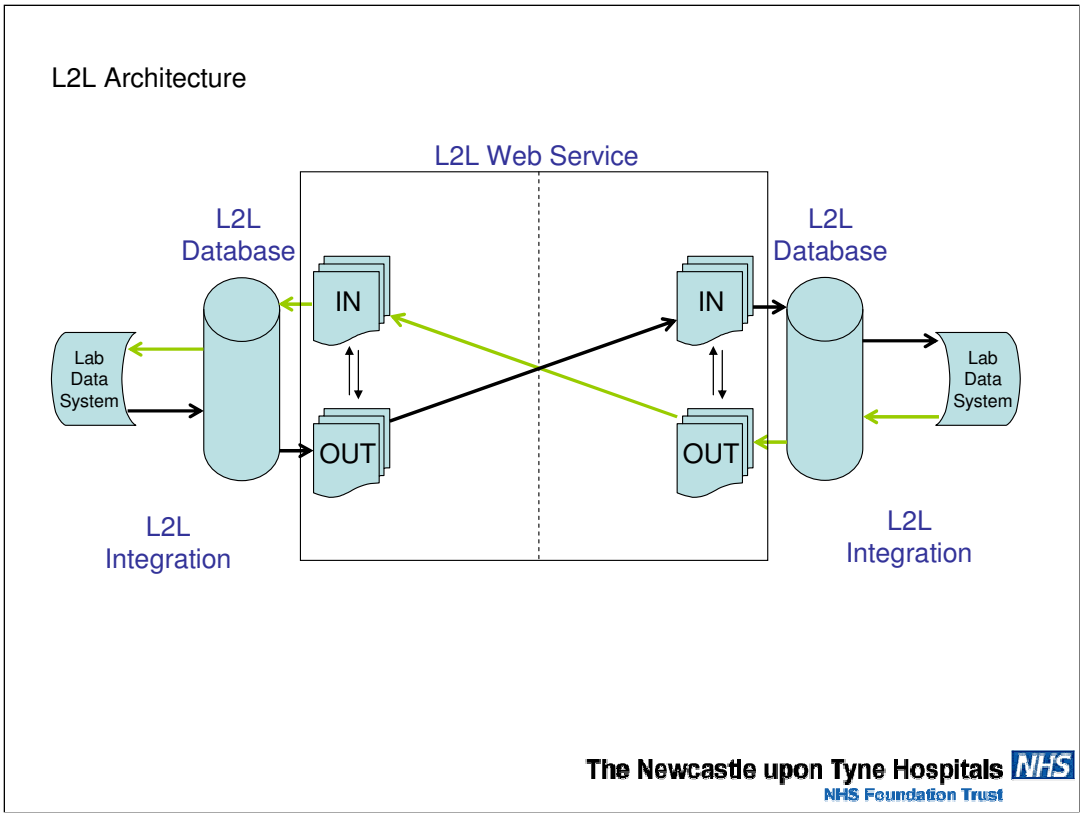


L2L Architecture

The simplest analogy of L2L is that of an inbox–outbox system.

This L2L implementation is essentially two mirrored systems running a web server in Newcastle and one in Leeds

There are three principal components

1) The L2L Web Service

Messaging

monitor inbox/outbox
send/receive

Web application

2) SQL Server Database

store messages

message tracking

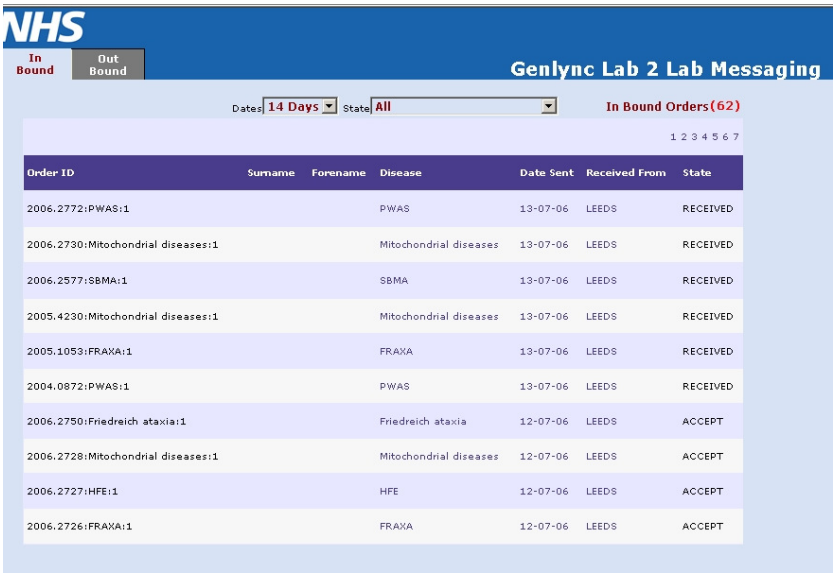
data transformation tables

3) Local Integration

Data import/export

Web services are at the core of L2L and the message itself is XML, a universal language for representing and transmitting structured data. This produces a very flexible system which is independent of the local hardware and software.

L2L in use – web application – in bound samples



Order ID	Surname	Forename	Disease	Date Sent	Received From	State
2006.2772:PWAS:1			PWAS	13-07-06	LEEDS	RECEIVED
2006.2730:Mitochondrial diseases:1			Mitochondrial diseases	13-07-06	LEEDS	RECEIVED
2006.2577:SBMA:1			SBMA	13-07-06	LEEDS	RECEIVED
2005.4230:Mitochondrial diseases:1			Mitochondrial diseases	13-07-06	LEEDS	RECEIVED
2005.1053:FRAXA:1			FRAXA	13-07-06	LEEDS	RECEIVED
2004.0872:PWAS:1			PWAS	13-07-06	LEEDS	RECEIVED
2006.2750:Friedreich ataxia:1			Friedreich ataxia	12-07-06	LEEDS	ACCEPT
2006.2728:Mitochondrial diseases:1			Mitochondrial diseases	12-07-06	LEEDS	ACCEPT
2006.2727:HFE:1			HFE	12-07-06	LEEDS	ACCEPT
2006.2726:FRAXA:1			FRAXA	12-07-06	LEEDS	ACCEPT

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The standard L2L interface is a web page configured to show the messages in the corresponding ‘in’ box

L2L in use – web application – out bound samples

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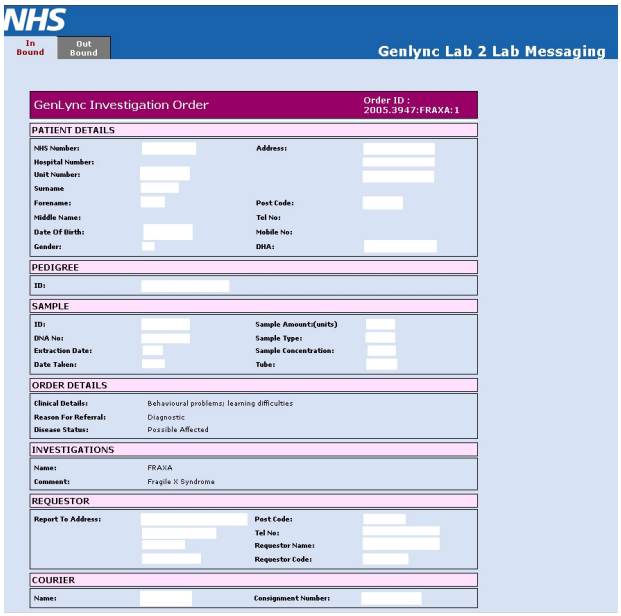
and ‘out’ box

L2L in use – web application – order information



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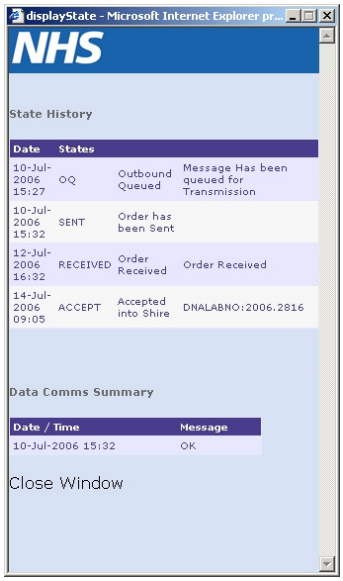
The system may be interrogated to show either the content of the message

L2L in use – web application – order communication logs



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or details of the communication history.

Everything that happens to a message within L2L is recorded in a communication log.

At this point the L2L system has accepted a data package, translated it into XML, transferred this to a remote L2L system which has in turn acknowledged that transmission.

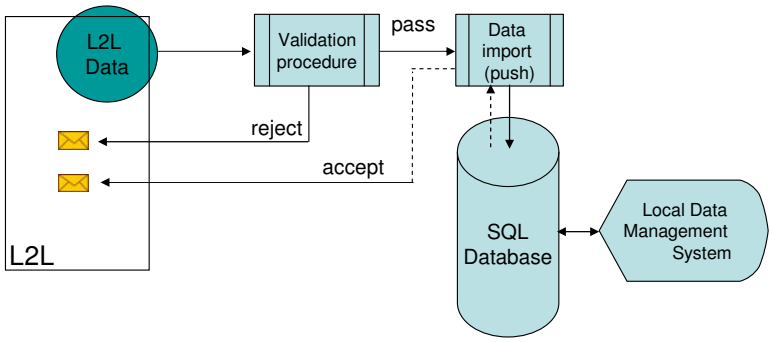
The next stage in the system is to do something with the message. That is either to make it available to the local laboratory database or to push the patient and sample details into the local system.

The configuration of L2L for GenLYNC has two methods (push and pull) to achieve the integration of the L2L message with the local systems.

While both Leeds and Newcastle have database systems based on Microsoft SQL Server, Leeds use the commercial Shire system while Newcastle run a bespoke application.

L2L in use – message import

Commercial SQL Server driven database system



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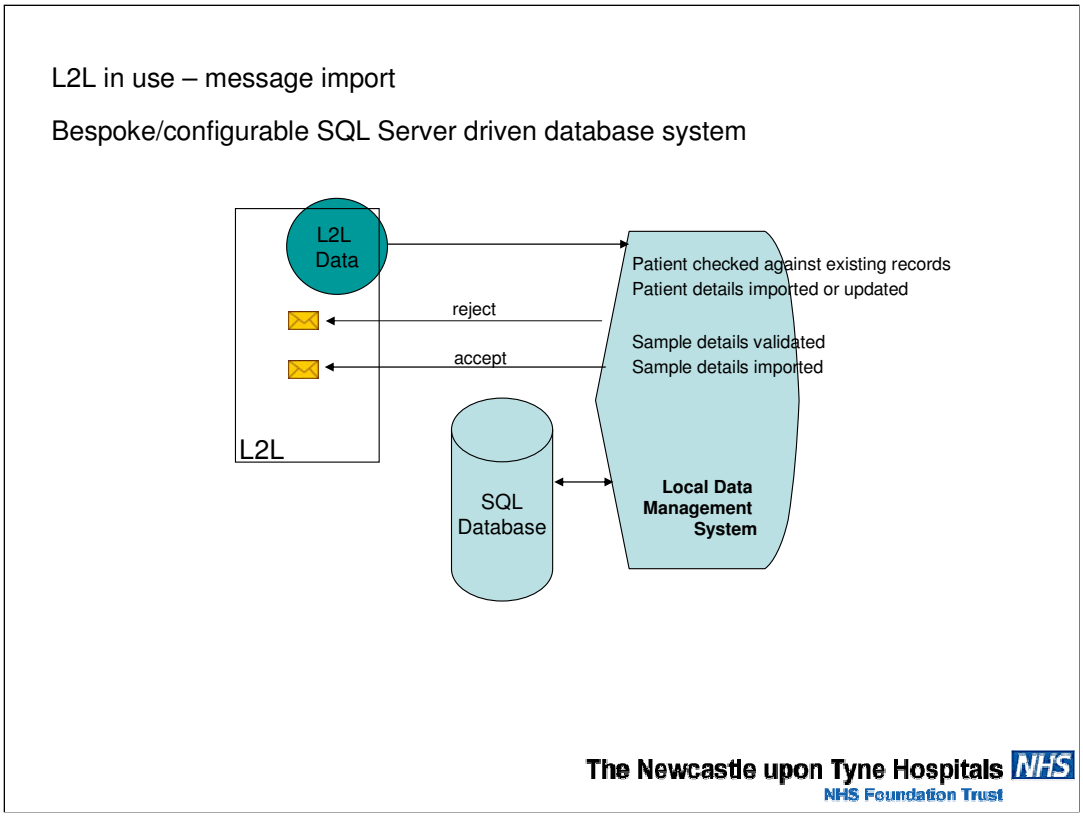
LEEDS

The L2L web application is configured to create a new patient entry and a corresponding sample entry at the press of a button. Data from the L2L message is extracted and passed to a stored SQL procedure within the database. If that procedure fails a message is returned to indicate the reason for failure (usually invalid data) and a message is also sent to the referring laboratory.



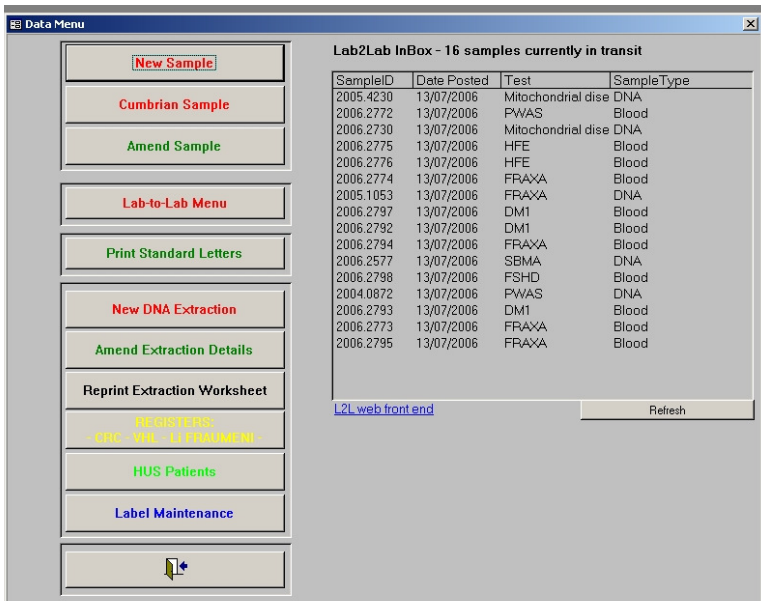
NEWCASTLE

A more flexible approach could be achieved with the Newcastle system allowing us to integrate the receipt of sample and the L2L message into our standard sample reception procedures.

The Newcastle database replicates the functions of the L2L web application giving a real time view of messages in the system to the database users.

Rather than pushing data into the database tables, staff follow our standard sample receipt process checking and confirming information as they would with any sample. The only difference being that the data entry is automatic, and usually just requires confirmation.

Local database system can be configured to duplicate the L2L web front end



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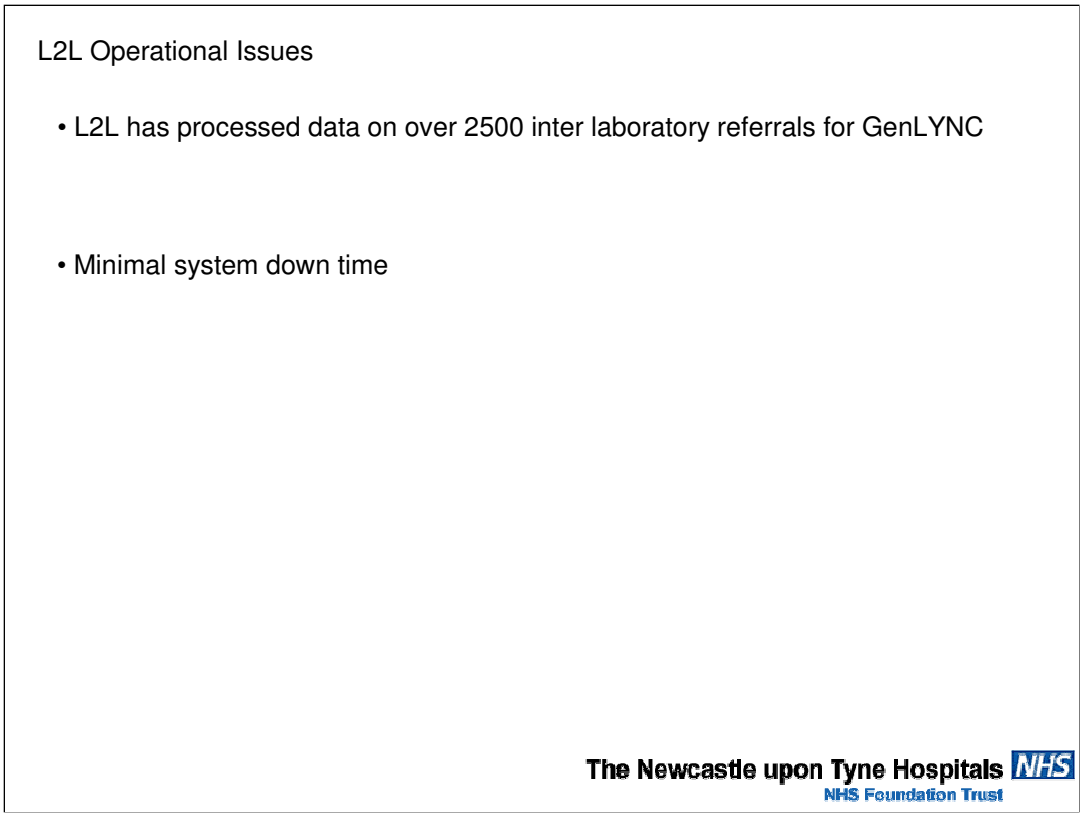
Local database system can be configured to duplicate the L2L web front end

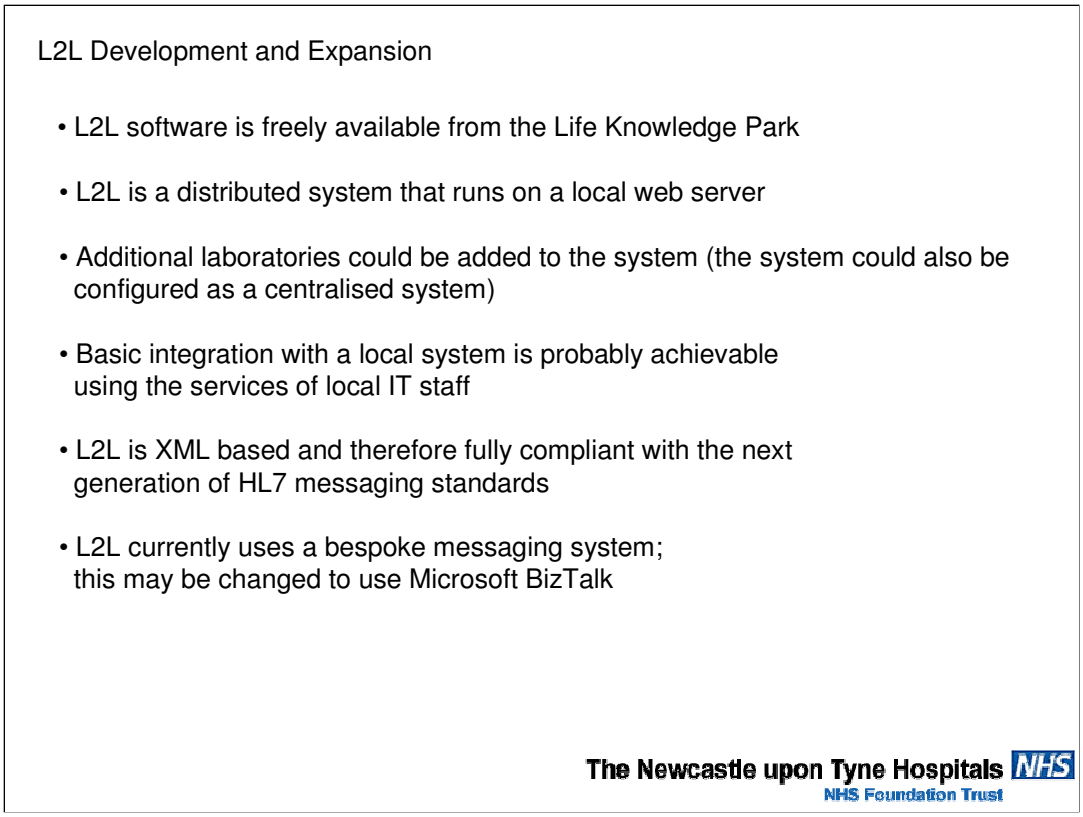
Any information required by staff to process samples should be available (or can be made available)

We haven't integrated the messaging logs … haven't found the need to interrogate these since the system has been remarkably stable



So far around 2500 samples have been referred between the two laboratories

and the system has achieved its objectives of speeding up data exchange, reducing duplicate data entry and minimising data entry errors. Over the past year, disruption to the system has been minimal.



The L2L software is freely available from the Life Knowledge Park.

The system currently operates by transferring messages between two L2L Servers, one based in Newcastle, the other in Leeds. Additional laboratories could be added to the network for the costs of the hardware (or space on a suitable local server) and integration with the local laboratory system.

Basic integration is probably achievable using the services of local IT staff.

There are plans to develop the local systems beyond the transmission of basic sample referral data.

While L2L is XML based and therefore fully compliant with the next generation of HL7 messaging standards, the system will need to be reviewed against any available national system such as the LabToLab pathology system.

L2L ACKNOWLEDGEMENTS

L2L is funded and supported by the Life Knowledge Park

L2L software is developed and maintained by Lee Dyson, Elende Software

L2L systems are maintained by IT Staff at Leeds and Newcastle

L2L development would have been impossible without considerable input from molecular genetics staff in both Leeds and Newcastle,

Dave Cockburn and David Bourne

L2L integration with the Leeds database

Steve Elwood

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