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Enabling change at the speed of thought

WHITEPAPER

Information sharing within NHS Networks with the Fiorano ITK Framework

Enabling innovation and choice using the CFH Interoperability Toolkit (ITK) Standard

The Fiorano ITK™ Solution

Enabling innovation and choice within NHS networks using the Connected for Health (CFH) Interoperability Toolkit (ITK) Standard

Summary

The Interoperability Toolkit (ITK) has been conceived to help break the existing barriers to healthcare information sharing and systems' supplier lock-in. To achieve this it defines a set of open standards that anyone can implement in order to create interfaces through which information can be sent and received between disparate systems. By creating a market open to ITK compliant systems from existing and new suppliers, large and small, the ITK empowers healthcare organisations with choice and generates the opportunity for innovation. In many cases, ITK-enabling existing systems will instantly provide greater flexibility; rather than trying to replace or update them with new functionality.

The Fiorano ITK framework is built on the Fiorano Service-Oriented Architecture (SOA) platform to bring its established powerful integration features, and proven reliability and scalability, into the healthcare environment. Fiorano presents its ITK framework: the Fiorano ITK Middleware Broker, to help interconnect ITK systems; and Fiorano ITK Adapters, to help quickly ITK-enable existing and new systems.

A Brief History of Healthcare Computing

Since the advent of the microprocessor, many pioneers and early adopters within the healthcare profession have used electronic systems to manage their data and organisations. The advantages of efficient data storage and its fast access, as opposed to shelves of paper records, the easy transmission of information across the organisation and the management of business practices are among the obvious reasons for taking an electronic path. However, because some systems were “home-grown” for a specific purpose, and others were initially designed as products to sell with no commercial incentive to integrate with other systems or connect between geographic regions, a situation naturally arose where communication between departments and organisations was hindered, as the useful information was effectively locked into electronic silos.

Figure 1
Early healthcare systems were “home-grown” or designed as products for a specific purpose.

In order to address this, new products were designed and sold with the intention of providing all the required functionality within one system; but with the consequence that requests for new functionality had to be directed through the system supplier, who for reasons of protecting their investment in the system's development and also in the interest of safeguarding the system from potential malfunction due to erroneous data, could not allow another supplier to augment the system. Additionally, the absence of a national strategy meant that there was no consensus on how to connect disparate systems together and so the electronic barricade to information sharing remained at a higher level. This was regrettable since it is self-evident that healthcare workers require all available information to make decisions, regardless of location or commercial contracts.

It would be unfair not to mention some of the ideas and systems that have been created specifically to address the issue of information sharing, especially as they perform their job well and so are in use today

National Health Application and Infrastructure Services (NHAIS or Exeter System)

Originally developed in the late 1970's at the Exeter General Hospital as a Primary Care and Patient Administration System (PAS), the “Open” Exeter system is currently accessible via a web browser within the NHS network. Although this is not an integration system, Open Exeter hosts and shares information such as: patient registration records, GP payments, breast and cervical screening information [01].

Health Level Seven (HL7) Organisation

HL7 was founded in the late 1980's to produce standards for healthcare systems. It developed the HL7v2 protocol/format messaging standard to facilitate communication of administrative, logistical, financial and clinical process information. It is widely used; however, different systems that use HL7 cannot necessarily interoperate as suppliers have implemented the messages in different ways, e.g. using different fields and formats for the same

data. Whilst HL7v3 has been developed as a move towards “plug-and-play” it is unlikely that this can ever be achieved due to the large scope of healthcare messages used across numerous and different departments.

Pathology Messaging Implementation Project (PMIP)

PMIP was developed in the mid 1990's to transmit pathology orders and results between laboratories and GP systems. The messages are encapsulated in the EDIFACT format and sent securely via a Data Transfer Service (DTS) which in essence is an email server deployed specifically for this purpose. Although there are potential problems with poor quality of data coding and rounding issues with changes of units [02] it is unlikely to be replaced in the near future.

Spine

Born out of the NHS National Programme for IT (NPfIT) in 2002, the Spine was intended to replace many existing services (e.g. patient demographics held in the Exeter system, see above) and also to provide new services to improve the efficiency of the NHS such as the Electronic Transmission of Prescriptions (ETP). The design included the use of standards-based and proven secure messaging protocols and formats, and also a centralised collection of services following the client-server model popular at the time. The programme was very ambitious and overran its budget and time frame. The programme has since ceased, after failing to achieve many of its deliverables [03], though services that are functional will continue to be maintained. Part of the reason for failure to deliver was due to the lengthy compliance accreditation process imposed on client systems that required the services, and this acted as a barrier to their uptake.
The complications of the process were perhaps imposed by the adoption of a centralised model, which required great care to be taken in areas of security and usage so as not to disrupt or compromise the operation of the system as a whole.

Figure 2
The lengthy compliance accreditation process was a barrier to uptake of the services on the Spine.

It can be seen that the issue of information sharing and problems with systems' interoperability remain to this day; more so than before, the healthcare computing space is full of different technologies each with their own messaging formats and protocols and many organisations are still locked into use of software whose upgrade path and addition of functionality is dependent on their suppliers.

The ITK and How It Helps to Share Information and Enables Innovation and Choice

It is clear that a new approach is required, built on the lessons learnt, that will help to connect systems new and old, enable greater freedom of choice and encourage innovation. The Interoperability Toolkit(ITK) is designed to do exactly this “...[it] is a set of national standards, frameworks and implementation guides to support interoperability within local organisations and across local health communities.” [04]

Its key points are:

- It is available to anyone who wishes to implement it.
  This opens up the market to new as well as existing suppliers and therefore enables choice and encourages innovation as ideas can come from a broader spectrum and smaller or niche suppliers are able to promote their products.

It describes an open standard, proven and secure messaging protocol.
This makes it easier to create ITK interfaces for legacy, existing and new systems alike as many tools and libraries already exist to help with implementation. It also provides a solid basis through which to grow interoperability.

The adoption of existing standards, clear guidance and focus on interoperability and a massive reduction in complexity (cf. the Spine) paves a faster route to accreditation. The time from conception to delivery of functionality is therefore reduced compared to existing healthcare computing development paths.

To understand how the ITK helps, imagine an organisation that currently uses a system provided by a supplier that has traditionally catered for most of their functional requirements. The organisation has learnt of some useful ITK enabled service, either through a conference, sales call or by browsing the ITK accreditation catalogue [05]. If the existing system does not expose an ITK interface then it is easy to put pressure on the supplier to add one because it is easier, quicker and cheaper to do this rather than the supplier copying and adding the desired functionality themselves; especially as once the ITK interface is in place then additional ITK enabled services can be included without any further work from the original supplier: the ITK standard requires that interoperability between ITK enabled systems and addition of new ITK services is managed purely by changes to configurations. Alternatively, the organisation may have identified a gap in functionality - perhaps a requirement for some data analysis services has arisen - and so contacts a 3rd party to develop this as an ITK solution. Once accredited, the solution can be quickly integrated within the existing system with just a change to the ITK configuration.

Currently, the ITK defines the following service groups:

HL7v2 ADT messaging services

The majority of the HL7v2 patient Admission Discharge and Transfer (ADT) messages can be sent through specifically defined ITK service operations. These are to aid interoperability with patient administration systems.

Correspondence services

Any type of clinical correspondence can be carried via the ITK using the correspondence services.
The documents can be text based documents such as PDF, TIFF and Kettering formats, up to full Clinical Document Architecture (CDA) with clinically assured content. A usage of this could be, for example, receiving patient referrals directly into a system rather than manually processing a fax or email.

Spine Mini Services

The tracing and retrieval of patient demographics from the Spine PDS is exposed via ITK. This is useful for an organisation that needs to access patient demographics on the Spine and circumvents their software having to go through the full Spine compliance accreditation process.

Dashboard services

Close to real-time information on unscheduled care activity (e.g. attendances, out-of-hours contacts) can be carried via the ITK to be displayed on a graphical, user-friendly dashboard.

Queue collection services

Some systems may not be able to receive push notifications, for example due to firewall configuration, or may need to regulate the rate of messages received. The queue collection services allow these systems to poll for and pull messages so that the connection is always created and controlled from their end.

The ITK is not only concerned with opening up systems within an organisation, it also describes a middleware broker that can route messages between systems and organisations. This enables the sharing of healthcare information across healthcare communities and sectors and also across geographic boundaries up to a national level. The broker manages the routing of messages by exposing a configuration that maps logical addresses of destinations to physical end points (either another broker along a path or an actual service). In this way a web of brokers can be envisaged that interconnect many different healthcare systems and so, for example, information about a patient from one trust can be retrieved and accessed at a different trust. Having systems interconnected via brokers also provides the potential to host distributed services within a healthcare cloud. This would be very useful to smaller organisations that can't afford the computing hardware or don't want to/can't manage and maintain the hardware and software themselves.

Fiorano ITK: Built on the Fiorano SOA Platform

Fiorano has been integrating systems since 1995 across a variety of different sectors (education, energy, finance, government ... [06]). This experience has resulted in the foundation of a Service-Oriented Architecture (SOA) platform that consists of a rich set of adapters that can connect with a variety of different systems and easy to use tools to help create, deploy and manage integration solutions. In most cases a solution can be built, via the Fiorano studio's graphical and intuitive interface, with no coding: all that is required is to drag, drop and configure one of the existing adapters. Armed with this capability and experience in systems' integration, Fiorano has welcomed the ITK and built on its platform to produce an ITK middleware broker and ITK adapter services to offer an invaluable solution to integrating healthcare systems via the ITK standards.

The solid basis of the Fiorano SOA platform brings the following attractive qualities to the ITK:

Solution creation environment

As mentioned above, there is a graphical studio to help build solutions using a rich set of adapters plus support for native coding languages to create new adapters, if required. Visual tools are also included to describe transformations, mappings and content based routing. Solutions can even be extended at runtime without having to stop and start the entire system.

Powerful service deployment and runtime control

The solution processes can be deployed across multiple machines and integrated event-interception provides runtime debugging from within the graphical studio, regardless of how the processes are distributed. There is also a centralised web-based console to monitor, audit and manage solutions.

Peer-to-peer architecture for performance, scalability and reliability

At its core the SOA rests on Fiorano's high performance message queuing system. This enables a peer-to-peer architecture with linear scalability and parallel processing with no single point of failure or need for a centralised control/data server. The built-in reliability of the queuing system means that messages are never lost.

Standards based SOA

The SOA can mediate between multiple standard protocols, e.g.: HTTP, SOAP, REST, FTP, SMTP, JMS, MSMQ etc.

Cloud Capability

It is also possible to run the Fiorano SOA in a cloud environment, thus freeing the client from the task of hardware procurement and management.

As well as these technical assets, Fiorano prides itself on the quality of its 24/7 support and rapid response to solutions or requests for help.

Fiorano ITK as a Middleware Broker

The Fiorano ITK middleware broker is a ready-to-use product designed to connect multiple healthcare systems together using ITK standards. These systems could reside within an organisation or be geographically separated within different healthcare sectors. The broker supports the full suite of ITKv2 web services which can be selected from to customise a deployment and then grow with demand:

- HL7v2 ADT messaging services
- Correspondence services
- Spine Mini Services
- Queue collection services

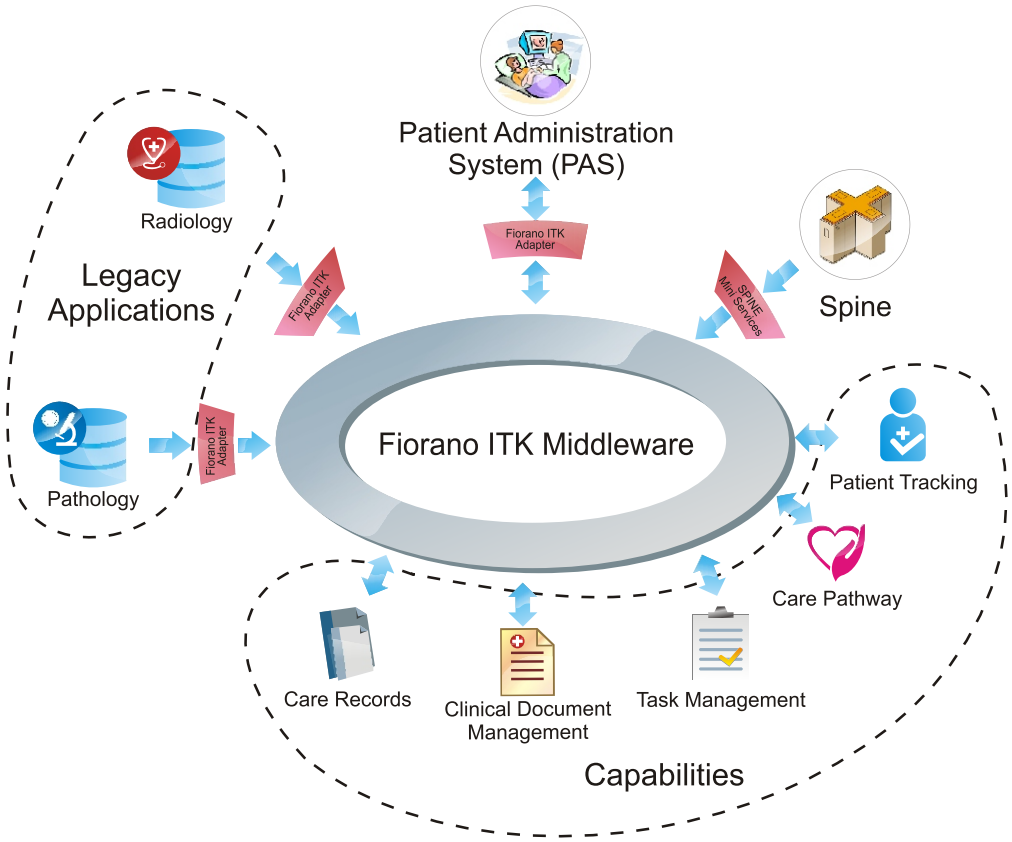

Figure 3

The Fiorano ITK middleware broker is designed to connect multiple systems together using ITK standards.

The Fiorano SOA platform guarantees that the broker operates efficiently and reliably from a small installation up to a large distributed cloud solution routing messages between many organisations. It also exposes interfaces for configuring the broker, negating the need to redeploy as the solution grows. Its web-based management console provides a centralised and secure interface for monitoring, auditing, message tracking and log reporting.

Fiorano ITK Framework as an Adapter

The ITK services developed for the middleware broker are available to use in combination with the existing suite of adapters and tools for transformation, mapping and content based routing provided by the Fiorano SOA platform. As it is principally an integration platform to help connect disparate systems together, the Fiorano ITK framework is perfect for use as an ITK adapter to ITK-enable legacy and new systems alike. Potentially any system, even if it has no existing interfaces or has proprietary interfaces, can be opened up to share healthcare information via the ITK standards. The platform can either be licensed to suppliers or organisations to ITK-enable their own systems or Fiorano's experienced team can help build the solution; either way, the solution will benefit from the same reliability, scalability and management tools as the ITK middleware broker product.

Future of Healthcare Systems

Fiorano is keen to work alongside healthcare organisations and partner with existing and new system suppliers to help solve issues with interoperability and so promote the sharing of healthcare information. Ultimately, the goal is to assist healthcare workers by providing them with effortless access to pertinent information whenever and wherever they need it. Fiorano see the adoption of the ITK standards as an important step in overcoming the existing technical obstacles and starting a path to fluid information sharing, with an open market of suppliers that will bring freedom of choice and innovative ideas to organisations.

The ITK marketplace and the ITK's potential to rejuvenate existing systems may transform the landscape of healthcare computing in new and interesting ways. Fiorano has a vision that traditional monolithic healthcare systems will be replaced with modular applications, or “capabilities”, that organisations will be free to pick and choose from to assemble their own customised solutions, specifically tailored to their needs and preferences.

References

Ref	Title/Link
01	NHAIS System and Value-Added Products and Services (http://www.connectingforhealth.nhs.uk/systemsandservices/ssd/prodserv
02	Overcoming Problems with Pathology Messages (www.fpm.org.uk/faculty/overcoming_problems_with_pathology_messaging_doc.doc)
03	The future of the National Programme for IT (http://www.dh.gov.uk/en/MediaCentre/Pressreleases/DH_119293)
04	Interoperability Tool Kit Background and Overview (http://www.connectingforhealth.nhs.uk/systemsandservices/interop/overview)
05	ITK Accreditation Catalogue (http://www.connectingforhealth.nhs.uk/systemsandservices/interop/accred/catalogue)
06	Fiorano Case Studies - By Industry (http://www.fiorano.com/customers/successstories/case-study-by-industry.php)

ABOUT FIORANO SOFTWARE

Fiorano's peer-to-peer distributed dataflow platform integrates applications and complex systems, increases business process performance, yields higher message throughput, and enhances availability through agent-based visual composition that bridges the capability gap between business models and their implementation the model is the application, ready to run. Global leaders including ABN AMRO, Boeing, British Telecom, Capgemini Telecom, Chicago Mercantile Exchange Group, McKesson, NASA, POSCO Steel, Qwest Communications, Rabobank, Schlumberger, Lockheed Martin, United States Coast Guard and Vodafone have deployed Fiorano to drive innovation through open, standards-based, dataflow SOA applications built in just days, yielding unprecedented productivity.

To find out more about how Fiorano can help you meet your enterprise integration objectives, visit **www.fiorano.com** or e-mail **sales@fiorano.com**

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