



Bi-Directional Interface between EMR and Quest Diagnostics®

Microsoft .NET with SQL Server Reporting Services solution for Healthcare Company

Executive Summary

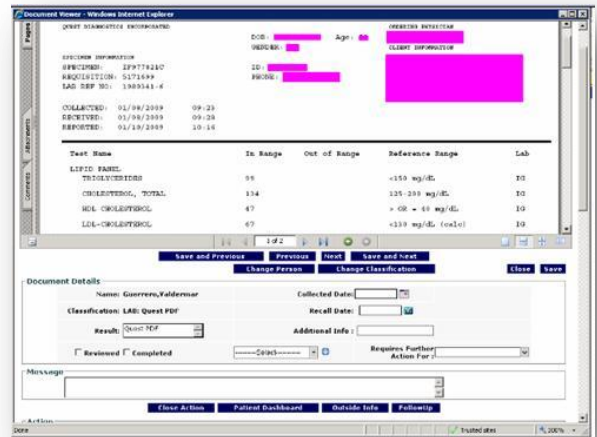
One of our EMR clients approached us to setup a bidirectional interface from their EMR with Quest Diagnostics®, the world's leader in diagnostic laboratory testing, information, and services. The client had a very tight deadline in mind and also this was of primary importance to get their business expanded. This case study describes the successful implementation of a solution to meet this requirement.

About our Client

Client A leading EMR company | **Location** Kansas, USA | **Industry** Healthcare

Business Situation

Our client, a leading EMR vendor in the USA, wanted to integrate with Quest Diagnostics. The interface would have to be a bi-directional one. The orders for tests would be sent electronically from within the EMR application and the results would also be received electronically.



We are very happy to have found Mindfire. They have been developing our software since last 9 years and have always shown the same passion towards commitment.

The key challenges included:

- The EMR in question is a web based Service oriented one. So there are many tenants and the Quest interface should be easy to switch on/off at individual tenant level.
- The interface should work seamlessly without too many modifications to the existing Lab Interface system of the client.
- Quest has many Business Units (BU) spread across the United States and individual tenants would have their own preference on the Business Unit to interface with.
- Each BU will have its own set of master lookup values of lab tests (the compendium) and the set would differ from one BU to another.
- The interface should be able to handle 1000s of simultaneous requests.
- The EMR application being a web based system, the new program should be developed in such a way that it should reside in one place (our client's data centre) and meet all the challenges listed above.



Solution Details

The Mindfire Solution

Mindfire had to address all the challenges mentioned above within a very limited timeframe. We decided to develop the solution in Microsoft .NET platform and it consisted of many modules.

1. The Ordering UI

The UI was done by keeping the existing lab order system as the base and the special features/pages/controls added in the module were available only for the tenants for whom Quest interfacing was active. The Quest related features in the UI were seamlessly integrated so as to provide the users continuity with what they are used to.

The orders are done using CPT code and from the specimen Queue, the Quest specific lab tests were shown for the selected CPT code. The users are shown the lab tests that are specific for the Business Unit(s) that they have registered with. When the user selects the lab test, the corresponding AOE info is shown. Also we have integrated with the billing system of the application for this purpose and relevant insurance info is automatically pulled and shown. Another complex feature that is integrated here is the dynamic generation of ABN form for state sponsored Medicare insurances.

We also presented the users with a Quick search to directly query the Quest BU's compendium for the lab tests they are looking to order.

The ordering system also had to present the end users with the manifests and specimen label, which were implemented with great success and praised for their ease of access and usability by the end users.

2. Database

Mindfire has very strong history and proven success with databases, which stood us in good stead with this work. The complete work of such a complex nature was possible due to a complete DB driven architecture. The orders were stored in the DB with the encounter, patient, physician details and then our other modules (discussed later) would take care of the ordering. Also the DB structure is the one which handled multiple Business Units and their lookups and the activation of the Business Unit(s) for specific – individual users.

3. Ordering Module

Quest requires the orders to be sent to their hub webservice. We also had one more challenge in this which is to group all the orders that are sent from one encounter. This is handled by 2 different windows services. One service looks at the orders that are accumulated and builds the ORM HL-7 message in the Quest specific format with various segments like PID, IN1, GT1, ORC, OBR, OBX Etc. The created order message is stored in the DB and then a different windows service picks up the constructed order message and sends to the Quest web service. The services are fail safe, fool proof and are built with reliability, scalability and performance in mind. Just these 2 services, which are hosted at our client's end take care of the complete ordering process of 100s users and are scalable for almost unlimited users.

4. Results Modules

Quest sends two types of results – Parsable raw ORU HL-7 messages and PDF results. The results are to be obtained from a webservice of Quest hub and are to be parsed and attached to specific, correct patients. There are 2 levels of matching involved in matching the results – the Placer Order Number can be used to track the order for which the result had come in and if this fails, a patient matching system (based on the demographics)



would come into picture and would match the result to the appropriate patient. After parsing the results, the message control ID, account ID and some more details from the message will be taken and used to match the PDF results to the patients. We had a total of 3 windows services doing this work.

5. Results UI

The next challenge was to present the results to the end users. The parsable results are and the PDF are pushed to a Document queue, using which the end users can review the results, place comments, forward to other users and finalize the results, after which they are permanently attached to the patient's charts. We also came up with a lab chart module which would allow the end users to monitor prognosis of diseases over a period time with graphical charts.

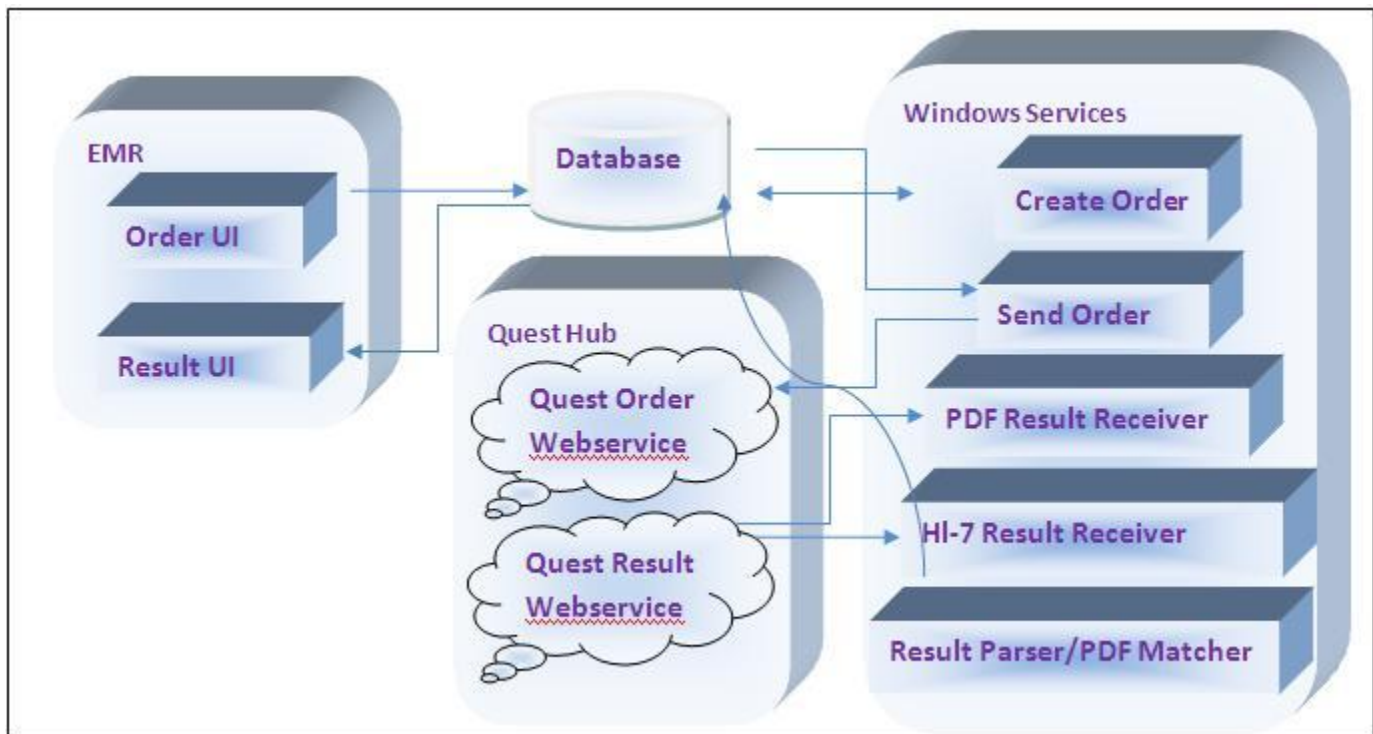


Fig -1: Schematic representation of the implementation

Achievements

- The full implementation was done in record time, enabling our client to successfully establish Bi-Directional interfacing with Quest
- Passed around 120 test cases (given and tested by Quest Diagnostics) that are tough, tests the system to the core.
- One Solution that served multiple tenants of our clients
- Takes 5 - 10 minutes to enable the interface for a new tenant/clinic and 2 minutes to disable the same for a clinic.
- Full control of the interface with our client/our developers. So easier to maintain.
- Introduced some very intuitive user friendly interface to review results.

Technologies

Technologies used: ASP.NET 3.5, C# 3.5, Windows Services, Web Services, SOAP/XML, Dymo Label Printer API, SQL Server Reporting Services, SQL Server 2008, HL-7, Java script, AJAX



Final Results

Software System

The following screen shots show some of the salient results/features of the system.

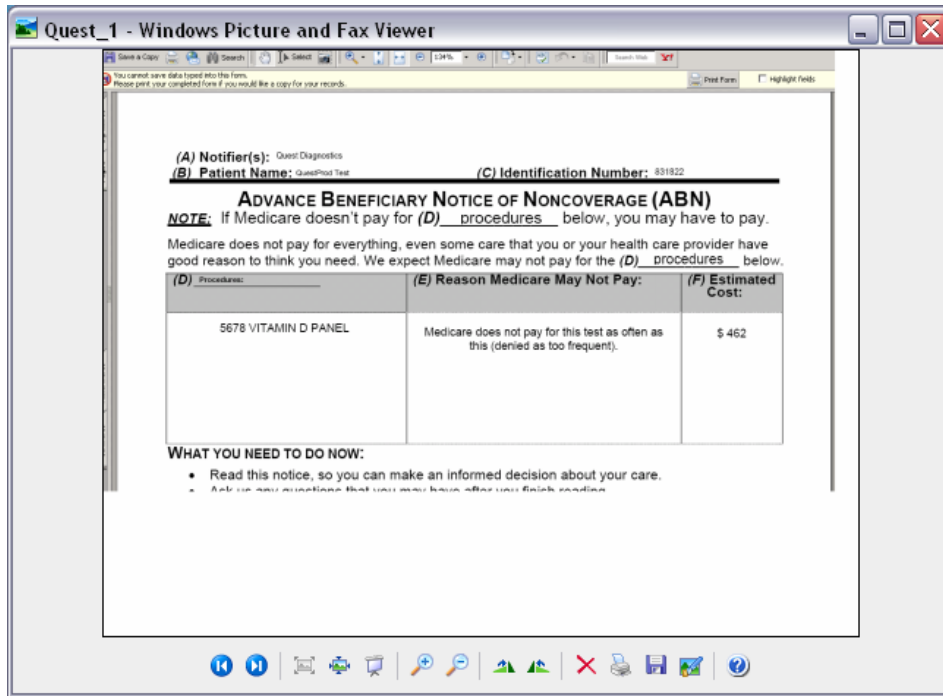


Figure 2: Generated ABN Form

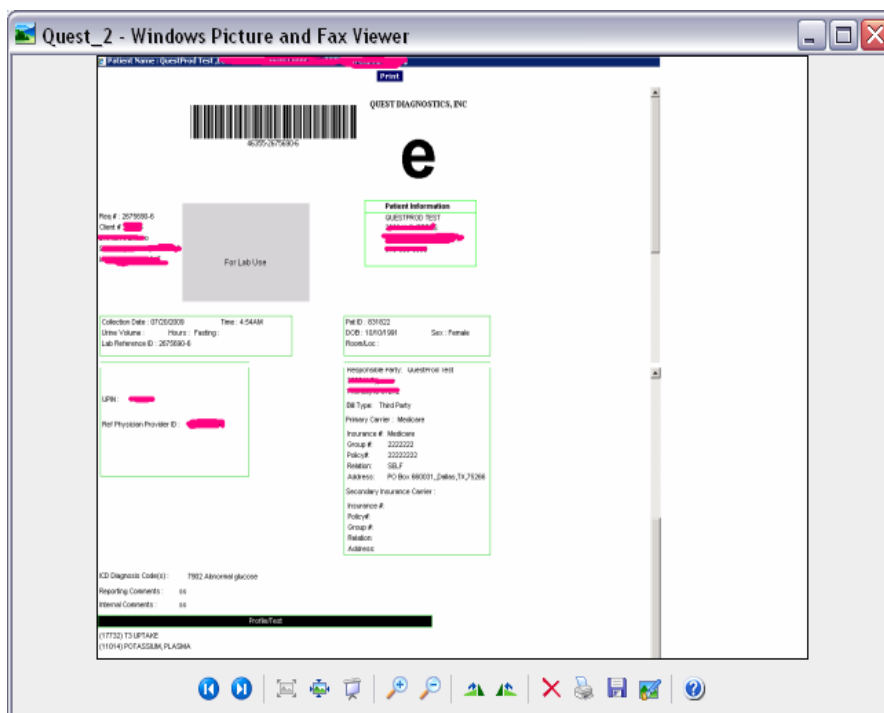


Figure 3: Order Manifest/Requisition



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MSH|^~\&|HUBWS|46355||DAL|200907200454||ORM^O01|MZ2675690|P|2.3|
PID|1|831822|||QuestProd^Test|19911010|F|||||3165555555|||||111111111|
NTE|1|||Test_Notes|
NTE|2|||Test_Notes|
IN1|1||MTX|Medicare|PO Box
660031^^Dallas^TX^75266|||2222222|||QuestProd^Test|1|||22222222|||T|
GT1|1||Test^Parent||20 James Bond Suite^^City^KS^67212|||
ORC|NW|2675690-6|||ZZ1111^test^phys|
OBR|1|2675690-6||^11014^POTASSIUM, PLASMA|||20090720045449|||
ZZ1111^test^phys||222720|||
DG1|1|ICD|7902|Abnormal glucose|
ORC|NW|2675690-6|||ZZ1111^test^phys|
OBR|1|2675690-6||^11732^T3 UPTAKE|||20090720045449|||ZZ1111^test^phys||222719|||
DG1|1|ICD|7902|Abnormal glucose|

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Figure 4: Sample Order Message [ORM]

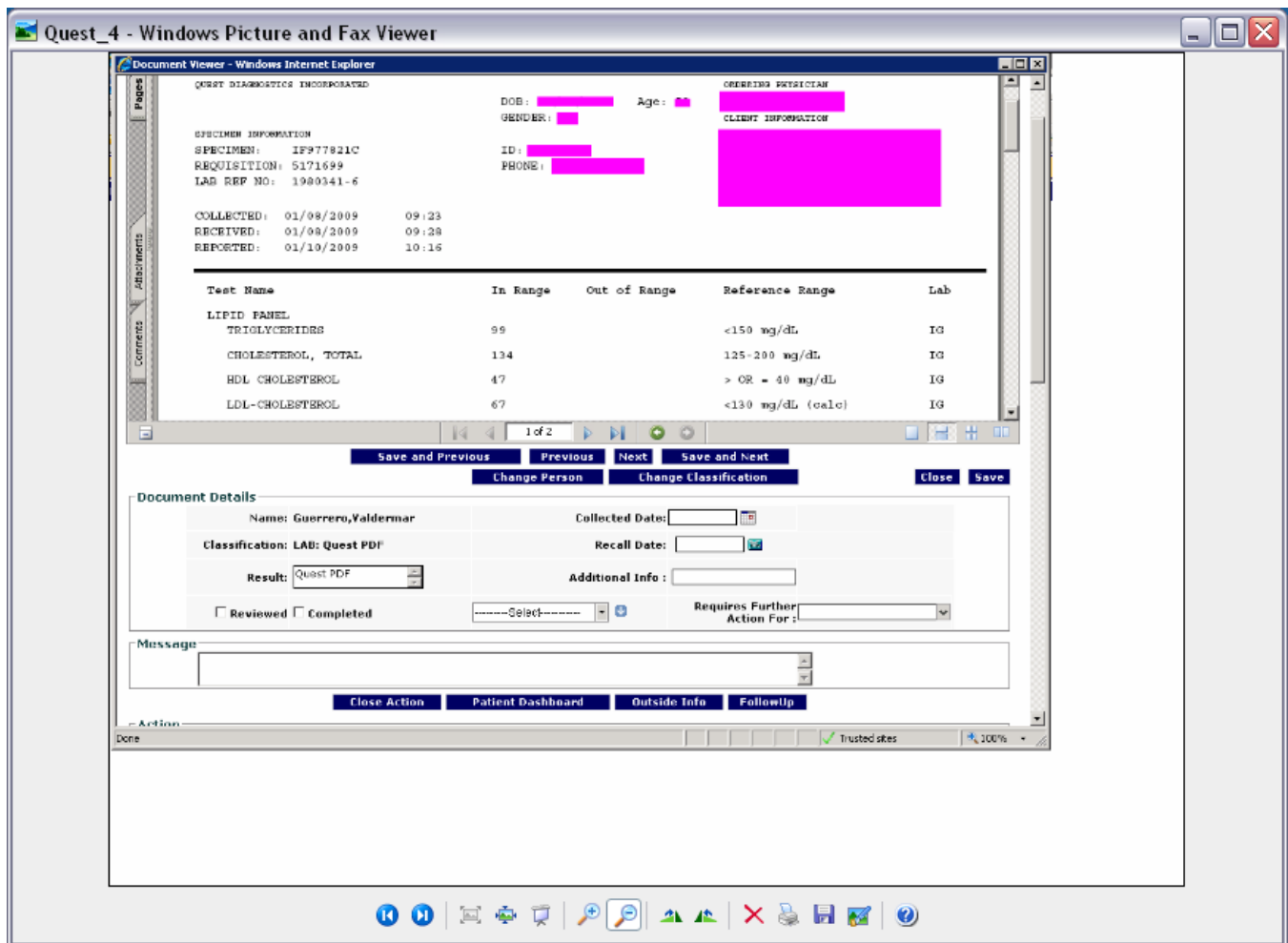


Figure 5: Sample result PDF Show inside Lab Result Viewer

Customer Benefits

The client benefited a great deal by this. There are few EMRs who have Bi-Directional interface system working with multiple labs and successful completion of this led to a lot of business for our client and end users were very pleased because this avoided the process of them to log into Quest hub and duplicate the ordering into the Quest system after



placing the orders in EMR. This would typically save around 10 minutes of the end user's time for documenting each visit (encounter with each patient). It's a proven fact that EMRs that take lesser time to document/work with have a huge success rate in terms of winning new business and retaining them.

Future Relationship

Our client continues with us with great success and happiness and we are executing multiple projects for them. On a similar note we also interfaced with few other labs for this EMR.