

A Technical Whitepaper on eTXHEMI

A Simple and Affordable Healthcare Messaging and Integration Engine

Introduction

Today, many Health Care Organizations (HCOs) are faced with integrating complex front-end applications such as patient scheduling, hospital information systems, pharmacy systems, order entry systems and corporate portals with back-end systems such as enterprise resource planning (ERP) and other custom, home-grown systems. In addition to integrating clinical data, healthcare executives are also calling for integrated business management intelligence in order to analyze real time key performance indicators in the areas of clinical, financial and quality of care metrics. The healthcare environment is truly a fine example of business processes driving IT initiatives.

Founded in 1999, eTransX is a rapidly growing Nashville-based company that specializes in enabling and facilitating Enterprise Application Integration (EAI), Health Level Seven (HL7) messaging and Business Intelligence (BI) solutions to the healthcare industry. Unlike competitors, we empower our clients with knowledge of industry best practices, and simple to use next-generation integration technologies that deliver guaranteed project success in record time, at typically 50%-80% less cost.

This philosophy is the polar opposite of that employed by the old guard integration companies, where much of their revenues are derived from implementation services based on a seemingly intentional complex service platform. Our solution to change this paradigm was the introduction of the eTransX Total Integration Platform, and eTXHEMI (Healthcare Messaging and Integration Engine), a quickly deployed combination hardware/software solution comprised of a combination of our three core technologies:

- **eTXIntegrator:** eTransX' flagship product- A components and transaction based integration technology that enables the Real Time Enterprise through a drag and drop integration approach with no custom programming. Supports the real time integration of SQL,ORACLE, DB2, HTTP, FTP, HL7, X12, ISAM/VSAM, and the creation of Web Services, creating the fastest conduit to deployment of a Service Oriented Architecture on the market.
- **eTXHL7:** Manages multiple versions of HL7 messaging by converting the complicated syntax into XML through a point and click approach, incorporating persistent and traceable transactions with absolutely no programming.
- **eTXIntel:** Enables real time Integrated Business Management Intelligence by integrating with heterogeneous source data to take the enterprise from “data rich, to information rich”. Key performance and quality of care metrics are available in real time.

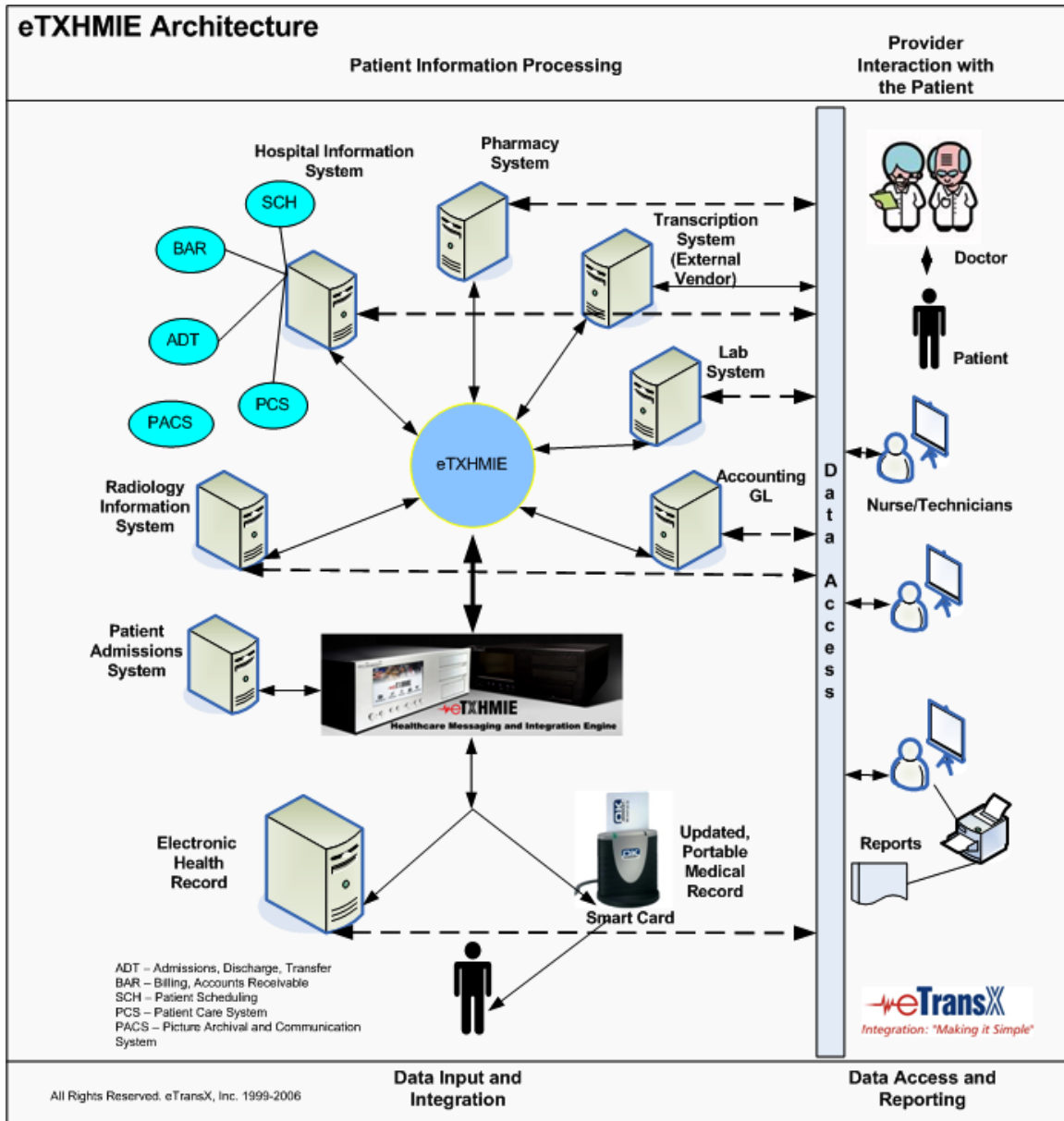
This “configuration, not programmatically driven” approach enables complex integration of disparate applications and their underlying databases *in days*, not the costly months-long engagements typical of other integration offerings.

There are many HL7 messaging and integration tools currently in the market with very different strengths in their offering such as Business Process Management, workflow, data translation and transformation. What sets eTXHEMI apart from other offerings is its absolute simplicity, affordability and excellent return on investment (ROI) via empowerment and enablement of its users to perform integration with little or no outside consulting help. The eTXHEMI Total Integration Platform is very focused on facilitating quick, simple and robust HL7 messaging and integration between various applications at an affordable price. In essence, it allows companies to “Do More with Less and Do it Fast!”

eTXHEMI flexibility and scalability:

- Supports 72 integration scenarios with source/target types including HTTP, FTP, HL7/X12, File HL7, Web, Web Services, etc.
- Simple drag and drop message creation.
- Automatically Converts complicated HL7 syntax to XML schema in real time.
- Supports all versions of HL7.
- Rapid deployment with absolutely no programming.
- Comprehensive Integration Engine integrates all types of clinical and financial data.
- Supports integration with any number of disparate applications in real time with absolutely no custom programming.
- On board and remote Transaction Analytics provides robust error monitoring, recovery and transaction monitoring intelligence.





Example deployment in a Healthcare environment

Architecture Overview

eTXHEMI is a hardware/software solution that is a standards-based, components oriented technology providing an easy to use, yet very effective method of integrating two or more applications and their databases using transactions. The software component of eTXHEMI consists of eTXIntegrator with HL7 adaptor built-in. It consists of a suite of components that are designed to assist customers from planning to implementation of HL7 messaging and application integration. These components allow the users to design, map and integrate transactions between two or more systems in real time. The components automatically generate XML Schema Document (XSD) and XML Style Sheet Language Transformation (XSLT) eliminating the errors and frustrations associated with manual generation. It uses World Wide Web Consortium (W3C) standards for XSD, XSLT formats. eTXHEMI uses a repository to keep track of the Meta data on the transactions and the actual transactions themselves for audit purposes. This repository can be any

SQL Server, DB2 UDB, Oracle or any other SQL-Compliant databases. By maintaining the Meta data on transactions in a database, eTXHEMI allows the user to change the transaction design, and transformation associated with each transaction very easily as the business requirements change. This is an important aspect of its simplicity and its empowerment of its users to perform integration. eTXHEMI uses Open Database Connectivity (ODBC) as its main communication and access technology for the databases since ODBC is available for every database available. ODBC is simple, yet provides rich functionality to do the normal tasks required of any integration engine. Using HL7 protocol, eTXHEMI communicates with any number or type of disparate healthcare related systems.

Components

The key components of eTXHEMI that assist users from designing a transaction, transforming a transaction from its original format to the desired format and configuring them to trigger and send them to its destinations are:

1. eTXdesigner
2. eTXmapper
3. eTXconfigurator
4. eTXdirector
5. eTXadministrator

The following briefly describes the various components of eTXHEMI.

eTXdesigner

eTXdesigner is an interactive tool to design simple to complex transactions. It uses ODBC connections to connect to the databases to access the table/view objects from which the transactions are created. It automatically generates an XML Schema Document (XSD) for each transaction.

eTXmapper

eTXmapper is an interactive tool that allows mapping a Source transaction to a Target transaction (i.e. source XSD to a Target XSD). It provides mechanism to specify the transformation to be made, if any for each field. It generates an XML Style Sheet Language Transformation (XSLT) document for the transformations specified.

eTXconfigurator

eTXconfigurator is an interactive tool to configure both the eTXmapper and eTXdesigner. It specifies the location of all the files, the data source name (DSN) for various source and target systems, and eTXrepository information.

eTXdirector

eTXdirector is the integration engine for the eTXHEMI. It consists of three Windows services, ETXOTM, ETXITM and ETXMONITOR. ETXOTM manages all the outbound transactions (both synchronous and asynchronous) from one or more source systems into one or more target systems. ETXOTM extracts data from databases in XML format specified in an XSD; Converts a source XML document into a target XML document applying any transformations specified in an XSLT document and updates the target database with the transaction or posts to the target web server either synchronously or asynchronously or puts it in a file folder based on target system configuration. ETXITM manages all the inbound asynchronous transactions from one or more source systems into one or more target systems. ETXITM processes transaction received via a web server. It uses the same approach as ETXOTM, i.e. converts a source XML document into a target XML document by applying any transformations specified in an XSLT document and updates the target database with the transaction. ETXMONITOR is a service that monitors both ETXOTM and ETXITM services to ensure that they are up and running all the time.

eTXadministrator

eTXadministrator is an interactive tool to configure the eTXdirector (i.e. systems, transactions, adaptors, repository and user information) and view and monitor the transactions between source and target systems.

Technology

eTXHEMI was built using various Microsoft technologies. It is a Windows-based system running on a Windows 2000 server. It can be set up either in a single server or in three-tier architecture with an Integration Server, a Web Server and a Database Server. For scalability and load balancing, a cluster of servers can also be set up. Though it is a windows-based system, it can access and integrate systems in Unix, AS/400 and mainframe platforms with ease.

Data Integrity

Users have to be able to rely completely on the validity of the transactions and their content data and document content presented by the system. Several key components of the architecture support this.

Transactional Processing

HL7 messaging and integration is based on transactional processing. eTXHEMI provides full transactional support for database updates. It queues the transactions for a given patient or customer id to ensure that appropriate inserts and updates are done in the order they were triggered thus ensuring the data integrity of the transactions. The COM components responsible for updating data perform all operations within transactions, thereby ensuring that multiple updates are completed successfully before data is committed to the system. If anything fails along the way, transactions are rolled back completely.

Referential Integrity

Referential integrity is implemented in the data tier. Using tools and techniques provided by the Database Management System (RDBMS) is by far the best way to ensure integrity at the database level.

Scalability and Performance

Maximum business benefit offered by any system is generally realized by deployment of the system to a large audience; thereby ensuring data is managed by and retrieved from a common, reliable source. eTXHEMI architecture supports enterprise wide deployment and will be able to scale accordingly. Scalability requires an underlying hardware and operating system platform that is robust and able to scale. In addition to making full use of this platform, there are three specific key components: Multi-Instance, Multi-Process and Multi-Thread, deployed in the eTXHEMI architecture that enables the platform to be used to its fullest potential.

Multi-Instance

eTXHEMI can be configured to run on multiple computers that are clustered. Each instance of eTXIntegrator can manage a set of logical systems (end points of integration) from which transactions originate. All of the instances will work out of the same repository, thus enabling a very high throughput of transactions.

Multi-Process

eTXHEMI launches an individual process for each logical system (ie. End point) that it needs to manage. Since each process has its memory, processor allocation times, one process does not interfere with another process. Multi-processing is limited only by the operating system parameters such as processor speed and available memory. There is no limit to the number of processes that eTXHEMI can launch. This architecture component provides high flexibility and scalability.

Multi-threaded

Each process launched by eTXHEMI can use multiple threads to process transactions. The number of threads for each process is a configurable parameter and is limited only by the operating system parameters such as processor speed and memory. This again provides very high scalability and increase in transaction throughput.

Distributed transaction file storage

Audit trail for each transaction that is processed by eTXHEMI is stored in an XML/HL7 file. A pointer to these files are stored in the repository. This reduces the storage requirements of the repository and enhances the speed of the database. This architecture component allows the system to scale very well when a huge volume of transactions are to be processed. The

audit files can be stored in a different file server thus increasing the performance of the entire system.

Optimized processing logic

This architecture component allows eTXHEMI to process transactions as efficiently as possible by minimizing repository access to get configuration information on the transactions. This allows the system to be highly optimized for the high transaction load, and dramatically improves performance under high load.

Cluster and farm friendly

The eTXHEMI architecture is regarded as 'cluster friendly', meaning it supports the use of server clusters for load balancing. Connection pooling and thread pooling is used allowing multiple connections to the database to serve multiple user requests without the need to establish new connections for every request.

Security

One of the ways eTXHEMI provides information integrity is by providing a secure environment in which data can be stored, updated and communicated. This relies heavily on the security provided by the underlying platform, and requires eTXHEMI to conform with and make full use of the security features provided by the RDBMS and network protocols.

User authentication

User authentication is at the core of any secure architecture. No user is allowed access without proper authentication. Connection to each of the logical system identified in the configuration also requires a user id and password.

Transaction Encryption

eTXHEMI provides mechanism to encrypt entire transactions so that the content can only be viewed with appropriate credentials.

Ease of Deployment

Deploying any enterprise messaging and integration solution poses some significant challenges. This custom Total Integration Platform is quite simply the fastest means to integrate any number or type of healthcare systems available today. By making the entire HL7 messaging and integration process simple, and providing the tools necessary to design, map, configure and integrate (our four step process for HL7 messaging and integration), we eases the pain of integration considerably.

Configuration Driven

Since the entire integration process is configuration driven, it simplifies the integration driven. The administrators are provided with all the tools necessary to configure the logical systems (end-points) and transactions easily without any programming or scripting.

Error-Notification

eTXHEMI has an extensive error capture and notification process. It sends an email to the administrators with a clear reason as to why a particular transaction is failed or unable to be posted. It provides both system error reference as well as a description of where it occurred. This helps in identifying and resolving the errors quickly.

Transaction Archival

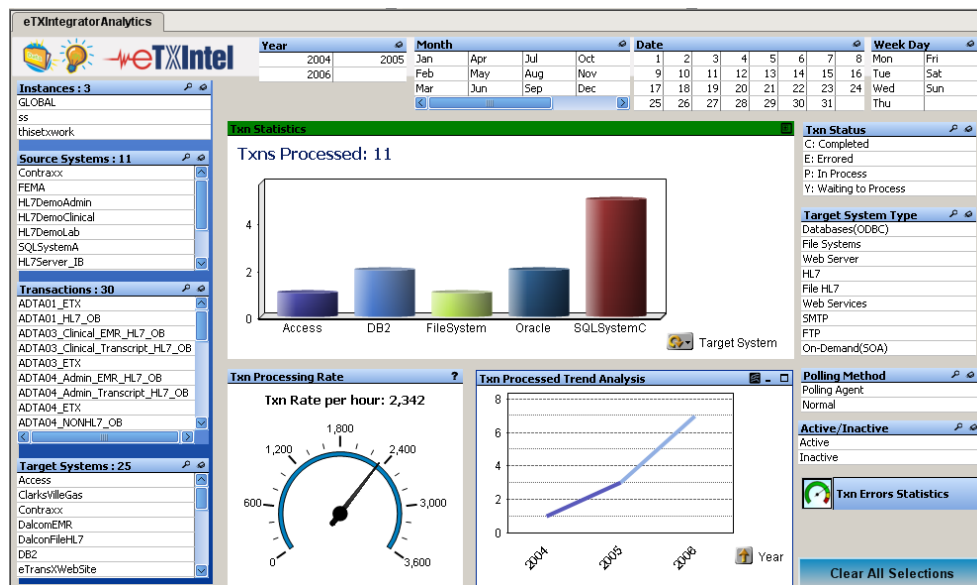
eTXHEMI has an architecture component that allows the user to define an archival process for the completed transactions. It allows the system to archive the transaction at pre-defined interval to improve performance of the system.

Standards conformance

Simple, consistent user interfaces ensure minimal training for administrators, conforms to WWC for XSD and XSLT specifications.

Transaction Analytics

EtXHemi provides a real-time transaction analytics for the administrators to monitor. It gives an easy-to-use interface to query the number of transactions that are being processed, average transaction speed per transaction and trend analysis of number of transactions processed over a period of time. The following figure shows the user interface:



Summary

eTXHEMI has been architected for the rigors of enterprise production use – without the historic configuration complexities. Implemented on the latest proven technologies of leading industry vendors, the eTXHEMI architecture provides the means for eTransX to provide value-added applications to meet its customers' needs now and as they expand.

eTXHEMI provides a simple and an affordable way to integrate applications in an organization true to its design motto of “Do More with Less and Do it Fast!”. eTransX performs the HL7 messaging and integration without requiring expensive custom programming like many other HL7 messaging integration solutions currently available. Not only do you save money at time of implementation, but you also have the flexibility to do future HL7 messaging and integration without incurring additional programming expenses resulting in much lower Total Cost of Ownership (TCO).

Whether the organization is a small, medium or truly a global enterprise, eTXHEMI can meet and exceed the expectations of its users because of the following differentiators that set it apart from its competition:

- faster deployment of HL7 messaging and integration projects
- greater reliability and manageability of integration processes
- reuse of components and configuration
- more effective use of staff
- Inexpensive
- Standards based
- Fast Implementation
- Lower Total Cost of Ownership
- No Programming Involved
- Low Risk Implementation

Contact Us

eTransX can provide your company – whether small, medium, or a large corporation – with the solutions, resources and technology necessary to stabilize your business and help it grow to effectively compete in today's competitive marketplace!

Our fully-staffed, knowledgeable, responsive, and client-focused professionals will assist you in solving your Integration and Implementation problems, employing our newly developed eTXHEMI. Let us be a part of your team!

Please visit our website to find out more about eTransX, or better yet, give us a call!

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