



# Immunization Repository for a Large Healthcare Delivery System

First Line Software partnered with one of the largest not-for-profit hospital and physician networks in the United States with over 15,000 providers and over 2 million patients under care. We engaged in the development of an enterprise-wide registry of immunization records for all patients under care within 11 hospitals and affiliated outpatient clinics in order to comply with the government guidelines and improve continuity of care. Additionally, First Line Software has assisted in a multi-year implementation and rollout of the Epic EMR medical system across their entire delivery system and is intended to import real-time and legacy immunization data into EPIC.

## Challenge

Hospitals and outpatient clinics in our partner's network are running on multiple vendor and in-house EMR and ambulatory systems which are being used to store and manage immunization data. Over time, the entire network has accumulated more than 40 million legacy immunization records. The data is "dirty" – having significant structural and content variances even within the same system.

This created system-wide inconsistencies in data representation paired with ongoing edits of current and past records by clinicians which presents a significant challenge to the importing more legacy record and current immunizations concurrently.

## Solution

A joint team of First Line and client engineers, medical informaticians, analysts, and hospital IT staff has worked together over a period of two years to design a sophisticated process and infrastructure to populate the immunization repository with historical and real-time data and export this data to Epic and government agencies. We have developed 13 interfaces from the client systems and outbound interfaces to Epic and state vaccination registries. The interfaces incorporate multiple protocols including HL7, Web Services, flat file ingestion, and proprietary APIs. We have also implemented complex data transformations that accounted for specifics of individual systems and variances in structure and data content.

In order to provide high throughput for legacy data import, our engineers designed a high performance parallel integration infrastructure based on InterSystems' HealthConnect IntegrationEngine with routing logic to guarantee preservation of historical sequence of records. First Line also developed a User Interface layer on top of the integration infrastructure specifically designed for clinical analysts to perform data validation, monitoring, and debugging of the workflow.

## Outcome

Using troubleshooting and monitoring tools, the project's analytical team has been able to identify patterns and problems in the data during dry run imports of the data in the test environment. Based on this analysis, the data transformation scripts were refined and improved to achieve the desired level of fault tolerance and scalability in the interfaces.

The integration pipeline, designed and developed by the team, has imported and processed over 40 million immunization records into the immunization repository at a rate of 200 records per second with no loss of data, interface breakdowns or reaching server capacity limits. The outbound interfaces have imported all records to EPIC and sent them to the state registry. The pipeline is continuously processing real time records from all organizations participating in the immunization repository.

## Technologies

InterSystems Cache, Ensemble, Objectscript, .NET, C#, MVC, Javascript, Ajax libraries



## Engineering of custom EHR/EMR solutions with advanced interoperability and optimized workflows

Our customers are visionaries and innovators who don't want to be bound by the constraints of their existing systems – we are their partner in fulfilling their ambitious goals. Modern EHR systems are powerful and highly complex. This complexity and long release cycles are the impediment for fast adoption of latest innovation opportunities, for improvements in care quality and safety, and expansion of care beyond the boundaries of healthcare institutions.

From Order Entry to Decision Support, to Medication Administration and to Acute Clinical Documentation - First Line Software has been developing and implementing hospital and ambulatory systems long before major EHR vendors gained wide adoption. We are building and integrating these systems and components for prestigious AMCs, innovative clinicians, and medical software and equipment manufacturers for nearly 20 years. The types of healthcare solutions we're building has evolved along with the transformation of the healthcare IT landscape. We work with you to enhance your EHR systems to create effectiveness and efficiencies that will help you change the world.

Learn more: [firstlinesoftware.com/healthcare](http://firstlinesoftware.com/healthcare)

### About First Line Software

First Line Software is a premier provider of software engineering, software enablement, and digital transformation advisory services. Leveraging its long history of distributed agile development methodologies, First Line Software delivers both excellence and efficiency in complex projects in healthcare, warehouse management, web content management, ecommerce, retail digitization, machine learning, and cloud computing.

First Line Software is consistently recognized globally with industry rankings and awards. As active members in Object Management Group and the Industrial Internet Consortium, First Line Software collaborates on establishing standards for technology, enterprise integration and Industrial Internet. As an Episerver Gold Partner, First Line provides implementation and customization services to direct clients and in cooperation with other Epi Partners.

Headquartered in the U.S., the global staff of 750+ technical experts serve clients across North America, Europe, Asia, and Australia, including Accenture, Bonnier Group, Clinic to Cloud, Partners HealthCare, Viastore, and others.

### Contacts

**Cambridge MA, USA,**  
+1. 877. 737. 7178,  
1 Broadway, 14th Floor, Cambridge MA 02142

**The Hague, Netherlands, +31**  
(70) 512 1899,  
Louis Couperusplein 2, 4th floor 2514HP

**Prague, Brno, Czech Republic**  
+420 721 537 689,  
Na Hřebenech, II 1718/8, 140 00 Praha 4

 [firstlinesoftware.com](http://firstlinesoftware.com)  
 [@firstlinesoft](https://twitter.com/firstlinesoft)  
 [sales@firstlinesoftware.com](mailto:sales@firstlinesoftware.com)

