



Fusion Analytics for Hospital Operations

Mike Kowolenko, NoviSystems' CEO, spent a majority of his career in upper management in the pharmaceutical industry including Senior Vice President and head of Operations of Biogen and SVP of Vaccines and Biotechnology at Wyeth (Pfizer). During his tenure in pharma, he was frustrated with the inability of IT vendors to integrate data between various systems so he could analyze business operations across multiple domains. This data integration would have provided valuable insights to greatly improve the operational efficiency of the business activities under his management while operating within a state of control and regulatory compliance.

After retiring from pharma, Mike began exploring how to apply state of the art analytics and AI techniques to solve this data integration and analysis problem. As the Executive Director of the Institute for Next Generation IT Systems (ITng) at NC State University, he worked with John Bass, ITng's Technical Director, on many software development projects including the IBM Watson Jeopardy project and Watson health.

Mike found that vendors in the IT industry focus on creating solutions that attempt to replace highly skilled personnel instead of creating systems to assist skilled personnel with their tasks. Mike (CEO) and John (COO) formed NoviSystems in 2018 to create systems to solve the data integration problem as well as keeping the human in control of the analytics. The result is Fusion Analytics, a platform to guide domain experts in their pursuit of answers from complex data without requiring data science skills. Fusion Analytics abstracts the complexity of using Natural Language Processing and Machine Learning techniques so that the person pursuing answers can focus on the problem, not the technology.

NoviSystems has deployed Fusion Analytics in pharma operations and sees a great opportunity to enable hospital leaders to integrate data between various business units to improve both business operations and clinical medicine.



Mission Statement of Company

The mission of NoviSystems, Inc is to build low cost, effective AI Appliances (our products) for decision makers (our customers). Our focus is in Healthcare with a passion for the Rare Disease Community.

What is the Fusion Analytics Platform?

Fusion Analytics (formally called NoviLens) is an integrated hardware and software appliance based on IBM's Power9 architecture. The system comes in three size configurations based on use case. The hardware features are listed below.

Hardware Configuration

Size	CPU	RAM (Gb)	Data Storage (TB)	System Storage (TB)	OS (Linux)
clinic	2 x 3.35 GHz	128	8	2	Red Hat Enterprise Linux
hospital	2 x 3.35 GHz	512	12	2	Red Hat Enterprise Linux
Hospital network	2 x 3.35 GHz	1000	16	2	Red Hat Enterprise Linux

The data acquisition, extraction, transformation and loading features as well as the integrated natural language processing, supervised learning and self serve Dashboards were developed at NoviSystems Inc and are the subject of three patent applications. The original NoviLens product was developed for the Pharmaceutical Contract Manufacturing Operations (CMO). Based on the founder's interest in life science and patient health, the next product developed is for organizations caring for Rare Disease Patients.

Software Features

Data Fusion Integration System: table converter, relationship builder, data type re-casting, data transposition, generated fields

Data acquisition: Web crawler, CSV loader, custom API's.

Database Connectors: Postgres, Oracle, Microsoft, SAP HANA, MySQL, IBM Db2

FHIR complaint API Connector (EPIC, CERNER, GE, etc)



Dynamic Dashboard: tables, timelines, scatter plots, bars, pie charts, lines, graph, search, selectors, geo mapping, date search

Dashboard Exports: to API's, Machine Learning platform, csv files, images

Advanced analytics: Bayes, Neural Nets, LDA, NMF, Regression (multiple), Decision Trees, Ensemble techniques, Random Forest, Kmeans,SVM, Classification and Data Reduction, Automated model tuning and selection.)

Natural Language Processing: Dictionary Builder, Co-Location, built-in thesaurus, Lemma, Regex

HealthCare Specific: ICD-10 Code Finder, PubMed data integrators, UMLS synonym dictionary builder

Why an Appliance?

There are three primary drivers that led us to package Fusion Analytics as an appliance:

1. A major drawback to current analytical applications is the need for extensive configuration of the software due to limits of the hardware. This is because these software packages are developed for a wide range of hardware configurations. Fusion Analytics is optimally built for our hardware options.
2. Many companies run private clouds or hybrid clouds to protect their corporate data. Fusion Analytics is packaged as an appliance that resides on the private side of the corporate firewall to ensure that corporate data is protected according to corporate policies and procedures.
3. Our appliance is designed to interface with a client's existing systems so that no there is no additional stress or resource drain on these existing systems or personnel.

This approach leads to three primary benefits of the appliance model:

1. This appliance approach allows Fusion Analytics to meet the objective of providing analytical results in minutes rather than months without additional resource consumption on existing systems or personnel.
2. It allows the client to leverage the investments they have made in other data acquisition and storage systems. Fusion Analytics **supplements** these systems, often providing a wider array of analytical capabilities than current data systems.
3. Support and training are built into the appliance subscription.

The only requirements for our system to connect to our client's data sources are associated data system APIs. Fusion Analytics comes with multiple API connectors built in, and custom APIs can be built upon request.

In multiple cases, clients have built working models in less than 30 minutes.



Reference Case Study

Our Fusion Analytics product for CMOs is currently utilized by ThermoFisher for the use in monitoring compliance and product quality attributes at 16 worldwide locations. NoviSystems Inc. also has a partnership with MLogica to provide a white-label system for their data storage platforms.