From Isolation to Insights

Solving Enterprise Imaging's Complex Interoperability Challenges to Reach Full Data Transparency

From Isolation to Insights

Now more than ever healthcare organizations are called upon to deliver increased value at reduced cost. Fostering this level of optimization and continuous improvement requires a data-driven approach that calls for new and advanced methods to access the vast amount of varied data that is generated across the healthcare enterprise. Unfortunately, traditional clinical information systems often exist in independent silos, and have limited capabilities for meaningful data analysis.

The road from data isolation to insights requires progression across the 4 levels of data maturity, as modelled in figure 1.

Technologies such as business intelligence (BI), artificial intelligence (AI) and machine learning promise to automate the delivery of key insights that can lead to measurable operational and fiscal improvements, while also improving the efficiency and accuracy of diagnostic interpretations. To deliver upon these promises requires level 4 data maturity, where data is collected across previously disparate systems, analyzed for relevance, and organized into a complete data repository where it can be mined for any number of clinical, operational, or financial purposes while maintaining data integrity, security, and privacy.

"The reality is that the industry is rapidly reaching a point where its dependencies on real-time exchange of data and information far exceed its preparedness to deliver." – Gartner, 2017

Figure 1: Levels of Data Maturity
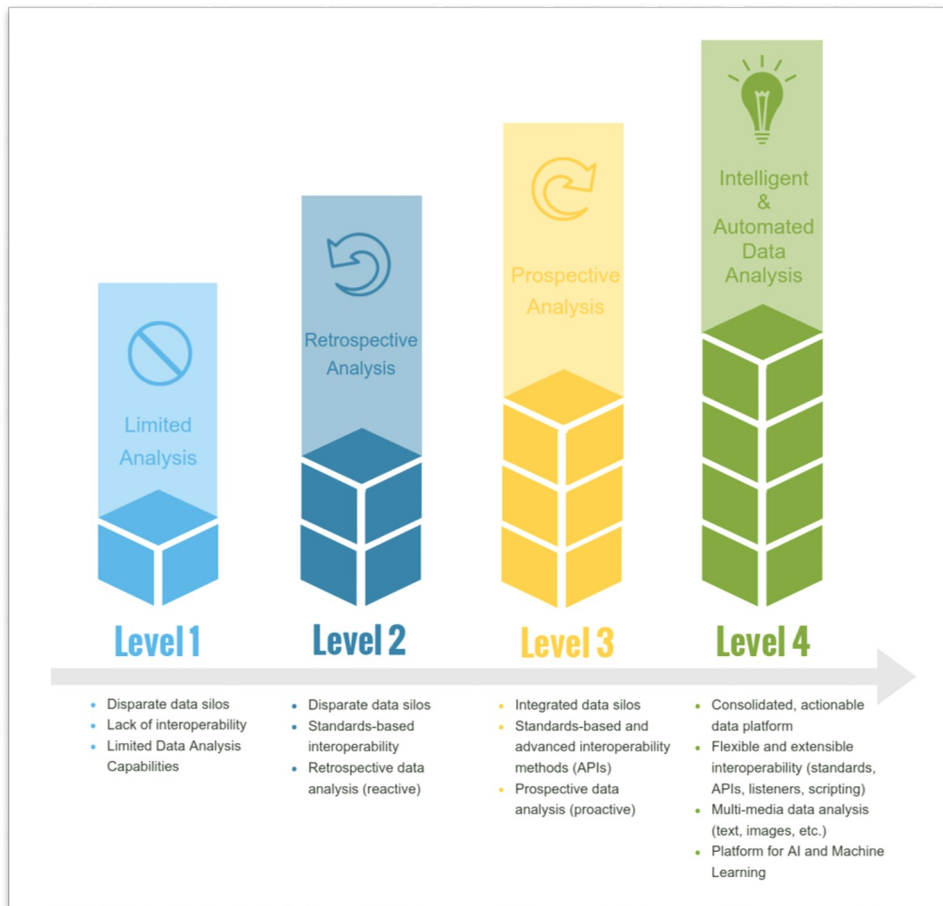
The Next Big IDEA in Data Analytics

IDEA (Integrated Data Engine for Analytics) is Bialogics' unique "non-invasive" data engine designed for product developers and integration specialists looking for a simplified approach to overcoming the integration challenges within healthcare by extracting data for information system integration, business intelligence or advanced application development. IDEA is a must-have wherever machine learning frameworks or data mining tools are required. Bialogics' IDEA engine is an all-inclusive data solution that offers key development advantages being vendor agnostic, scalable and fully interoperable. IDEA can provide these advantages while simultaneously excelling in the acquisition of IT messaging from a variety of standardized protocols including HL7, DICOM, and XML while remaining compatible with the latest FHIR messaging standard.

For the Application Developer or Integration Specialist IDEA offers:

- Immediate access to real-time HL-7 and DICOM data streams

- Proven accuracy (99.999%) across all network applications

- Lower total cost of ownership, by eliminating expensive HL7 integrations or complex interfaces to build, install and maintain

- Rapid deployment time with minimal IT resource requirements

- A searchable hierarchical, relational database extract of variables in JSON or CSV formats

- External data exchange data with secure anonymization

- 4 methods of integration of data through data export through the interface, Restful Data Web API, ODBC and, if needed, a custom script.

- Accelerated development and integration for systems that require both full HL7 and DICOM meta data files for advanced application development

This white paper will discuss how the IDEA can help you achieve level 4 data maturity to enable the discovery of broad and meaningful insights and form the foundation for artificial intelligence and machine learning.

Tap into the Information Value Chain

The data generated across the healthcare ecosystem can be viewed as a supply chain of potentially valuable insights. At each stage existing information is received, new information is generated, and both are passed along to the next system in the chain. Unfortunately, under traditional models as data moves from silo to silo it is transformed to conform to each system's unique data format and communication requirements. As this occurs data becomes fragmented, with bits and pieces residing only within the system where it was generated and withheld from the

information supply chain because of incompatibilities in data standards, format, or size between downstream systems and vendors. Bialogics taps into the information supply chain to create value by collecting data across multiple sources using various structured and unstructured data formats, including but not limited to:

- Registration and Scheduling (HIS/RIS)
- Electronic Medical Record (EMR)
- Clinical Decision Support (CDS)
- Diagnostic Modalities
- Workflow Management
- Dose Monitoring
- Radiology (PACS)
- Cardiology Imaging and Information Systems (CVIS)
- Voice recognition and dictation (VR)
- Billing and Finance

Figure 2: Information Supply and Value Chain

> *"Business analytics is a collection of technologies, applications, and practices that aggregates data from various systems, integrates them into one database, stores the data until it's ready for analysis—and then the final piece is presenting the data to you, the decision-maker […] The hard part is making sure the data is in a unified and consistent format."*
> *- Katherine P. Andriole, PhD, Associate Professor of Radiology at Harvard*

Achieve Hassle-Free Interoperability

To achieve this level of data interoperability, modalities and applications must be capable of communicating in a democratized manner. While industry standards offer a method for systems to communicate key information across the healthcare enterprise, not all information types and fields are supported and developing and maintaining the many interface engines, protocols, and messages is a time consuming and costly exercise, often requiring involvement from multiple technology vendors.

A single tool for all data sources, IDEA has been designed specifically for Medical Imaging Application Development where accessing multiple data sets from disparate silos is required to turn it into insightful information. Using a methodology referred to as Line Data Analysis, IDEA automatically captures, parses, and stores multi-protocol messages associated with distinct patient

interactions and unique identifiers. By leveraging vendor-agnostic wire collection techniques such as port replication, E/RSPAN, Network TAP, and standardized listeners IDEA is able to collect data across enterprise systems and protocols including HL7, DICOM and XML in real-time – with absolutely no impact on active production systems, and without the need for proprietary integration or customized interfaces. As well, IDEA also offers unique ways of extracting data from offline applications, or where messages are contained within the application itself, ensuring a complete and comprehensive dataset is available for analysis.

For industry vendors looking for a data intelligence partner, IDEA comes equipped with tools for advanced application development including a comprehensive set of Application Programming Interfaces (APIs), AVRO (a data serialization framework) and Open Database Connectivity (ODBC) integration points, as well as support for client-specific scripting. Even better, the Bialogics team trains your team to integrate our one-of-a-kind data engine into any third-party application – which is simple and fast – accelerating time to market and return on investment (ROI).

Figure 3: A Single Tool for all Data Sources
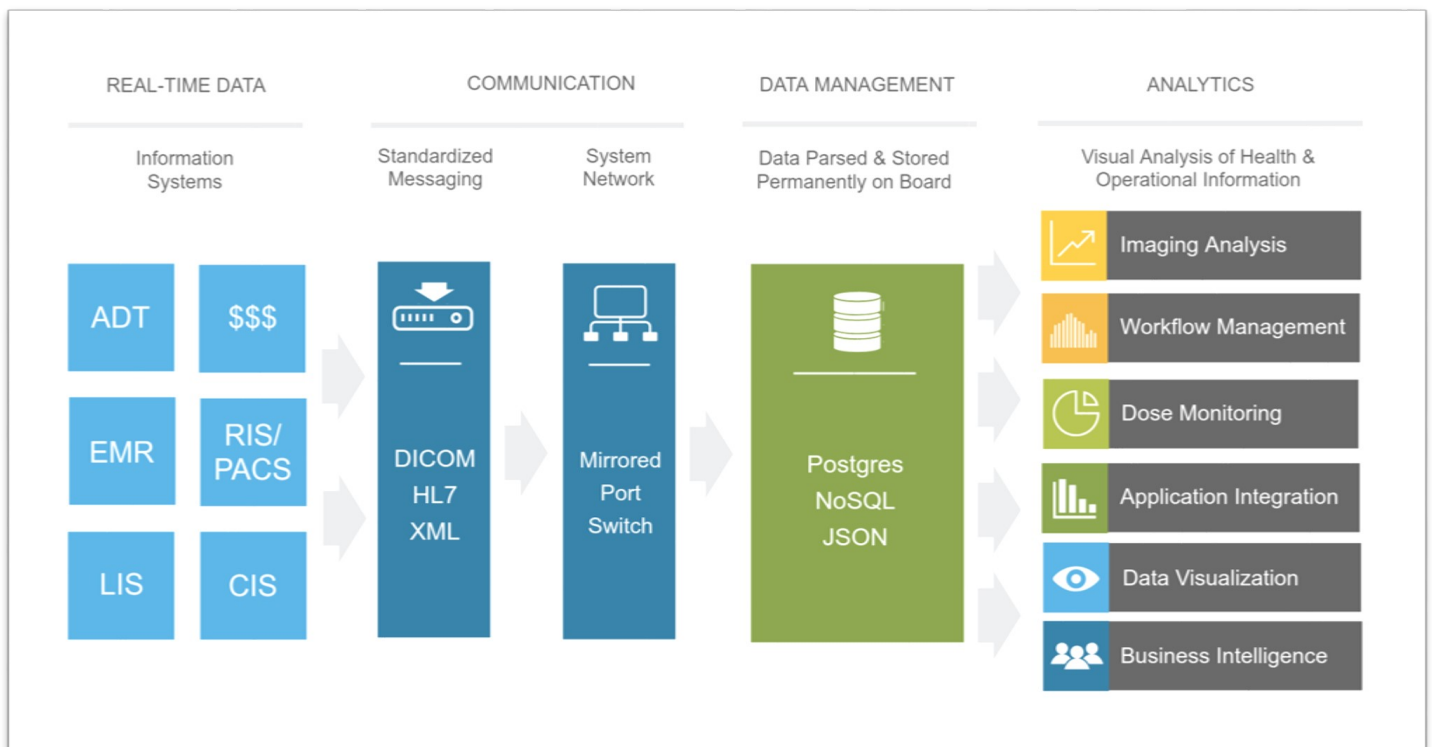
Exceed Scalability and Performance Demands

The volume and variety of information that can be collected across enterprise imaging and information systems is vast. Even when it can be aggregated into a centralized repository or Vendor Neutral Archive (VNA) significant challenges related to indexing and correlating information in a manner that supports efficient data mining and analysis remain. Many departmental systems continue to struggle with legacy architectures and data models, preventing efficient data mining and analysis. Non-standard or large-scale queries can take hours, days, or even weeks to perform – if they can be performed at all without over-taxing resources and bringing the host system to its knees.

IDEA overcomes these scalability and performance challenges by leveraging the latest 'big data' technologies, which are designed to meet the flexibility and performance demands of our digital 'instant gratification' society. IDEA's NoSQL Database is able to scale in real-time and can support the onboarding of new modalities, systems, or even facilities without incurring downtime or performance degradation. All data elements are in a JSON and FHIR ready format, making them organized and easily indexed to support the rapid and flexible searches required to support business, clinical, research, and educational applications.

Realize Immediate Return on Investment (ROI)

Today's complex and fragmented healthcare ecosystem places a constant stream of demands on IT resources. Even worse, many dominating companies make data sharing intentionally difficult and expensive – trying to integrate disparate systems or gain access to the information locked within their proprietary databases often involves long lead-times and costly professional services engagements that can amount to hundreds of thousands of dollars.

IDEA solves the problem by enabling full enterprise integration within a matter of hours, and best of all Bialogics' cost-conscious pricing is typically less than the initial standard HL7 cost! This provides both immediate value and long-term cost savings, ensuring a fast and lasting return on investment when compared to traditional HL7 integrations and PACS interfaces.

A Proven Solution for Any Healthcare Organization

"We chose to partner with Bialogics because its unique data discovery platform provided the advanced capabilities we needed to launch our own Radiology Practice Management and Analytics solution" – Senior Vice President, Radiology and Oncology Solutions

Because of its unique and non-invasive approach to data collection IDEA is the platform of choice for leading PACS vendors, Industry OEMs, Application Developers, and Data Science professionals who seek to achieve level 4 data maturity, simplify access to enterprise-wide data, and build a platform for future AI and machine learning applications. Because IDEA can be integrated into any healthcare enterprise or system within a matter of hours it is able to immediately deliver key insights, deliver value, and avoid the high costs associated with proprietary interfaces or integration work.

Through our own clients, as well as our industry partners, IDEA is deployed at some of the largest healthcare organizations and integrated delivery networks (IDNs) in North America, actively collecting data across disparate systems with distinct capture requirements and delivering comprehensive insights into performance, uptime, and operations across the imaging continuum.

Whether you are collecting HL7 or DICOM metadata to inform clinical workflow and patient safety, leveraging scheduling or financial data to optimize business processes, or building a platform for AI or machine learning initiatives IDEA is a simple, proven solution for private practices, large hospitals or health systems, and industry vendors alike.

About Bialogics

We provide fully interoperable and innovative data transformation solutions for healthcare provider organizations and industry vendors that enable informed business decisions, greater workflow efficiencies, and improved patient outcomes. Developed in collaboration with industry partners and healthcare clients we set out to build a true vendor agnostic platform for Medical Imaging Administrators and Physicians, incorporating a comprehensive tool-set to measure and improve patient access to diagnostic imaging, procedural appropriateness, Turn-Around-Times, and operational costs and efficiencies. The pursuit of our vision has resulted in a unique data engine designed to support business intelligence, AI, and Machine Learning applications.

We believe that by unlocking data already available within your health network intelligent insights can be delivered to any user from a single source, where and when the information is needed – simple, cost-effective, and powerful.