



eBook

Powering the Digital Oilfield



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iStore powers the Digital Oilfield by accessing, aggregating, and presenting multiple data sources from within an organization as an integrated totality. E&P professionals no longer have to chase data, the data chases them. Through its industry leading suite of visualization templates, iStore configures just the right set of data for each business problem. Data accessed directly from analytical systems, operational databases, SCADA systems, and other systems is timely, accurate, and complete. The iStore Digital Oilfield is composed of quality information that is presented by connecting disparate islands of E&P data in such a way as to assure an efficient assemblage of the right types of information in juxtaposition to the business problem being addressed. The iStore architecture allows businesses to continue to add incremental value as data quality and workflows evolve, the key to sustainable deployment of a Digital Oilfield solution. The Digital Oilfield aims to improve business value by enhancing decision making, whether it is optimizing a brownfield or managing exploration plays.

The Information Challenge

Oil and gas wells generate a torrent of technical and financial data throughout the exploration and production life cycle. Managing and utilizing this abundance of information over the life of an asset requires specialized data systems and applications, resulting in an information sprawl of disparate data silos. Asset management teams, charged with making decisions to maximize return on investment, often have difficulties finding, compiling, comparing, and analyzing data in a timely manner. As a result, decisions are delayed and often are based on incomplete data or confusing multiple versions of the “truth.” Information technology is enabling an unprecedented capacity for storage and acquisition of data streaming in from the field. Never before has the petroleum industry had more information to support decision-making, from finding new reserves and drilling to production allocation and field optimization. Yet when it comes to achieving higher returns, retaining a competitive edge and improving operational safety, it is not how much data is available that is the key success factor. It is how that data can be most effectively deployed to generate business intelligence and corporate knowledge. Over the past two decades, significant insight has been achieved into how information can be better shared across petroleum companies and the industry. These IT advances have included improvements in networking infrastructure, relational database technology, real-time data access, and open-source data models. While these advances have helped to ensure the availability, integrity, and exchange of data, the information

landscape has remained technology centric rather than business oriented. Getting the right mix of information into the hands of the right business stakeholders at the right time remains a challenge for the industry. The solution, in the form of the Digital Oilfield, has become clearer over time.

Never before has the petroleum industry had more information to support decision-making, from finding new reserves and drilling to production allocation and field optimization.

Digital Oilfields are only as successful as the underlying data management and information delivery technology and practices. With thousands of sensors in the field streaming data across the asset life cycle, the emphasis has shifted from acquisition and storage to managing and leveraging the deluge of information. Yet the information landscape of the petroleum enterprise is often characterized by islands of data. The information architecture tends to be application centric, providing data access and reporting for some specialized users (Subject Matter Experts or SMEs), but effectively locking out the rest of the asset team members from access to the data. Digital Oilfield information delivery is impeded by traditional data management strategies and IT solutions. These have focused on moving, copying, or migrating data to create master data repositories, such as a well history master database. Often implementation of these data warehouses require a significant IT investment over many years. Such projects fall short and ultimately fail because creating business value quickly is essential to sustaining any data management effort.

Data Management Approach

Achieving a truly effective Digital Oilfield requires a pragmatic information management strategy and selection of the right technology. Because the petroleum industry's data management environment includes informal work processes and many project and application databases, there is often poor integration of information, lack of standards for keys (such as well_IDs), and inconsistent document and file management across the enterprise. The traditional approach has been to copy all of the related information into a single system. However, setting up a new master data repository and copying and managing the information tends to be significantly more expensive than accessing the information directly from the existing repositories. It also prevents an end user from being able to access real-time data. Ironically, master data projects often add to the growing information sprawl, making it more difficult for users to access the data they need and creating data confusion due to update frequency being out of sync with business needs. Adherence to two key principles can help an organization overcome these challenges:

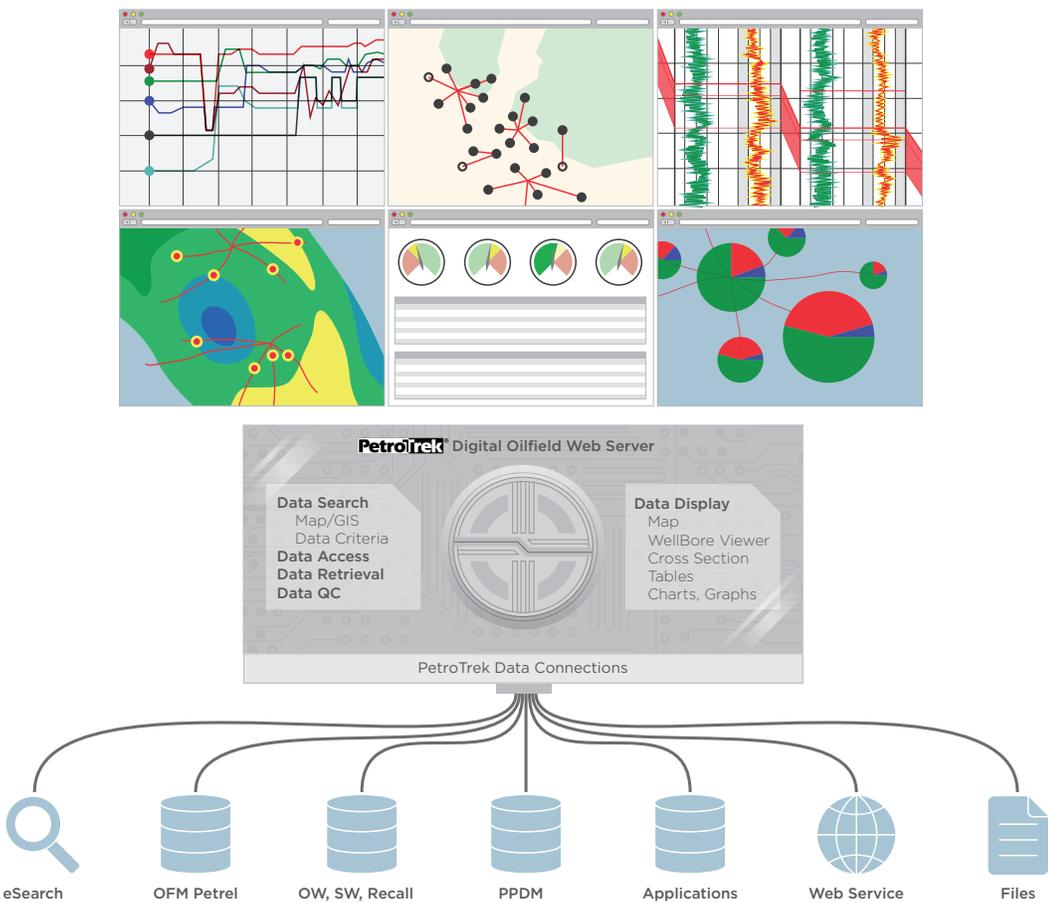
- ▶ Identify where information is being managed and make that information easily accessible. As part of the access mechanism, information from one source can be integrated with information from other sources concerning the same business entity. An example would be integrating oil well, oilfield, and lease information into a coherent whole.
- ▶ Where information is not being managed well, add a repository with appropriate data governance rules to manage it.

Using this federated master data approach, a company can create business value quickly by connecting people and information with a loose coupling of data sources. The data remains where it is being managed and the Digital Oilfield solution accesses information from its existing

location and presents users with an integrated set of data consistent with business needs. Data is aggregated from multiple, independent sources into a single, logical entity. In the background, the solution utilizes metadata that holds data key mappings and identifies where source data is physically located to allow associating data from the multiplicity of databases. The result is centralized and seamless access to databases that may be schematically different and/or geographically distributed.

True value creation occurs when the Digital Oilfield solution transforms data and information into actionable business intelligence that supports operational decision making. In essence, it is simply connecting the right people with the right information at the right time. Achieving this requires solutions that not only integrate and distribute critical data, but are capable of presenting it in meaningful ways to information consumers, including geoscientists, engineers, asset managers, and executive staff.

A successful Digital Oilfield is not a matter of building massive data warehouses or moving data between data stores and applications. The Digital Oilfield is often discussed in terms of moving data via predefined adapters or components or in the form of a single large repository. Both of these approaches are limited in their adaptability and longevity and entail creation of "data silos" that by their very nature limit the flow of information due to complex data update scenarios.



The iStore Approach

iStore's approach to the Digital Oilfield is value-driven. An iStore Digital Oilfield solution creates business value by improving decision-making. This translates into easily identifiable benefits for production, reserves, exploration, productivity, and operational safety. PetroTrek®, iStore's suite of web-based digital oilfield templates, is an extensible and flexible Digital Oilfield architecture that sustains business value over time through efficient data access and fit-for-purpose functionality. iStore delivers data in ways that best support upstream E&P decision-making. It helps organizations tap the hidden potential of data working in concert. Asset teams, managers, and executives see the information inherent in data being combined in business context.

Information is delivered via a single website that ensures secure access via the company intranet or the Internet. Leveraging open standards, PetroTrek data access and visualization solutions deliver results that can be adapted over time to keep pace with changing business needs. iStore's approach facilitates rapid deployment and development of business focused decision support tools, including key performance indicators, production roll-ups, electronic well files, operations reports, and joint venture workspaces. The PetroTrek software suite features solutions for operational dashboards, drilling operations, GIS, and JV collaboration and has an integrated data management solution for use as needed.

PetroTrek solutions are built using familiar business objects, such as wells, fields, reservoirs, leases, completions, and administrative entities, such as assets, regions, departments, etc. The data access technology allows any identified data for an object (a producing well, for example) to be combined and displayed in context. This includes information such as production, health-environment-safety, operations, financial, location, facility, weather, platform, well, and human resources data. Building on established, configurable templates developed specifically for upstream petroleum business work processes, iStore Digital Oilfield solutions are rapidly deployable and easily customizable to each unique business context.

Delivering information for oil industry knowledge workers requires a deep understanding of the associated E&P workflows and data.

PetroTrek solutions employ a comprehensive authentication-entitlement model to ensure that end users see exactly what they need. A role-based approach binds specific business objects unique to the work process, such as a well completion, with associated business roles, such as production engineering. This enables administrators to easily control access from the top down for both a function and its data.

PetroTrek handles documents and structured data within the same framework so that all data, structured and unstructured, are accessible from the same web page, independent of source or storage format. PetroTrek combines technical and financial data along with documents in context to highlight situations of interest for E&P asset teams and allows any user in the enterprise to monitor, report, graph, extract, and map the information they need.

With PetroTrek, the petroleum enterprise begins generating value immediately in terms of data transparency, which continues to evolve at the speed of business as operational needs dictate new data views, charts, graphics, documents, or data grids. The combination of industry hardened technology, iStore domain experts, and iStore's experienced development team enables rapid implementation of PetroTrek solutions fit for the business purpose, usually delivering business

value within a few weeks. A typical iStore Digital Oilfield implementation will follow business priorities and can adapt as a project evolves. The delivery process includes end users, SMEs, business managers, and IT, thereby making all stakeholders co-owners and architects of the solution.

With PetroTrek, businesses can:

- ▶ **Increase ROI:** PetroTrek leverages existing information technology and data with minimal IT overhead. As a result, implementation cost is reduced while creating additional value and returns on legacy systems and IT investments, including information systems and data management.
- ▶ **Enhance Decision-Making:** PetroTrek information delivery solutions provide a decision-support framework that bridges the gap between strategic and operational decisions, enabling optimal business results and value.
- ▶ **Improve NPV:** PetroTrek boosts net present value by improving exploration and production asset management, reducing cycle time, and optimizing decision-making for exploration and production opportunities.
- ▶ **Reduce Cycle Time:** PetroTrek solutions facilitate collaboration and knowledge sharing across the petroleum enterprise, enabling organizations to harness collective expertise from a globally distributed workforce, improve process efficiency, and reduce cycle time for E&P work processes.
- ▶ **Increase Productivity:** With more timely access to the information they need to make decisions, asset teams can focus on generating business value. What's more, PetroTrek requires minimal training to use, providing a non-disruptive solution.
- ▶ **Rapidly Deliver Enterprise Intelligence:** PetroTrek can be deployed in weeks rather than months, creating immediate data transparency and value while enabling incremental value creation as data quality improves with visibility and process feedback.

Petrotrek Technology

The core PetroTrek information technology enables efficient, simultaneous connection to multiple databases and data sources with native support for Oracle and SQL Server, as well as Open Database Connectivity (ODBC). The data access technology provides a robust cache control framework to ensure data availability and application performance. A PetroTrek solution consists of:

- ▶ A server-side framework and associated libraries
- ▶ Application configuration templates
- ▶ Application metadatabase and optional QQDM database

The thin, cross-platform PetroTrek application middleware and visualization components enable rapid deployment through common web servers over the Internet or corporate intranet, delivering single-point access to all authorized users with a web browser.

Solutions are built and customized to specific business requirements using iStore proprietary technology. iStore's technology is web-based, delivering the entire application via a web browser

with no plug-ins involved. Application code, in the form of HTML, JavaScript, and CSS, is delivered through Microsoft's IIS web server via the iStore .NET framework (XTAL).

The elements served up through XTAL dynamically create user interface (UI) components in a web browser. These components contain data that is gathered from across a client's network into the PetroTrek application. To get data into the UI components (select lists, grids, charts, maps, static tables, images, documents, etc.), the components themselves make calls to another critical part of the PetroTrek architecture—a set of web services designed to deliver data on demand to the application. PetroTrek applications are composed of both UI and data. These two elements are inextricably linked; both must be present. To be effective and efficient, iStore PetroTrek applications are designed from the top down taking into consideration both the UI and the data services, and are then built from the bottom up using toolkit components. For the application to work seamlessly and efficiently, the data services are tailored and tuned to the needs of the UI.

To build effective, performant solutions, iStore offers the XTAL .NET framework. It is designed to serve up both UI components and data. XTAL web data services are REST services built on the ServiceStack code base. They are callable in either a REST or Ajax mode and allow for:

- 1) *Strongly typed objects generated from databases (based on tables, views, and stored procedures),*
- 2) *SQL defined services, and*
- 3) *IronPython-based scripted services.*

Incremental Master Data Store

While PetroTrek leverages existing IT assets and data through the federated data model thereby creating immediate business value, data that is not being managed well can be put into an iStore QQDM database. Creating a master data repository also applies even if data is being managed in project or other application-centric master databases where it makes sense to compile such data over time and share it across the enterprise. This is particularly true when data standards have not been followed in the application databases. The PetroTrek data management approach supports creation of master data as an incremental value-adding process that provides the benefits of immediate data transparency, a centralized corporate knowledge store, and a clearinghouse of data keys to legacy data stores.

iStore's QQDM utilizes a PPDM-based data model. iStore's QQDM enables petroleum organizations to benefit from an extensible, flexible database and user interface that is coupled with iStore's industry leading data visualization tools to provide a data management environment that promotes data QC, system longevity, model extensibility, QC flexibility, and cross-discipline data transparency.

E&P Data Types

Building an effective Digital Oilfield requires cross-disciplinary integration of E&P data types, including:

- ▶ LAS, LIS, DLIS Well Logs
- ▶ Directional Surveys
- ▶ SEG-Y Seismic
- ▶ Well Headers
- ▶ Cores
- ▶ Stratigraphy

E&P Data Types (cont'd)

- ▶ Production (Allocated, Planned, Actual, Forecast)
- ▶ Tests (RFT, DST, MDT, PLT, RST and more)
- ▶ Zone Attributes
- ▶ SCADA, DCS, PLC
- ▶ Operating Parameters (Temp, Pressure, Choke, Production/ Injection Flow)
- ▶ AFEs & Joint Operating Agreements
- ▶ GIS Data
- ▶ Well Events & Incidents
- ▶ Seismic Data Licenses
- ▶ Drilling Permits & Leases

Types of Data Integrated

Data virtually aggregated through the PetroTrek data access and caching model allows companies to connect to the existing databases in situ, including:

- ▶ Partner Drilling Information
- ▶ Operated & Non-Operated Well Production, Well Tests, & Operations Documents
- ▶ Completions & Workovers
- ▶ Well Tests, SCADA & Gas/ Fluid Meters
- ▶ Reserves Information
- ▶ Well Logs & Documents
- ▶ Land & Culture
- ▶ Properties, Contracts & Leases
- ▶ Seismic Navigation Data

Databases and Data Sources

PetroTrek supports the following databases and data sources, as well as more than 80 others:

- ▶ SAP Business Warehouse
- ▶ Landmark OpenWorks
- ▶ GeoQuest Finder
- ▶ Peloton WellView
- ▶ OSI PI Historian
- ▶ EMC Documentum
- ▶ ESRI SDE
- ▶ Honeywell PHD
- ▶ Landmark SeisWorks
- ▶ Professional Petroleum Data Management (PPDM) Data Model
- ▶ IBM Livelink
- ▶ IHS Probe
- ▶ SharePoint Lists
- ▶ IHS Enerdeq Web Service
- ▶ ImpactWeather Feeds
- ▶ Proprietary Data Models (in Oracle, SQL Server, MySQL, all with ODBC)

iStore provides integrated products, services, and solutions for the oil and gas industry focused on maximizing the value of data by providing quick and easy access to organized, high quality information.

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