



PointCross Solutions

www.pointcross.com

blog.pointcross.com

get_started@pointcross.com

POINTCROSS'S SMART OILFIELD (SOF™)

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PointCross's Smart Oilfield (SOF™) supports intelligent operational, tactical, and strategic decision-making by offering meaningful access to E&P companies' existing knowledge base, including SCADA and DCS data; advanced search, orienteering, meta-analysis, and predictive analytics capabilities; and process orchestration, all in a secure, unified collaborative environment.

THE NEED FOR SMART

The deep waters of the Gulf of Mexico, the frigid tundras of Russia, and the desolate deserts of the Middle East are just some of the exploration and production sites too inaccessible and unsafe to staff with any more than a minimal team essential for operations. Added to these geographic considerations are several social and economic factors – including the “crew changes” that are making skilled industry personnel precious resources themselves; and increasing competition that demands smarter, faster decision-making based not only on good data – but the best possible knowledge.

The convergence of these factors has driven E&P companies to automate their production and maintenance wherever possible, and extract knowledge for strategic decision support. Since the last decade, companies have begun doing this to maximize first year operability from new production facilities, optimize production for maximum recovery from the existing facilities, improve the life of the field, reduce downtime, optimize production, eliminate unplanned maintenance costs, and improve their HSE environment.

A number of oil companies and oil field service companies have invested considerable capital and effort in bringing this kind of automation to their oil fields. These initial efforts have been appropriately focused in the area of developing sensors and controls that can be deployed in the harsh environments of an oil or gas field, on shore and off-shore. New technologies such as RFID have taken root bringing with it the promise of data integrity and remote sensing with more flexibility at less cost.



The actual goal however remains the introduction of intelligence into the operation of the field by extracting meaning from the massive amounts of data being generated and putting control loops in place to automate certain low-level decisions which were traditionally made by people working the field with manual collection of data. Companies are now seeking not only to see their data anytime, anywhere, but to be able to understand, manipulate, and collaborate with that data toward the goal of effective and fast decision-making. In other words, they are now seeking not only Digital – but ‘Smart.’

What does a Smart Oilfield look like? One with a high ‘intelligence quota’ should include:

- ☑ An evolving knowledge infrastructure;
- ☑ Search and navigation across enterprise-wide data in a purposeful way to uncover salient, new knowledge;
- ☑ Metadata extraction and meta-analysis of data across multiple wells, collection, and treatment facilities;
- ☑ Meta-data extraction from the performance of automated and people-in-the-loop decision control loops
- ☑ Pattern & trend-tracking, and the ability to perform predictive analytics;
- ☑ Integration of process-sourced data, other structured information, and tacit knowledge in meaningful ways; and
- ☑ Advanced collaborative environments around the context of people’s work.

These capabilities will allow E&P companies to take their Digital Oilfields the next logical step forward to support medium-to-long-term, ‘Outer Loop’ decision-making.

SMART OILFIELDS: THE OUTER CONTROL LOOPS

The instantaneous, daily, monthly and yearly decisions by which a modern oilfield is run are examples of cascading control loops – a control loop being loosely defined as an “observe-decide-act” process executed by a human, automatic control, or a hybrid system.

In each case there are, broadly, three levels of control loops, each one nested within the other. The innermost loop takes care of the fast-reacting, operational responses. The middle level applies a higher level of smart feedback controls usually by inserting a human being into the control loop so that tactically significant, short-to-medium-term decisions can be made. Outermost are the longer-term, strategic decisions made with broader understanding of insights and trends contained in sensory data and other internal and external knowledge.

Current Digital Oilfield solutions deal primarily with the inner loop and in some cases and to some degree the middle loop, while SOF™ stands on the shoulders of these technologies to support the outer two loops – especially people-in-the-loop processes and the collaboration required there.

Over the past few years, E&P companies have executed some level of automation in some fields, primarily focused on data collection from facility systems, sub-systems, sensors and such using SCADA and DCS systems – the ‘inner loop.’ Some companies have gone a step further and created an onshore center where they bring in the SCADA and DCS feeds for operational stakeholders for them to analyze and make decisions. The availability of this data facilitates the middle loop to an extent, although not all the information necessary or desirable to make some of those tactical decisions are available or easily extracted.

These medium-to-long-term decisions – the outer two control loops – require involvement and approvals by stakeholders responsible for the overall operations and maintenance of the fields, governance and execution of

strategy, planning, HSE compliance, security, and more. These stakeholders in turn need ready access to complete and meaningful data to support their decisions; however the siloed data environments of most oilfields do not seamlessly integrate these people-in-the-loop processes.

People-in-the-loop processes, operations, planning, and strategic workflows require appropriate and organized information to make informed decisions; deliberations among engineers, management and/or other users; and collaboration and communication through emails, SMS alerts, phone calls and exchanged documents. Conducting these on an ad hoc basis is risky because key people-to-people steps tend to be missed and key steps in the production processes can fall between unintentional cracks risking HSE. Also, the products of these deliberative decisions are essential for compliance and audit traceability.

By intelligently orchestrating relationships between people, processes and knowledge, SOF™ provides a level of support for these people-oriented decision processes that is relatively new in current Digital Oilfield environments.

For a technology to support this kind of intelligent decision-making, it must be built on a platform that is intrinsically capable of handling and interacting with people, knowledge, and processes seamlessly.

‘SMART’ PLATFORM: AN ORGANIZATIONAL BRAIN

SOF™ has a fundamentally different architecture from typical enterprise software in that it is rooted more in neuroscience than computer science. Its underlying platform, Orchestra™, is run on an ontology engine which is highly flexible, adaptive and capable of representing institutional memory and relationships. Orchestra™ is a metabase of extracted metadata and their relationships to people, processes, and their knowledge in context. It is a tentative representation of how memory, decisions, and knowledge are stored in a brain to the extent we understand it through neuroscience.

Orchestra’s™ unique ontology engine becomes smarter, creating new connections (like the synapses in our brains) as processes cycle and each user performs their normal daily tasks. As processes and people use data in various contexts, they are creating a living, dynamic repository with traceability and integrity. This process of ‘contextualizing’ otherwise passive data through normal, daily activities of process cycles, operations, and business decision-making is the transformation of static data into usable knowledge – and SOF’s™ foundation for "smarts."

THE CRADLE OF INTELLIGENCE: CONTEXT

When it comes to information technology, ‘context’ is the cradle of intelligence. Many technologies attempt – and may even succeed – in uniting data across multiple systems, assets, geographies and other artificial data silos. But even if it is centralized, data *en masse* is confusing and unintelligible. For data to be *meaningful*, it must be understood in context.

A context can be defined as a virtual object that represents a real world business topic, event, entity, asset, project, deal, and any other concept around which business decisions will be made. Because contexts are ideas and objects that engineers, geophysicists, and business users think about every day, users are able to stay immersed in their familiar language and thought process while reaching deep into the institutional memory stores of their organization. When data is married to its relevant context, it automatically forms transitive relationships with other data in the same contextual families, and thus become part of the company’s living, evolving intelligence.

Unlike the discrete data in database-driven platforms, contexts flow organically across the rigid boundaries of databases, data formats, applications, org charts, geographies, wells, and reservoirs to connect knowledge and people in new, creative ways. For E&P companies, this represents an opportunity to gain new perspective on data that has already been applied for ‘inner loop’ decision-making, by connecting and analyzing that data holistically and intelligently to extract higher and higher levels of metadata, and discovering fresh insights that can be applied to tactical and strategic decisions.

OVERVIEW OF POINTCROSS’S SMART OILFIELD™

SOF™ is a secure unified collaboration environment for automating people-in-the-loop processes and supporting operational, tactical and strategic decision making. Its core capabilities include:

- ☑ An Evolving Knowledge Infrastructure that is capable of extracting metadata and creating a metabase
- ☑ Knowledge Discovery through Search & Orienteering
- ☑ Comparative & Predictive Analytics
- ☑ Data Normalization for Universal Standards
- ☑ Process Orchestration
- ☑ Portals & Dashboards
- ☑ High-Value Collaboration
- ☑ Security & Compliance for “Most Sensitive” Information

AN EVOLVING KNOWLEDGE INFRASTRUCTURE

SCADA and other operational data is typically consumed in immediate and short-term monitoring at the time it is sampled, and then filed away in the data historian where its access and use is limited; an E&P company’s tacit knowledge, including emails and documents, have similar fates. However the value of this data can appreciate if it is used, re-purposed, annotated, and made available in a way that people can draw new connections and insights by searching and navigating through it in various contexts.

SOF’s™ knowledge infrastructure supports learnings, look-backs, compliance and audit traceability. The ontology engine within SOF™ ensures that all the decisions, the basis for those decisions, the relevant structured and unstructured data used to make those decisions, the stakeholders who were involved in the decisions, and the metadata are continuously captured contextually in a common trusted source. SOF™ then does near-real-time re-purposing of this information gathered during process execution into system-level breakouts and role-wide breakouts, so that it is possible to look for maintenance, uptime, and “first year operability” decisions and look backs from completed processes.

SEARCH & ORIENTEERING

Built intrinsically into SOF’s™ ontology engine are powerful methods of discovery that span the breadth and depth of institutional knowledge, giving users rich access not only to the right portions of the SCADA and DCS data but also automatically extracted metadata and contextually relevant tacit and structured information, that together can foster broader understanding and better-informed decision-making.

SOF™ offers a variety of Search options – including free text, full content, metadata character, and parametric – as well as navigated search, or Orienteering. Orienteering allows users to chart multiple foraging pathways through

institutional data, to understand the context of their search results, and to explore new and often unforeseen relationships across wells/reservoirs, people, applications, and geographies, breaking down these traditional silos. This exploration is the key to explorationists and oilfield engineers connecting patterns across disparate, disconnected areas of knowledge, seeing new patterns that were previously hidden, and collaborating with their peers toward common understanding and aligning their goals.

COMPARATIVE AND PREDICTIVE ANALYTICS

SOF™ taps into a company's existing knowledge base, including real-time SCADA and control data, contextually organizing it with related tacit content and process-sourced data, and extracting valuable metadata. This data infrastructure allows E&P companies to perform advanced meta-analytics across multiple wells, reservoirs and systems, and a basic level of predictive analytics, in support of intelligent operational and strategic decision making.

SOF™ provides facilities to analyze the data, meta-data and predictive trends generated from external third party tools, as well as comparative analytics from historical information existing and other similar facilities. It provides statistical analytics including filtering of raw data to create the metadata. The solutions can also be used to provide decision support in terms of looking for similar patterns in parametric data, or providing short term predictive indicators from current and near-past data, or conditions.

DATA NORMALIZATION FOR UNIVERSAL STANDARDS

Data standards can help reduce the friction of information transfer between multiple sites, partners and regulatory agencies such as HSE, but the standards themselves have different versions that continue to make comparisons of data from multiple versions difficult.

Orchestra's Semantic Data Exchanger (SDE™) combined with contextual communications facilitate the interactions across the organization and between E&P companies, partners and agencies. SDE uses semantically-linked thematic data models to form a universal operational data model instead of the typical data base centric single rigid monolithic data, which makes this kind of flexibility with integrity possible.

PROCESS ORCHESTRATION

SOF™ offers a suite of orchestrated processes and solutions – its Integrated E&P Suite (IEPS™) – that are essential for efficient oilfield operations, tactical decision-making, and long-range planning. The suite orchestrates disparate processes across the organization with relevant challenge-response criteria at key tollgates; streamlines data flows in order to create an efficient production environment; integrates and contextualizes process-sourced data with other relevant content; and provides collaboration facilities around contexts related to the processes.

PORTALS AND DASHBOARDS

SOF™ is capable of driving multiple portals with topical information, dashboards, graphics and other interactive screens. The preferred portal is Microsoft's SharePoint. Our Gluon™ adapter is intended to provide all the data synch and conversion capabilities between SharePoint and Orchestra™ and smart synchronization to Outlook or mobile smart phones. With the companion Solo™ client provided to SOF™ users, Orchestra™ extends SharePoint to E&P offline users through their Outlook (or optionally configurable to Lotus) client so that these users can work with the most recent information and their teams even when offline. The same extension can be made to mobile devices such as PDAs and smart phones. For more information, read our brief on Gluon™ on www.pointcross.com under Papers & Articles.

HIGH-VALUE COLLABORATION

As technology gets smarter, so must the people filling increasingly knowledge-based roles. Activities that used to be performed by dozens of people on site can now be performed by a few people armed with the right technology and knowledge. Collaboration between these knowledge workers is rapidly going from a high-value activity to a basic necessity at every level of the organization.

In SOF™, collaboration organically evolves through self-selection as users automatically declare common goals by spending time within various contexts. The more users ‘hang out’ within certain contexts, the more they will virtually ‘bump’ into other users within those contexts, and thus form professional networks that are mutually beneficial.

SECURITY & COMPLIANCE

SOF's™ platform, Orchestra™, was architected not only to meet the needs of a knowledge intensive industry, but with the recognition that these same industries are decision-centric – where the decisions are based on informed risk taking and judgment, and they are subject to audit reviews, compliance regulations and sensitivity. The business sensitivities are so high that if these decisions and supporting data are allowed to fall into unauthorized hands it could cost the company dearly not to mention the likelihood of potential breach of regulations related to governance and securities.

Orchestra™ was architected with search, security, and compliance at its core in part driven by its genesis in defense, and to a greater extent by our understanding of the environment in which decisions are made in knowledge industries such as E&P. SOF™ intelligently uses role-based security at the context level to keep knowledge safe and secure at all levels of the organization.

KEY BENEFITS OF SOF™

- ☑ Shorten ‘Data to Decision’ cycles: empower E&P companies to identify issues and opportunities in their production facilities faster and more reliably;
- ☑ Drive better operational and strategic decisions by enabling advanced search, orienteering, meta-analysis, and predictive analytics;
- ☑ Maximize first year production and operability, and minimize production downtimes;
- ☑ Flexible architecture enables rapid deployment - about 1/10th the time of traditional architectures;
- ☑ Lowest total cost of ownership - about 1/3rd of traditional systems;
- ☑ High Returns – SOF™ deployment at an independent Oil & Gas company delivered an IRR from Productivity gains of 612% (not including risk reductions such as managing downtimes).

COMPONENTS OF SOF™

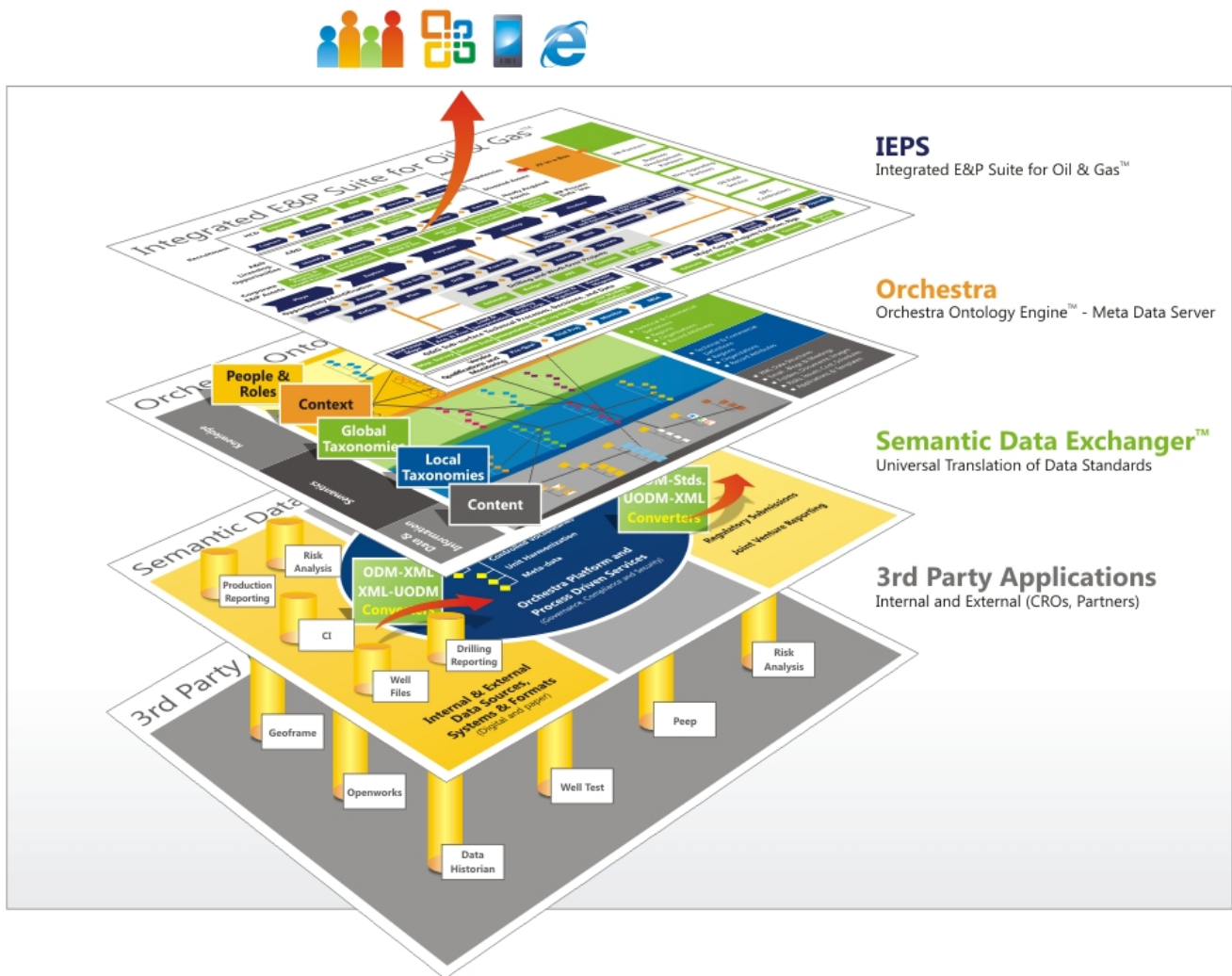
The below schematic represents SOF's™ layered architecture and its various components.

The Semantic Data Exchanger (SDE™) is layered below Orchestra™, translating data formats and units across multiple sites, partners and regulatory agencies that may use different data standards, thereby allowing multiple parties to talk to each other through digital networks.

PointCross's ontology engine, Orchestra™, sits on top of Semantic Data Exchanger, contextualizing and provisioning data and information, constantly building the organization's institutional memory.

The Integrated Exploration & Production Suite (IEPS™) sits on top of this foundational architecture, automating processes across the organization and offering holistic access to the company's knowledge, processes, and relationships.

In the following pages, we will discuss each of these components in more depth.



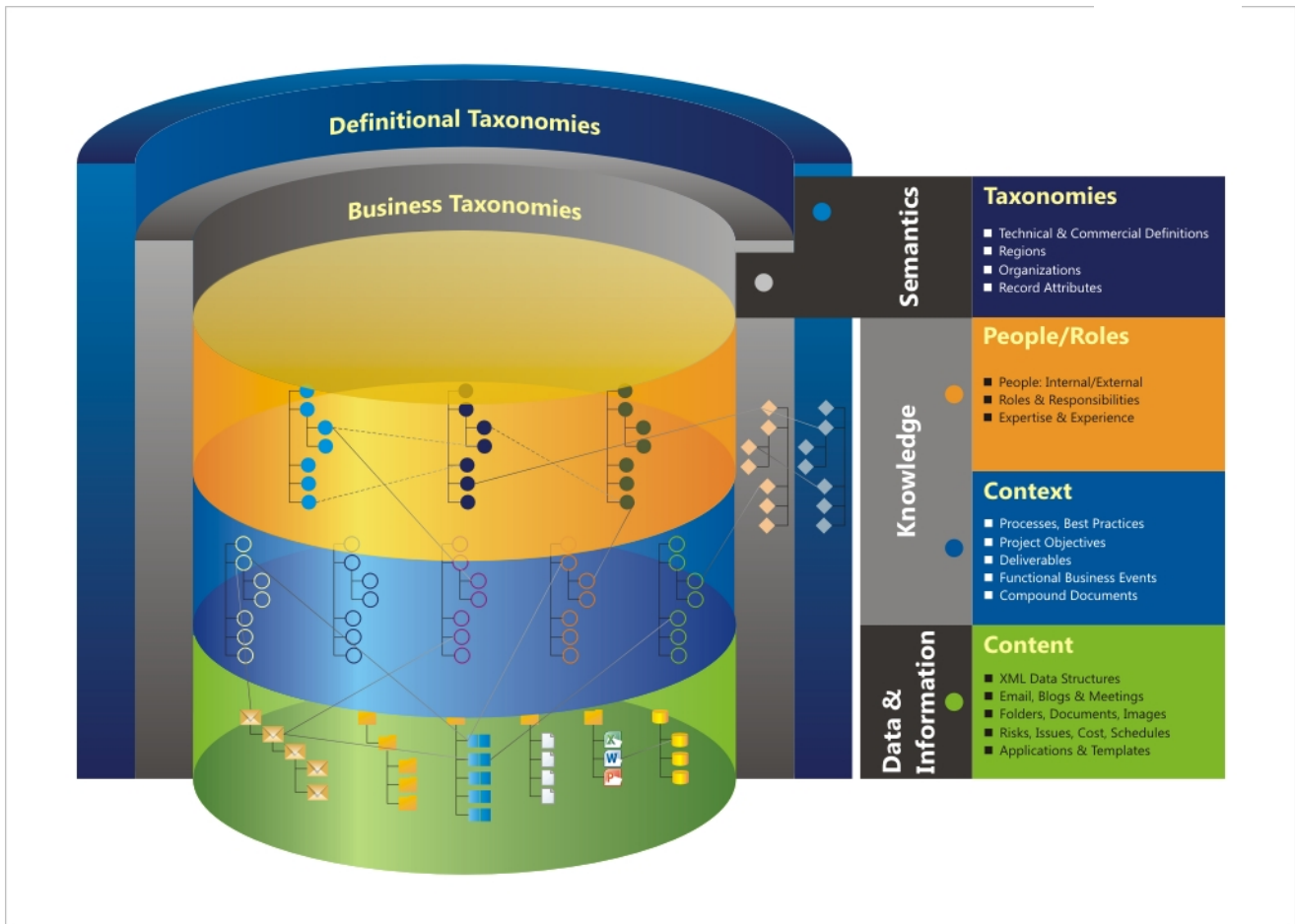
ORCHESTRA™ BUSINESS ONTOLOGY

The foundation of SOF™ is the Orchestra™ Business Ontology Engine and Meta-Data Server or metabase. This ontology engine represents an extensible data model that is behind the multitudes of processes that support exploration and exploitation. The data model is thematically constructed with an open XML schema that is can be re-purposed to any integrating applications, external reporting needs, or for secure access through dashboards, analytics and such.

The ontology engine continuously contextualizes attributes and adds the meta-data generated from processes to the data that is gathered from various production applications such as SCADA and data historians. It also associates this data with emails, SMS, meetings and documents that are exchanged in completing the production processes, or in decision making. This engine also has facilities to re-purpose the gathered data and distribute it to the appropriate processes and stakeholders in real time.

Orchestra™ helps eliminate both the knowledge and management gap in organizations by vertically integrating the knowledge stack of data, information, and knowledge, with the management stack of strategy, tactics and operations. Orchestra is therefore strategic to the enterprise, while simultaneously facilitating daily interactions among people and processes.

Read our white paper [“Why an Ontology Engine Drives Orchestra”](#) on our website under Papers & Articles.



SEMANTIC DATA EXCHANGER (SDE™)

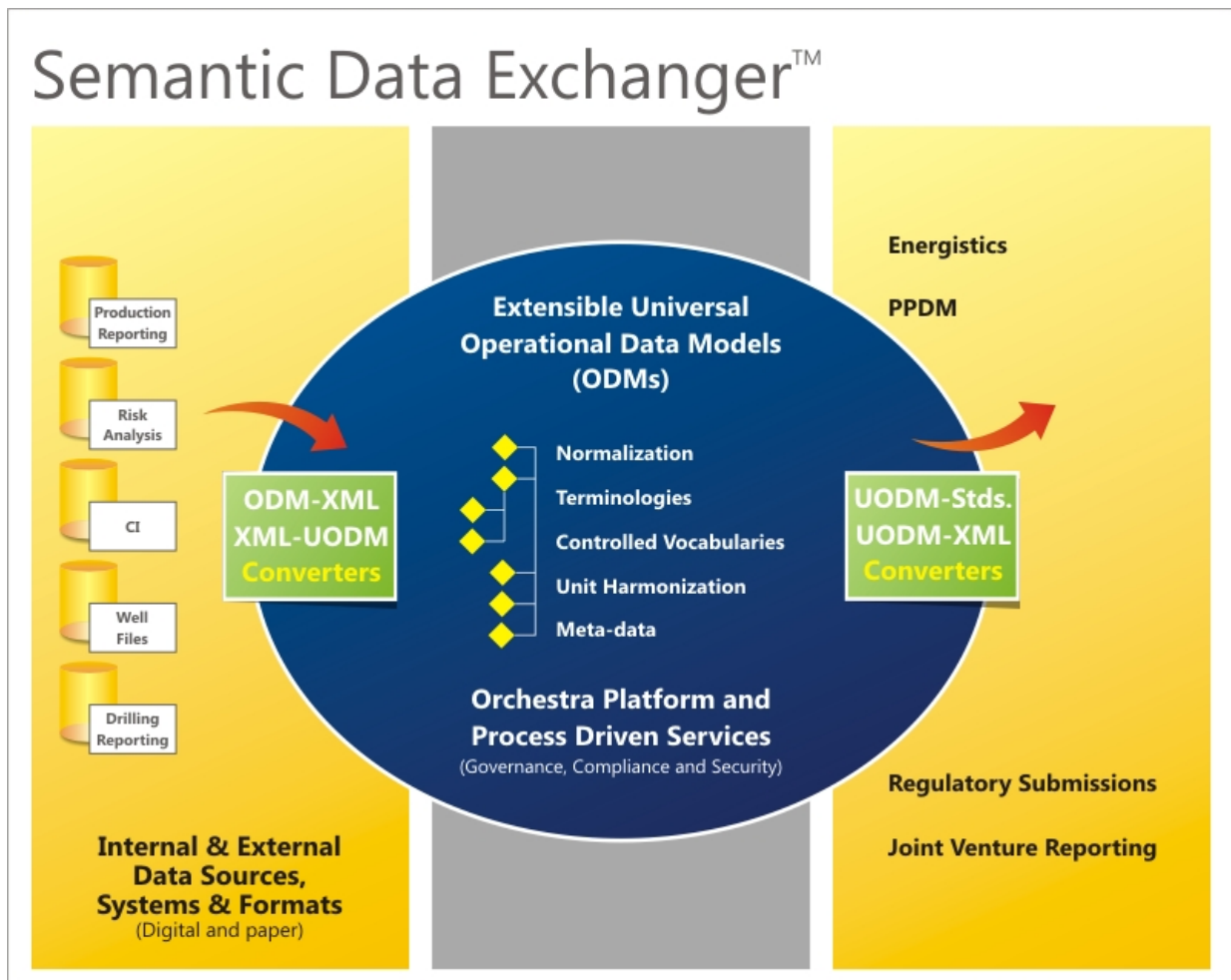
The Semantic Data Exchanger™ provides a comprehensive, flexible, and rapidly deployable integration framework which enables contextual data acquisition and integration, while ensuring data integrity and audit traceability.

SDE™ is an enterprise toolkit that creates a unified layer for data exchange services. It can be thought of as a grand central station for all data and information flowing in and out of the organization while proving simultaneous translation services much like in the United Nation general council meetings. It supports the creation of standard connectors to common E&P applications, and also provides the ability for companies and their systems integration partners to build and maintain their own connectors. All data is held in vendor neutral XML.

In this sense, SDE™ is a “data exchange terminal” that can:

- ☑ Securely extract data from multiple systems and formats
- ☑ Convert it into a Universal Data Model (avoiding the perils of point-to-point integration)
- ☑ Create linkages among controlled vocabularies and taxonomies, and
- ☑ Publish data on demand and with integrity to other formats, or to other applications for meta-analysis.

Read our white paper on the “[Semantic Data Exchanger](#)” on our website under Papers & Articles.

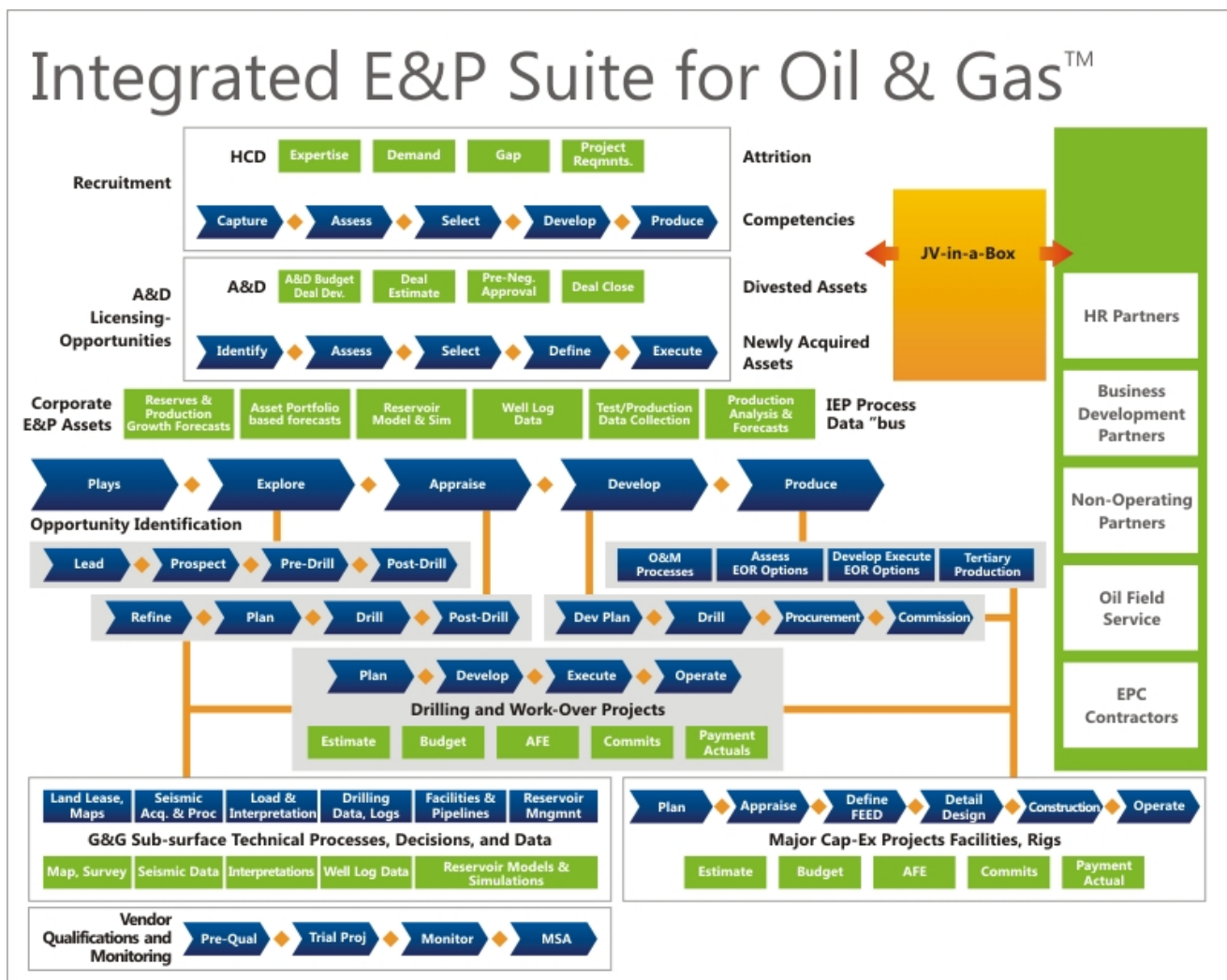


AN ADAPTIVE PROCESS FRAMEWORK (IEPS):

PointCross's Integrated Exploration & Production Suite (IEPS™) is a suite of orchestrated processes and solutions that are essential for all E&P companies. IEPS™ covers initiation, execution, and monitoring of assets, projects, or deals using common processes and governance by roles. Every IEPS™ process captures all the content and communications generated in the course of its execution while keeping track of the incremental expertise gained by the people involved and the knowledge gained by the project being matured. Individual modules of IEPS™ can be independently deployed at various times and merged into a single orchestrated environment.

IEPS™ also includes additional dashboards for controls of these processes by their stakeholders as well as project, program, and portfolio management offices. Information and data from one process flows automatically to, or triggers, other processes to create an orchestrated virtual representation of the E&P Company.

Since IEPS™ is built on top of the underlying Orchestra™ ontology engine, the natural flexibility of ontology environments makes IEPS™ adaptive and capable of working with a company's current processes, rather than asking the company to bend to the technology's processes.



This means rapid, painless implementation without interruption of current company business processes. IEPS™ works so seamlessly with the business, and with the natural workflow of employees, that employees generally adopt the technology quickly and easily, and companies can begin realizing value in as soon as a few weeks.

Following is an overview of the processes that are automated as part of SOF™:

- ☑ Well StartUp
- ☑ Production Data Accounting & Reporting
- ☑ Permit to Work
- ☑ Well Shutdown
- ☑ Manifold Shutdown
- ☑ DWPLEM Shutdown
- ☑ Subsea Intervention With Shutdown (Production loss)
- ☑ Subsea Intervention Without Shutdown (No Production loss)
- ☑ Subsea Intervention with Valve Operation
- ☑ Production Planning
- ☑ Sand Monitoring & Management
- ☑ Hydrate Monitoring & Management
- ☑ Annulus Pressure Monitoring
- ☑ MEG Injection Monitoring
- ☑ Well Ramp up/Ramp down
- ☑ Shutdown Planning

The key business deliverables as part of automation and deployment of these processes include:

- ☑ Automation of common workflows and processes to manage production and planning
- ☑ Improve visibility to production events, providing better management and prioritization on resolution of events
- ☑ Deliver an evergreen knowledge repository of its operations, developmental decisions and performance
- ☑ Management reporting at their desktops, laptops and even their mobile devices with security, transparency, drill-down, and data integrity in near real-time – or on demand
- ☑ Improve clarity in business and technical decisions that materially impact the P/L or Balance Sheet
- ☑ Support medium term planning and production forecasts
- ☑ Visibility into status, risks and identifying and tracking issues for every instance of a business process
- ☑ Organization of emails, documents, and associated information related each instance of a business process
- ☑ Capture meeting notes and relate them to the appropriate activity in a business process
- ☑ Ability to search and discover information related to different business processes
- ☑ Offline capabilities for collaboration
- ☑ Ability to securely interact with all stakeholders
- ☑ Live simulation of production processes to replicate real world scenarios for training and reality check on staff preparedness

ABOUT POINTCROSS

PointCross is a global provider of advanced strategic business solutions to knowledge-rich markets, including the Oil & Gas industry. Our Integrated Exploration and Production Suite (IEPS™) specifically addresses E&P companies' business needs. At the heart of PointCross's solutions is Orchestra+Solo™, an adaptive, contextual knowledge environment and personalized client that orchestrates core business processes. This robust solution set provides:

- ☑ Single point of access to contextualized tacit and structured knowledge across the enterprise, with search and guided navigation within and across contexts;
- ☑ Robust search and orienteering capabilities across studies, emails, documents, meta-data and more across the entire organization, EPCs and partners
- ☑ Flexible, fool-proof IP security based on contexts and roles, determined by business rules;
- ☑ Secure multi-party workflows for knowledge sharing and business-social networks within and across companies;
- ☑ Semantic Data Exchanger (SDE™) for vendor-neutral data exchange, normalization and unit harmonization;
- ☑ Business development, e-discovery, audit, compliance, and more;
- ☑ Scalable architecture and development toolkits for additional capabilities.

PointCross represents a new way of doing business. We deliver business ready solutions in 1/10th the time and a fraction of the costs compared to standard technologies, while offering strategic advice from people who know the Oil & Gas industry.

We are headquartered in the California Bay Area with offices in Houston, Texas and Bangalore. We are a Microsoft Gold Certified partner. We also have a global network of service, consulting and infrastructure partners.



For more information, visit us at www.pointcross.com and call us at (281) 295-1900. Also, check out our blog at <http://blog.pointcross.com>.