Energistics and ISO 15926

October 20, 2010
Kuala Lumpur

Introduction to Energistics

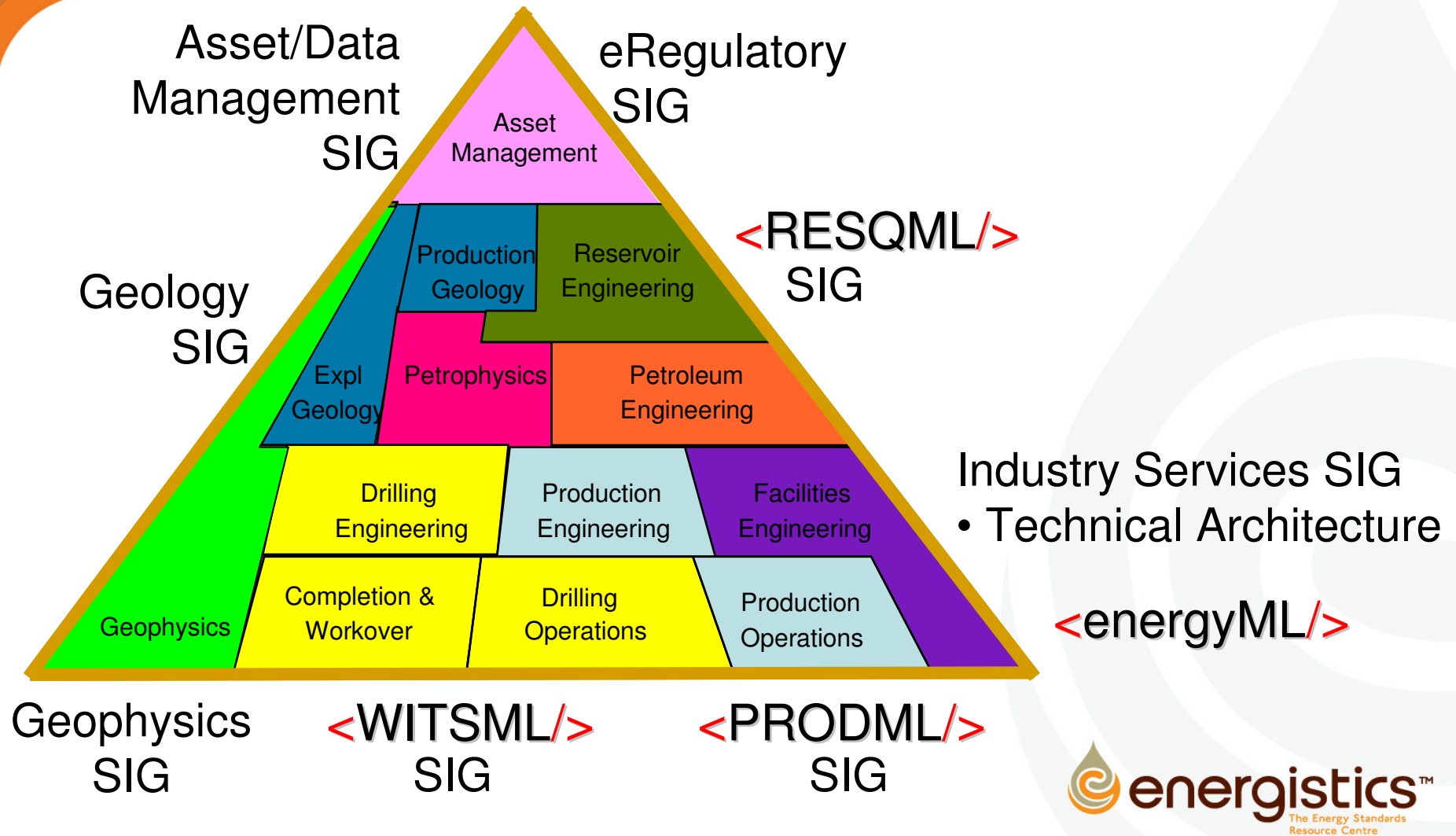- An open standards consortium
- 20 years serving upstream industry (formerly as POSC)
- Over 100 members…
  - Integrated, independent & national energy companies
  - Oilfield service and professional service companies
  - Software, hardware and integration vendors
  - Regulatory agencies, institutes and media partners
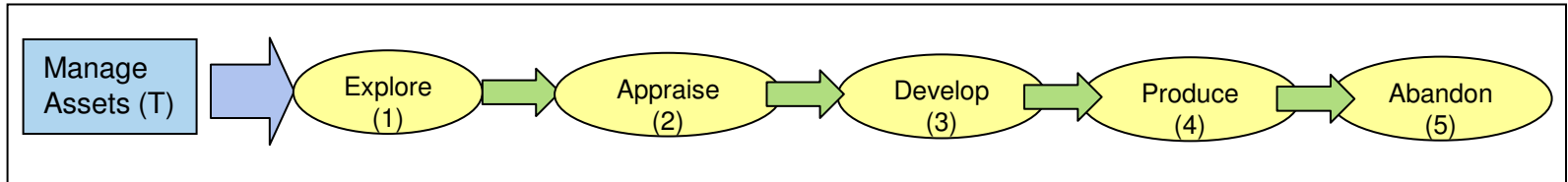- Varied portfolio of standards, with emphasis on DATA EXCHANGE

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Benefits of Data Exchange Standards

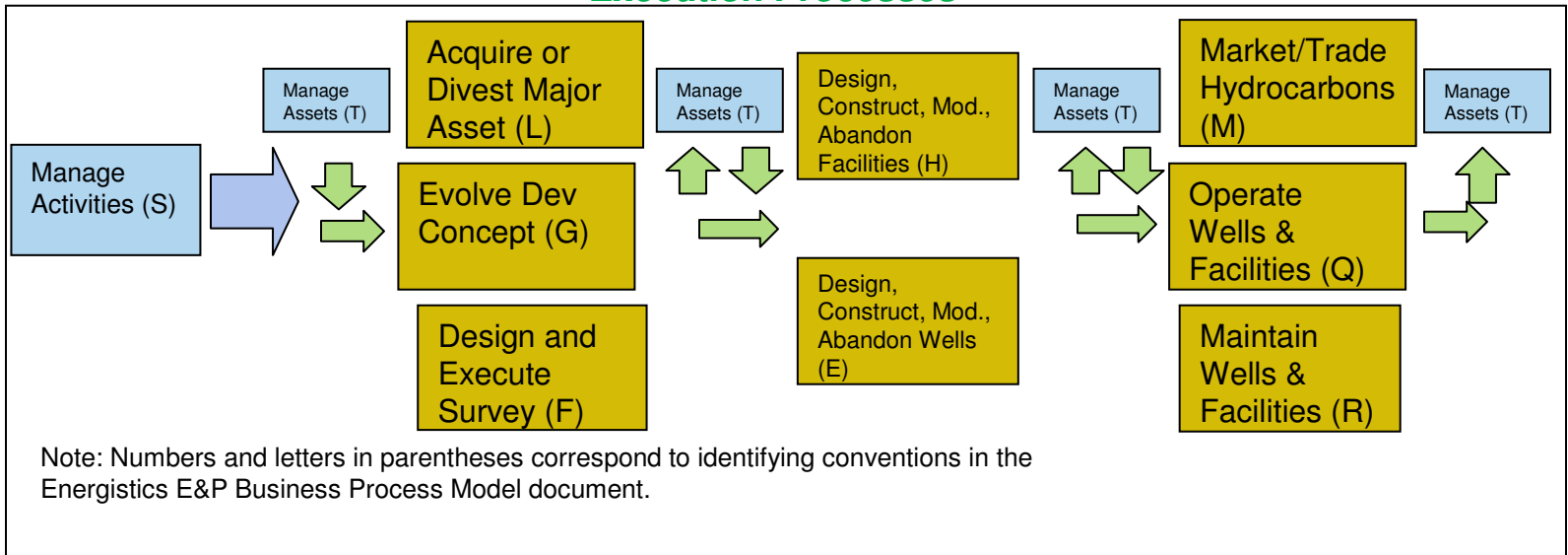|		
Improved accuracy	i.e.	ETL can be lossy, error prone, and rules for what represents a complete, valid business object are inconsistent from system to system
Overcome limits of proprietary formats	i.e.	avoid vendor lock-in, "plug and play"
Compliments/encourages development and use of common ontologies	i.e.	standard formats lead to conversations about standard vocabularies
Real Time Data	i.e.	eliminate unnecessary transformations
Efficient integration	i.e.	build once, connect many, reuse standard business objects in multi-functional workflows

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Energistics Subject Areas

Asset/Data Management SIG

eRegulatory SIG

Geology SIG

<RESQML/> SIG

Industry Services SIG
• Technical Architecture

Geophysics SIG

<WITSML/> SIG

<PRODML/> SIG

Asset Management

Production Geology

Reservoir Engineering

Expl Geology

Petrophysics

Petroleum Engineering

Drilling Engineering

Production Engineering

Facilities Engineering

Geophysics

Completion & Workover

Drilling Operations

Production Operations

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Asset Life Cycle Stages

Management Processes

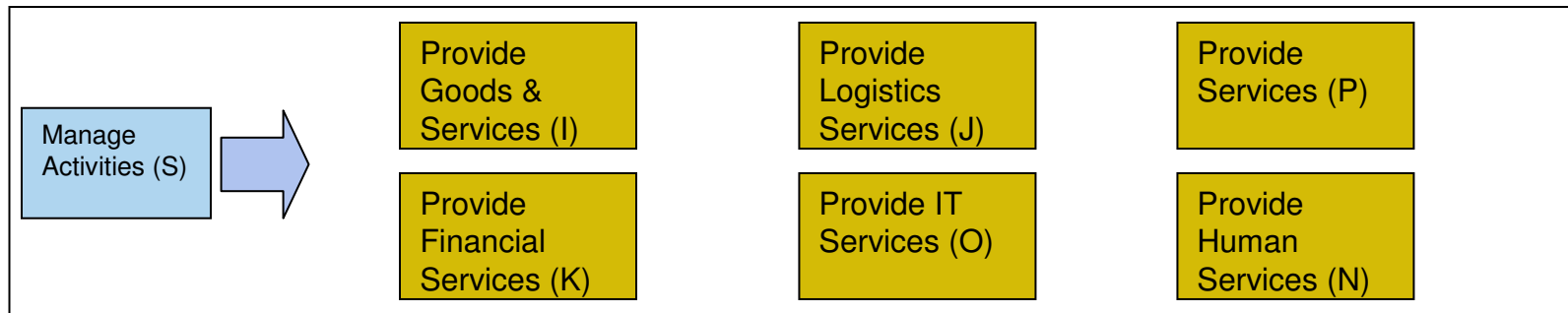| Manage Assets (T) | → | Explore (1) | → | Appraise (2) | → | Develop (3) | → | Produce (4) | → | Abandon (5) |

Each stage above uses various combinations of the Execution and Service Processes.
Some processes are universally applicable; others are modified, as appropriate, for a particular stage.

Execution Processes

Manage Business (B)

Manage Corp Management System (C)

Manage Processes (D)

Manage Activities (S) →

Manage Assets (T)

Acquire or Divest Major Asset (L)

Evolve Dev Concept (G)

Design and Execute Survey (F)

Manage Assets (T)

Design, Construct, Mod., Abandon Facilities (H)

Design, Construct, Mod., Abandon Wells (E)

Manage Assets (T)

Market/Trade Hydrocarbons (M)

Operate Wells & Facilities (Q)

Maintain Wells & Facilities (R)

Manage Assets (T)

Note: Numbers and letters in parentheses correspond to identifying conventions in the Energistics E&P Business Process Model document.
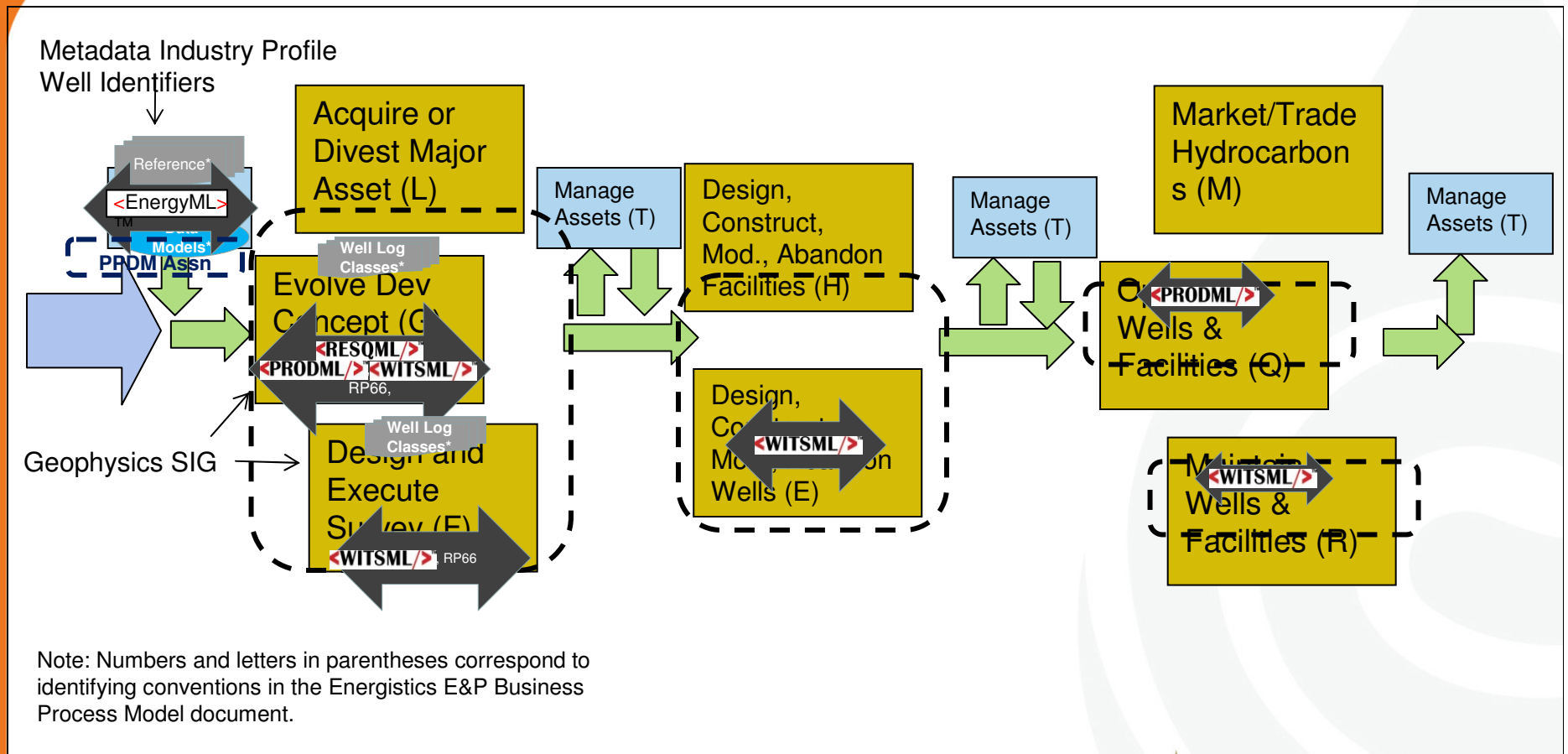
Support Processes

Manage Activities (S) →

Provide Goods & Services (I)

Provide Financial Services (K)

Provide Logistics Services (J)

Provide IT Services (O)

Provide Services (P)

Provide Human Services (N)

Energistics Standards and the Execution Processes

Metadata Industry Profile
Well Identifiers

Reference*

<EnergyML>

™

Data Models*

PRDM Assn

Acquire or Divest Major Asset (L)

Manage Assets (T)

Design, Construct, Mod., Abandon Facilities (H)

Manage Assets (T)

Market/Trade Hydrocarbons (M)

Manage Assets (T)

Well Log Classes*

Evolve Dev Concept (G)

<RESQML/>

<PRODML/> <WITSML/>

RP66,

Well Log Classes*

Geophysics SIG

Design and Execute Survey (F)

<WITSML/> RP66

Design, Construct, Mod., Abandon Wells (E)

<WITSML/>

O... Wells & Facilities (Q)

<PRODML/>

Maintain Wells & Facilities (R)

<WITSML/>

Note: Numbers and letters in parentheses correspond to identifying conventions in the Energistics E&P Business Process Model document.

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Standards Landscape

	Develop (G)	Survey (F)	Drill Well (E,R)	Operate (Q)	Build Facility (H,R)
Explore and Produce (A)					
Manage: Company (B), Accountability (C), Process Program (D)					
Acquire/Divest (L)					
Drilling SIG	WITSML	WITSML	WITSML		
Production SIG	PRODML			PRODML	
Reservoir SIG	RESQML				
Asset & Data SIG	metadata	metadata	metadata	metadata	metadata
Geophysics WG		velocity, metadata			
eRegulatory WG			reg. reporting	reg. reporting	
Technical Arch WG	EnergyML, WSI, Cloud	EnergyML, WSI, Cloud	EnergyML, WSI, Cloud	EnergyML, WSI, Cloud	
Manage Asset (T)					
Market Hydrocarbons (M)					
Provide: Goods & Services (I), Logistics (J), Finance (K), Human Resources (N), Information Technology (O), Lab (P)					
Manage Activity (S)					

not shown: Epicentre, Geoshare, RP66, PWLS, well log classes

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<WITSML/>™

<PRODML/>™

<RESQML/>™

<ENERGYML/>

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WITSML™ Drilling Standards

"The 'right-time' seamless flow of well-site data between operators and service companies to speed and enhance decision-making"

An Open Information Transfer Standard for the Oilfield

‹WITSML/›

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WITSML Data Object Schemas (XML)

General
- Well
- Message
- Operations Report
- Real Time
- Wellbore
- Wellbore Geometry
- Risk
- Coordinate Ref Sys
- Drill Report
- Attachment
- StimJob (Fracturing)

Surface Logging
- Mud Log

Surveying
- Survey Program
- Target
- Trajectory

Logging While Drilling
- Log → Well Log (includes Wireline)
- Formation Marker
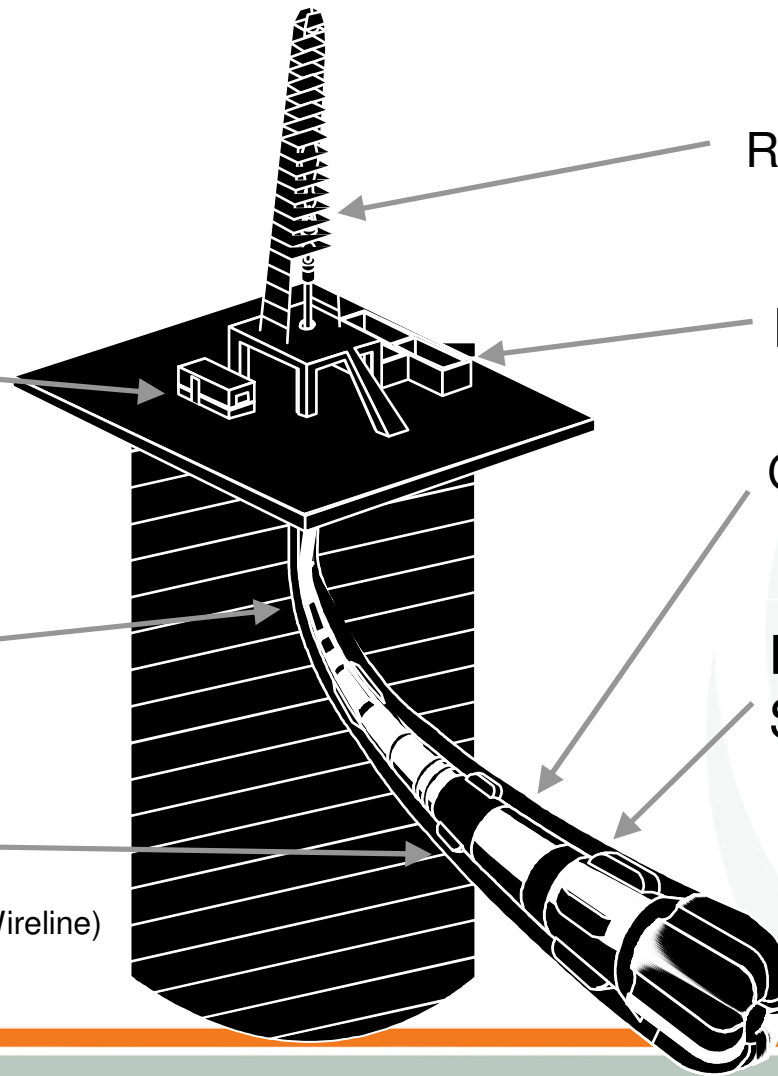
Communication
- Subscription
- Server Capabilities

Rig Instrumentation
- Rig / Rig Equipment
- Cement Job

Fluids Systems
- Fluids Report

Coring
- Sidewall Core
- Conventional Core

Directional Drilling Systems
- Tubular /
- Bit Record
- BHA Run

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Service Contractor to Operator

Service Company | Operator

WITSML

User interface control

Application / Corporate Data store

RT Torque-drag analysis

Geoseteering
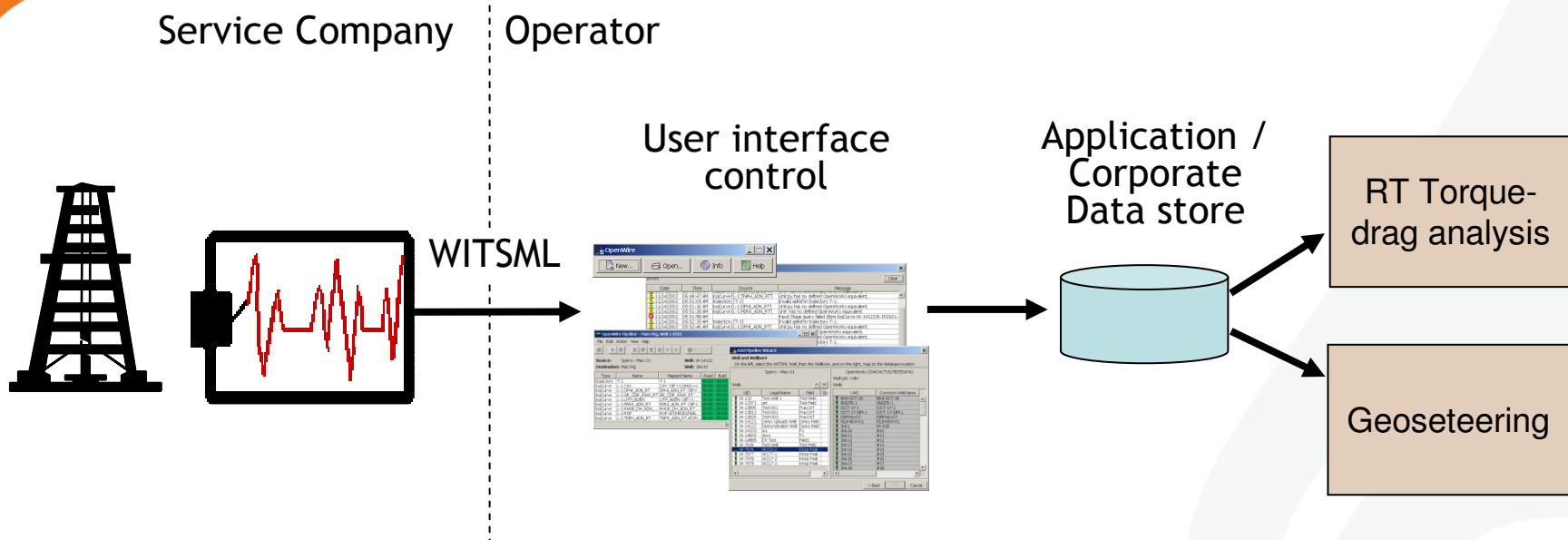
- Enhanced situational awareness

- Real-time engineering analyses in certified corporate tools

- Linear and most commonly uni-directional

Inter-Operator and Operator to Government

- Partner reporting

- Government reporting
  - E.g. Norwegian NPD

- Increased automation

- Query-able data vs. pdf

WITSML

- Next Deliverable: v1.4.1 near completion, contains: bug fixes, stimJob object for fracturing reporting, error Model object

- Milestones: Candidate Release July 2010, Publication target January 2011

- Other:
  - *WITSML Brief* updated to reflect new release information – posted on website – Standards Portfolio Drilling section
  - Abstract submitted to IADC 2011 Program Committee – purpose to educate IADC members about WITSML and to explore WITSML role in drilling automation

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PRODML™ Production Standards

Current Specifications

Production

- ProductVolume
- ProductionOperation
- ProductFlowModel
- WellTest
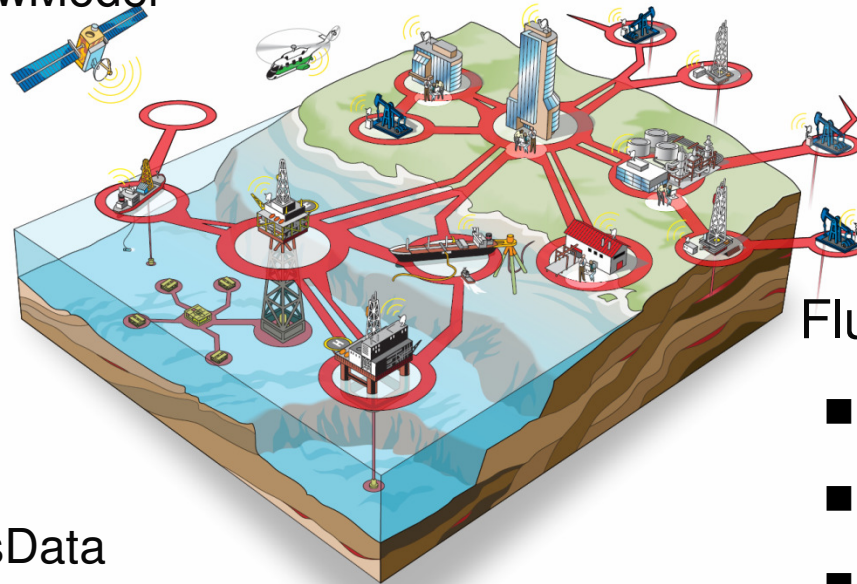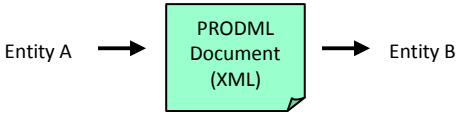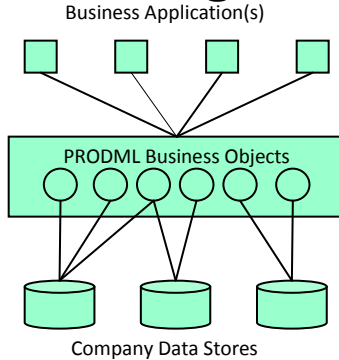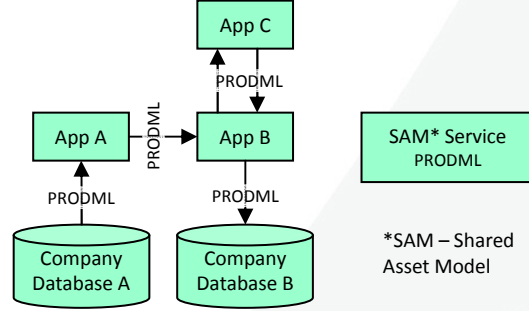
DTS

- DtsInstalledSystem
- DtsMeasurement
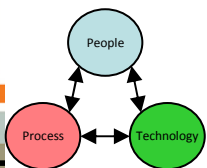
TimeSeries

- TimeSeriesData
- TimeSeriesDataStat

Fluids

- FluidSample
- FluidAnalysis
- FluidAnalysisResult

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Classifications of PRODML Capabilities

Data Transfer

Entity A → PRODML Document (XML) → Entity B

PRODML schemas as exchange format between entities.

Established Uses :
Production Reporting:
- Op Co. to Regulator
- Op Co. to Op Co.

Activities
- NOJV reporting
- Well Services to Op Co. Excel-to-PRODML.

Data Integration

Business Application(s)

PRODML Business Objects

Company Data Stores

PRODML schemas /web services to map data for apps & data stores, simpler workflows
Established Uses:
- Production Reporting, DTS

Activities:
- Transient Testing

Work Flow Automation

App C

PRODML

App A   App B   SAM* Service PRODML

PRODML

PRODML   PRODML

Company Database A   Company Database B   *SAM – Shared Asset Model

PRODML schemas /web services/asset model to automate business processes.
Proof of Concept:
- DTS

Activities:
- Publication first release

Base Business

Business Transformation / Smart Fields

People
Process   Technology

Increasing potential business value
Increasing complexity (People-Process-Technology)

People
Process   Technology
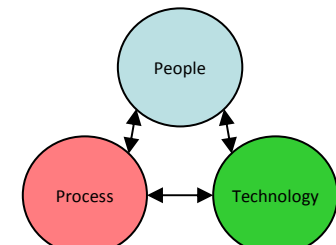
PRODML

- Next Deliverable : v2.1 on track for Q2 release in 2011

- Includes: Wireline Formation Testing, facility parameters (pressures) for reporting, improved documentation, EnergyML compliance, and enhancements to the Shared Asset Model.

- Shared Asset Model (SAM): general way to show hierarchical organization of assets (geography, operations, etc.), to provide a cross reference of asset identifiers, and a directory of services to retrieve XML data objects.

- Milestones: SAM PoC due in early December, "model documentation" workshop Oct 26 at Energistics

RESQML™ Reservoir Standards

Including geological and geophysical model exchange

Reservoir Engineering (RESQML)
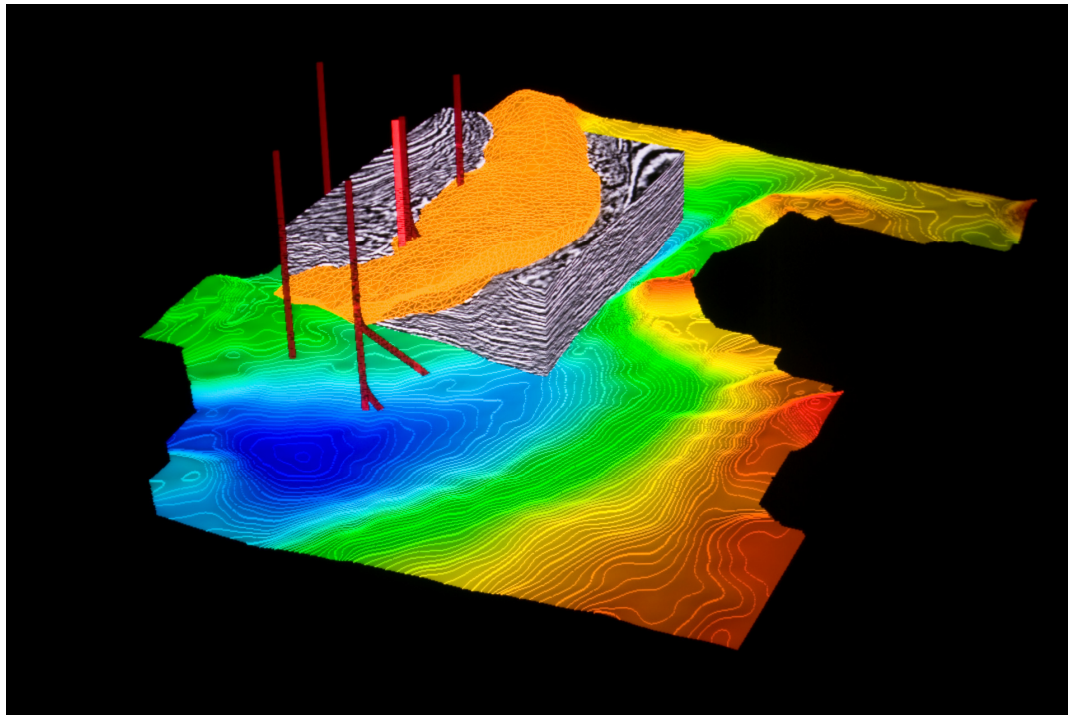
Structural

- Fault

- Horizon

- Stratigraphic Column

- Wells

Volumetric

- Corner Point Grid

- Property Sets

- Unstructured Grids

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RESCUE Consortium

- Initiated in 1995, RESCUE is a Joint Industry Project managed by Energistics (formerly POSC). The acronym 'RESCUE' stands for *REServoir Characterization Using Epicentre*
  - http://www.posc.org/rescue
- The purpose was to provide a forum for the development of an open standard for the transfer of data from "geomodels to upscalers", specifically through the use of the POSC Epicenter data model

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RESCUE Consortium – 2

- Delivery of the standard provided a collection of binary flat files to describe:
  - Structural Framework: Faults & Horizons
  - 3D Grids: Static and Simulation
  - Wells: Especially Log Data
- To ensure a common implementation a set of Class Libraries were developed under contract to the RESCUE project, and are the vehicle of choice for implementing an API to the RESCUE standard.

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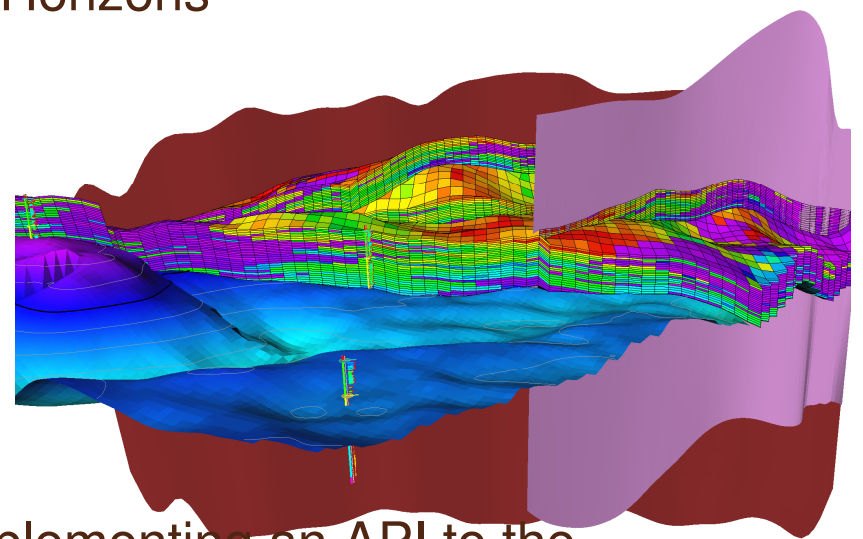
RESQML

- Next Deliverable: v1.0 on track to include: most RESCUE functionality, handling of large data models(HDF), traceability, georeferencing

- Milestones: Candidate Release target October 2010, Publication target December 2010

- Other:
  - RESQML Working Meeting (ILAB) held 13-17 September, hosted by Total in Paris: finalize v1.0, data exchange to test candidate release version prior to public review
  - *RESQML Brief* updated and posted to website
  - Article accepted for August *Harts E&P* , abstract submitted for SEG 2010 Annual Conference

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ENERGYML Standards

Industry Services

- Technical Architecture team re-launched:

  The purpose of the Energistics Technical Architecture Work Group is to deliberate and formulate "enterprise IT architecture" standards and guidelines relevant to Energistics Standards, with the goal of creating a consistent and highly functional foundation on which those standards will be developed, implemented, and supported.

- Standards development guide

- EnergyML

- Web Services Interoperability

- Identity Management

- Study role of other standards, i.e. REST, ODATA

Standards Orientation – EnergyML Primer

- EnergyML lays a foundation for increased consistency, easier implementation, and greater interoperability across all Energistics "MLs"
  - groups XML schemas that are "common" and that should remain consistent across all MLs
  - seeks to resolve URL namespace conflicts that will make it easier to implement multiple MLs for an integrated solution
  - address versioning to allow for evolving data objects to be upgraded without affecting stable, core object or breaking existing implementations
  - simplify packaging and distribution of all MLs, and publish all schemas at HTTP resource location
  - establish new implementation concepts such as a compound document, an archive of related XML instance documents

Standards Orientation – EnergyML Primer

- EnergyML is **both** an "installable XML thing" **and** a policy specification for supportability and interoperability.

- EnergyML will continue to be the specification where schemas, services, and technical principles relevant to all MLs will be managed – a "core" distribution upon which the other standards will be based.

- EnergyML will will be delivered by February 2011. PRODML 2.1 will implement EnergyML.

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Common Services

- **Generic Data Access**
  - Single CRUD-style service for all data types.
  - Implemented in PRODML 2.0 supports all WITSML and RESQML documents.
  - Investigating RESTful bindings (currently SOAP)

- **Shared Asset Model**
  - Common view of asset hierarchies
  - Support for Company-specific classifications

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Metadata Workgroup

- Metadata:
  - WHAT: "Realize metadata standards and guidelines which enable stakeholders in the energy industry ("the community") to effectively and efficiently discover, evaluate, and retrieve information resources."
  - WHY: With proper metadata standards, searches can effectively answer questions such as:
    - What bathymetric maps1 are available for this area2?
    - What geophysical information1 is available about Project X2?
    - Is this the latest version2 of this dataset1?
    - Does the copyright2 on this image1 allow me to use it?
  - Initial focus is on structured and unstructured information resources which have associated **spatial coordinates**. Working on Energy Industry Profile (EIP) of ISO 19115.

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Workgroups

- Regulatory: planning NDR10 for March 2011 in Rio de Janeiro. Work Group formed to build business case for standardized production reporting (in conjunction with PRODML) and drilling reports (in conjunction with WITSML) based on the current NPD-Statoil reporting process.

- Geophysics: intends to develop a interpretation metadata and velocity exchange standards, and take the industry toward XML. Coordinating with SEG, meetings in SEP seek to lay the groundwork for a presentation to ONGC in JAN 2011. Led by Paul Maton and Jerry Hubbard.

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"Energistics and ISO 15926"

PRODML / WITSML Vocabularies

- WITSML Standards
    - Rig equipment and instrumentation
    - Drilling tubular components and drill string components
    - Wellbore fixed components
    - Completion equipment and instrumentation
- PRODML Standards
    - Production flowpath equipment and instrumentation
    - Gathering system equipment and instrumentation
    - Artificial Lift equipment and instrumentation

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PRODML Vocabulary Development

- Current activity to assess needs and cross-reference to sources
  - Needs
    - Functional components / items – not composition, nature, etc.
    - Association with quantities measured, estimated, etc.
    - Linkage with other domains, e.g. maintenance (MIMOSA), ERP (SAP), planning/engineering design and construction (ISO 15926),
  - Scope
    - Correlation with high-level equipment classifications, e.g. basic concepts from ISO 15926 Classes of Inanimate Physical Object
    - Correlation with wellbore spatial and geoscience concepts
    - Correlation with producing asset aggregations, such as subsets of assets, assets, and organizational roll-ups.

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Illustrations of mapping with ISO 15926

- Functional Component Classes for PRODML cross-reference with ISO 15926 Classes of Inanimate Physical Objects
    - Casing [RDS13029297]
    - Compressor [RDS14286497]
    - Controller [RDS289844]
    - Flowline [RDS80665386]
    - Flow Meter [RDS417464]
    - Mandrel [RDS7606608]
    - Liner [RDS1128104]
    - Pressure Meter [RDS417374]
    - Riser [RDS414809]
    - Separator [RDS13047965]
    - Temperature Meter [RDS417329]
    - Valve [RDS292589]

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Thank You