DIGITAL ENERGY CONFERENCE
MUMBAI- 29 SEPT, 2016

TITLE : DOING MORE WITH E&P DATA – A.K. TYAGI

GLOBAL O&G LANDSCAPE

- Oil Industry in Choppy waters in 2014 & 15

- Recent rebound (30 to 50 US Dollars) evoked optimism

- Rebuild the survival Kit – A. Enhance Production by inducting Secondry & Tertiary Recovery Technologies B. Rduce Production Cost by Raising Production efficiencies in existing Assets --more sensors in Ops/ Mechanised DMS / Upscaling IT Band Width/more value from existing E&P Data .

- Surveys indicate that digital technologies in the E&P operations could down the capital expenditures by up to 20 percent & operating costs by 3 to 5 percent (in Upstream) . E&P Data Modernization & Integrations are buiding Blocks for that.

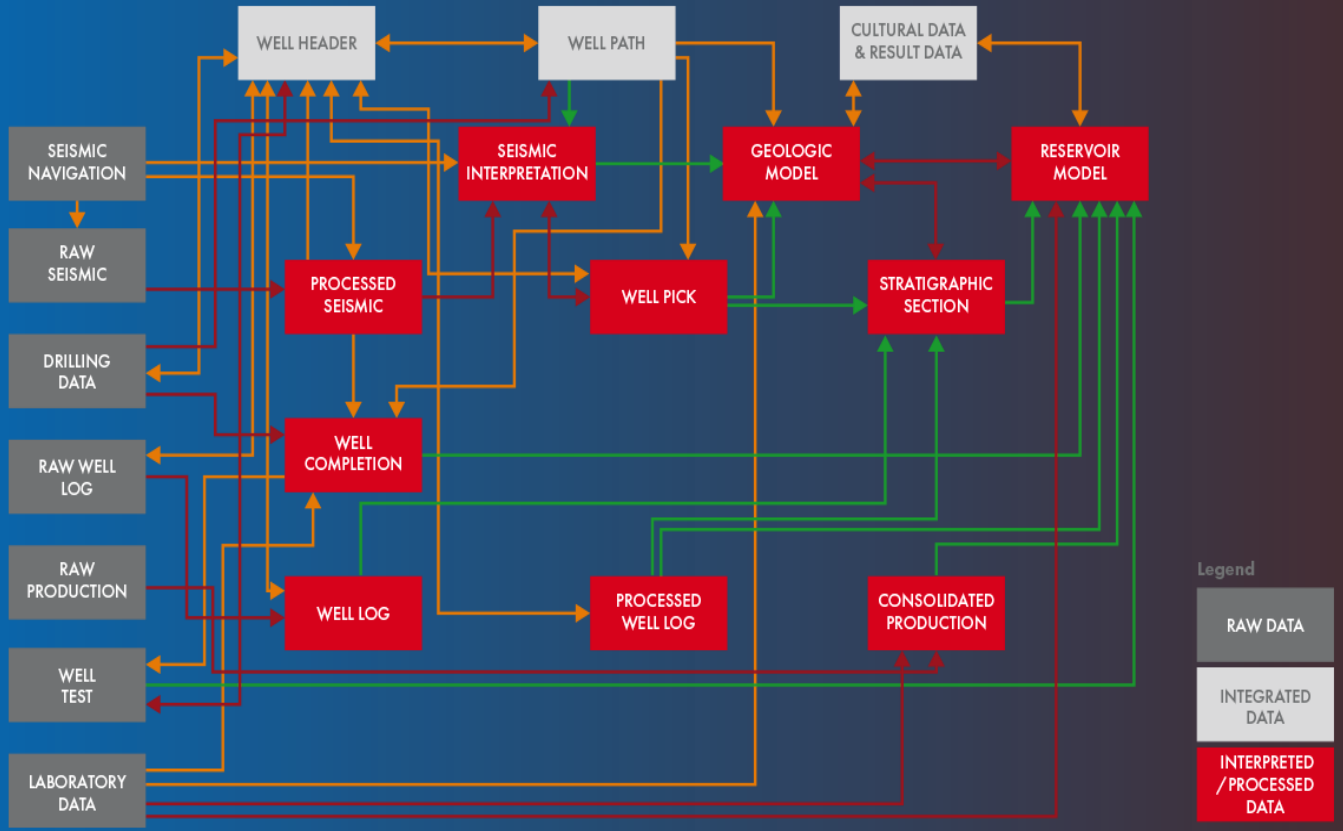
Major E&P Data Types

(Managing Intellectual& Physical Assets is still a challenge ? Value Proposition > 20)

Data Availability in Entirety leverages Interpretation Quality & Decision Quality

E&P DATA MANAGEMENT LANDSCAPE

Major data types in E&P value chain. Depicting complex interrelations between the disciplines in E&P and Database



Intelligent Well Systems

- Real Time data Streaming (Sensors to Scada)
- Controlling the data stream through different aggregation levels
- Reposition in DMS for Collaboration , Visualization (Vertical & Horizontal) and Decision Support
- Empower Quality Imprvement in Vertical Models
- Improved Horizontal / Visualization cum Collaborative Model

Intelligent Well Systems

Operational efficiencies &production increase and reduce costs

Capable of collecting, transmitting, and analyzing well production and

reservoir completion integrity data

Allows remote action to control reservoir, well, and production process

Provides the key Data & Insights wrt following :

- Improved zonal/areal recovery monitoring and allocation
  - Locate remaining oil and define infill development targets)

- Optimized production (improved lift, acceleration

Platform for Integrated /Smart Field improvements

Real Time data Integrity Data

E&P Standards -Key Value Provider O&G Data

Standards adoption & participation Across entire E&P Data Chain is a Must for adoptions of NEW Digital Technologies Adding Value to Data & Data Interoperability

Key Standards : WITSML/PRODML/RESCUEML/NDRML/PWLS

KEY STANDARDS BODIES

- **PIDX** International e-business standards for oil & gas and traders
- **PCA** (POSC Caesar Association) standards enabling interoperability of data, software and related matters
- **PODS** (Pipeline Open Data Standard Association) data standards for pipeline companies
- **PPDM** promote professional petroleum data management through development and dissemination of best practices and standards
- **SEG** (Society of Exploration Geophysicists) promotes the science of applied geophysics through its publications, conferences, etc.
- ENERGESTICS Promoting & Developing E&P Standards ie WITSML, RESQML,PRODML,PWLG,GEOPHYSICAL ML, NDR etc

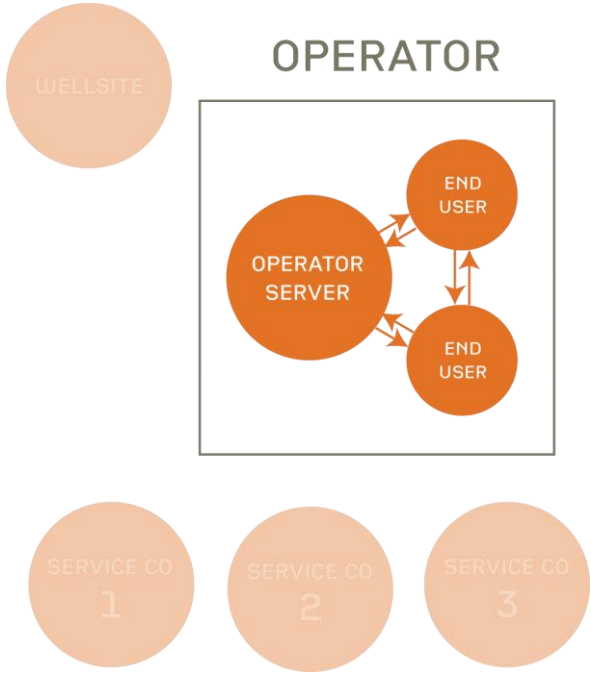
RESQML™

energistics standards

RESERVOIR STANDARDS

Consistent high-quality transfer of earth modeling data across multiple applications and vendors

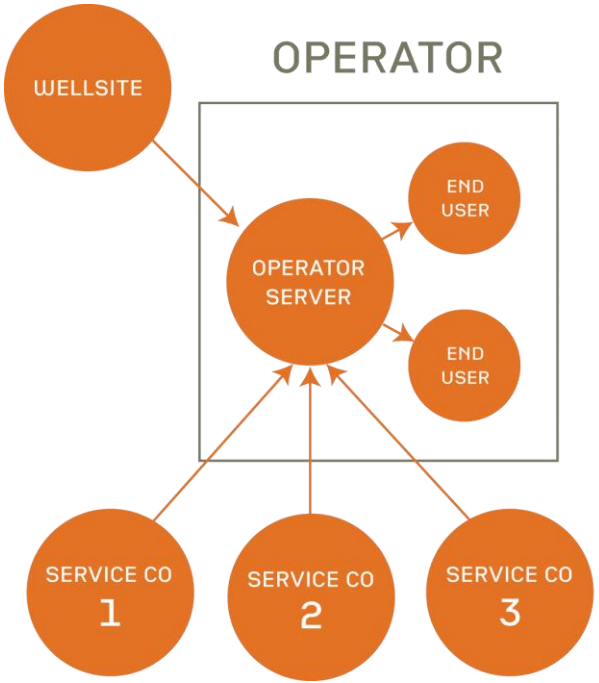
- Sharing earth model data across asset teams
- Movement of data across the seismic to simulation workflow
- File-format-neutral archival of earth model at key decision points
- Archive earth model at key decision points



DRILLING STANDARDS

Consistent high-quality transfer of wellbore and drilling-related data

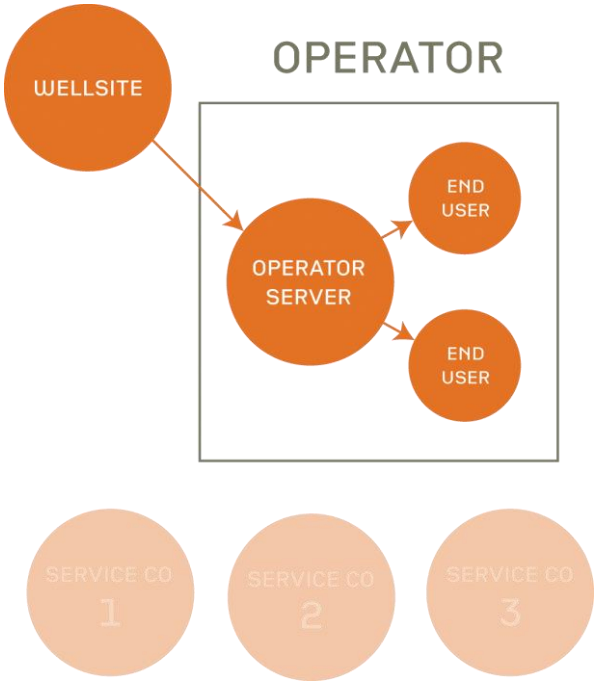
- Data transfer to real-time operations centers
- Move wellbore-related data among applications
- Real-time availability of drilling operations
- Archival history of drilling operations



PRODUCTION STANDARDS

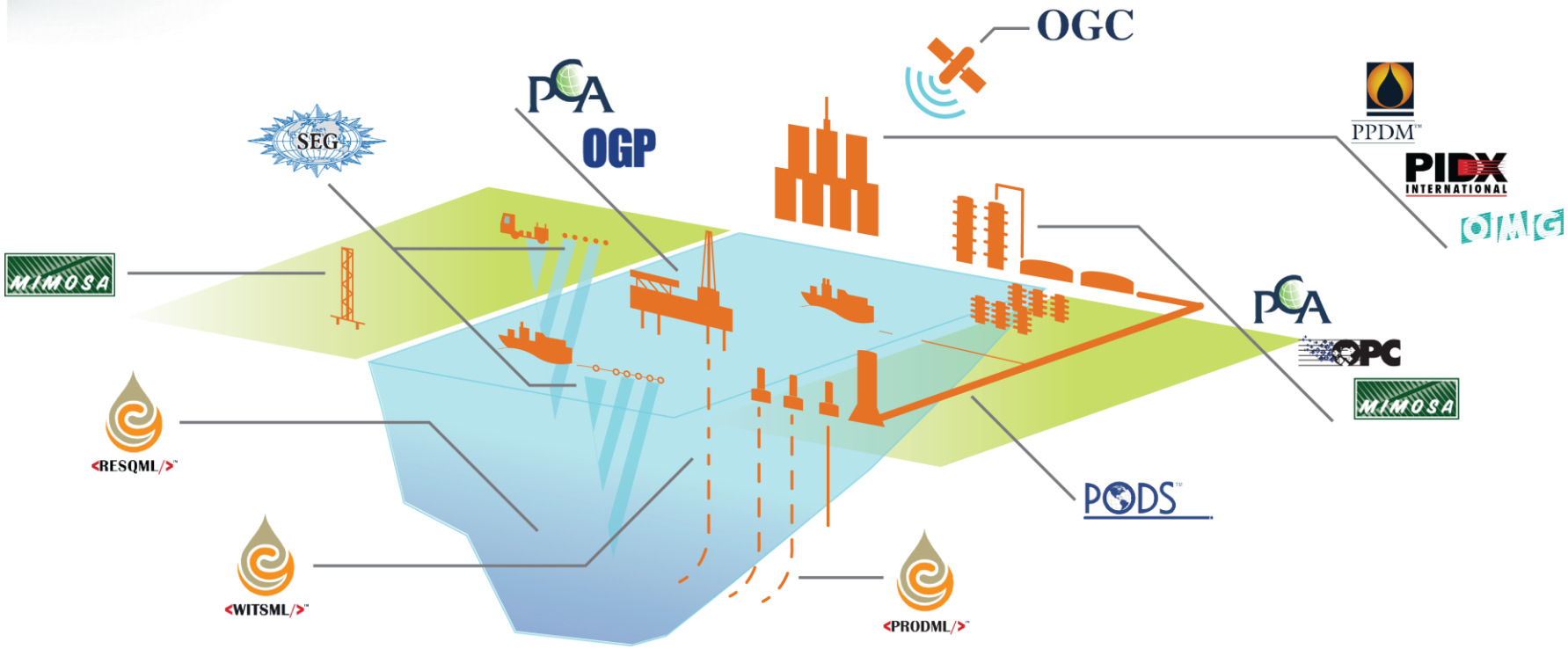
Consistent high-quality transfer from producing wells of production-related data

- Data transfer to production surveillance centers
- Move production-related data among databases and applications
- Real-time availability of producing operations
- Archival history of production operations



Key E&P Standards Development Organizations - Geography

Oilfield Standards Landscape



Standard Focus Areas

Industry Focus

- High Risk & High Cost E&P Projects
- Data quality and volume management
- Heterogeneous global regulatory environment

Technology Focus

- Interoperability of multiple software products
- Provides seamless data integration functionality
- Optimizes software performance characteristics

Business Focus

- Resolves real-time data configuration issues
- Allows multiple vendor project participation
- Significantly reduces data search cycles

E&P Standards Implementations – Use Case

US Independent Major Oil Co – Existing Data Scenario

- Drilling and completion data available in the field
- Completion data manually entered in Excel in the office
- Then re-entered into completion database at HQ
- Lots of data entry inconsistency

E&P Standards Implementations – Use Case

US Independent Major Oil Co – Solution Framework

- Operator developed a WITSML adapter for Excel
  - Completion data comes from the field, is reviewed in Excel and goes to the completion database all via WITSML
  - Standard reference values are applied
- Manual data entry eliminated
  - Improving data quality
  - Chain of custody is clear

ONGC (India) – Similar existing data scenario and provided similar solution

E&P Standards Implementations – Use Case

Aramco - Existing Data Scenario

ارامكو السعودية
Saudi Aramco

- Multiple service and software companies
- Each service company has its own software infrastructure and visualization tool
- Lack of coherent content and format standards
- No connection between real-time and static master data environments

REF: 167873-MS SPE Conference Paper – 2014
REF: 164205-MS SPE Conference Paper – 2013

E&P Standards Implementations – Use Case

Aramco – Solution Framework

ارامكو السعودية
Saudi Aramco

- Implemented WITSML-based solution
  - Data enters WITSML store from all vendors
  - Common reference values applied
- Static data also translated into WITSML
  - Validated static data improves real-time quality
  - Reduces re-work and re-keying

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NDR EFFORTS BY ENERGISTICS/PPDM

Well Header Data

- The business processes that collect, store and release the data
- Not Very Good Quality of the data in majority cases.
- The solution emerged is the drilling data standard WITSML™.
- Employed in the software of drilling companies – basis for Regulators
- Regulatory digital data exchange standard for well data throughout the life of a well is the ultimate aim.

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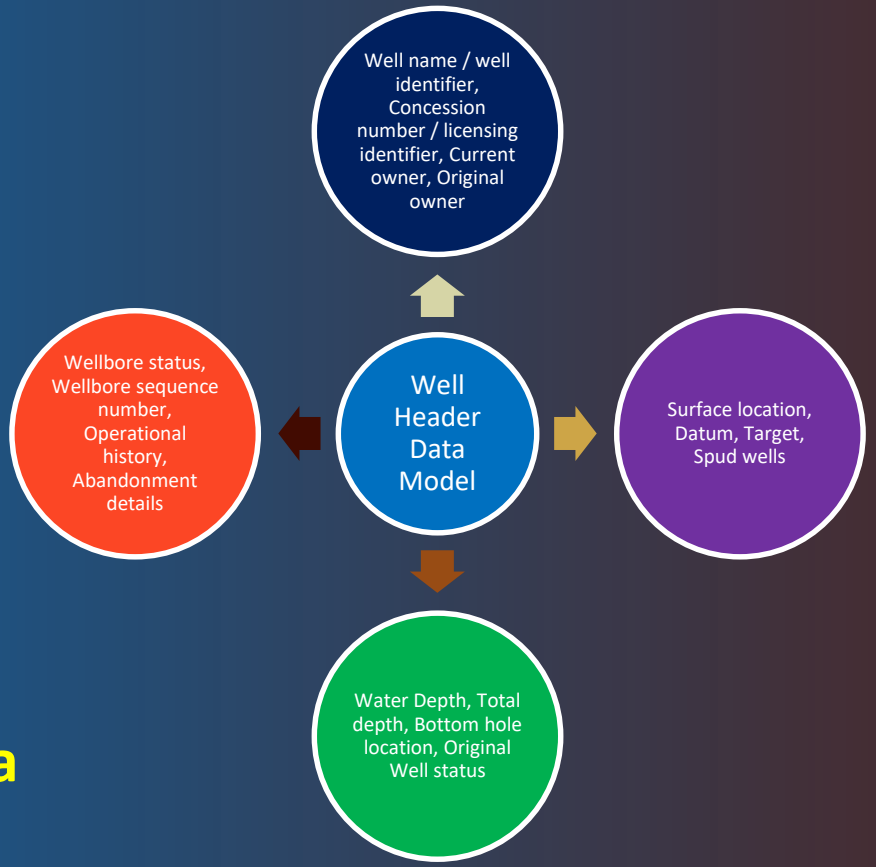

Well Header Data

NDR IN INDIA (Great Valve Accretors of E&P Data)

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NDR IN INDIA (Great Valve Accretors of E&P Data)

Key Configuration

- Standardized and quality controlled upstream E&P data of India
- Fully owned by Gov. of India at DGH's premise in OIDB Bhawan, Noida
- Solution provider i.e. M/s Halliburton would operate for 6 years (extensible by +2 years)
- Multi client data hosting
- Role based multi-level authorization
- Web based/GIS based data viewing and ordering
- DR infrastructure provisioned

NDR IN INDIA (Great Valve Accretors of E&P Data)

Key Attributes

- E&P data a national asset – for all category of Users
- individual Companies asset is their own data sets only
- Even age-old E&P dataset have potential to contribute more with new results (new technological infra & advances)
- National Data Storage with all interoperability Systems
- DM & Transmission Work Flows, Roles , Responsibilities (with operating Co's)

NDR IN INDIA (Great Valve Accretors of E&P Data)

Status

- Presently offline digital data library to archive different seismic data
- Processed & raw data received in media like 3590, 3490, 3592, 8 mm Exabyte, LTO etc.
- DM in Phased Manner
- Development, testing on Oracle10g database with .Net web based applications in progress
- Categorisation / cataloguing of structured data and meta dataset In progress

NDR IN INDIA (Great Valve Accretors of E&P Data)

Products Planned & Advisory

- National Processing Centre
- National Visualization & Application Centre
- National Training Centre
- National E&P Knowledge Portal

NDR IN INDIA (Great Valve Accretors of E&P Data)

Advisory

- NDR Could Advise OIL Co's--- 1)Physical Asset / Reports Digitization ?
- Conventional Core Digitization ?
- Intellectual Layers Digitization
- Pre Interpretation Layers Management
- Roles /Responsibility understanding - Current Data Flow to NDR

New Tecnologies as Value adders to E&P Data & Users

Operational : Newer Technologies with IOF Concept in O&G Fields

- Time lapse seismic/4d Seismics (beginning – middle) across all field sizes (Why in Mega Fields only)
- Real time, integrated system wide simulation / modelling and collaborative visualizations
- Enhanced SCADA (supervisory control and data acquisition) and DCS (distributed control systems)
- Added Intelligent completions - downhole control valves and advanced sensors
- Remote operations and visualization facilities

New Tecnologies as Value adders to E&P Data & Users

Digital Technologies with IOF Concept in O&G Fields

- Visualization Technologies - Interpretation during work in progress
- Big Data Analytics - Complex, Manifold datasets of parameters understood concurrently
- IOT (Machine to Machine Communication)
- Artificial Intelligence/Neural Networks/ Pattern Recognition - IBM
- Parallel simulations