

The WITSML Service For Devon Energy

**A WITSML Compliant
Real-Time Drill Data
Management System**

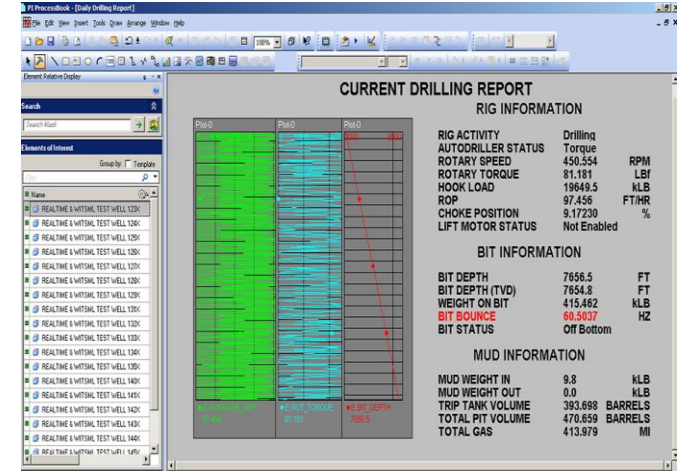


Presented by **Rick Howell, Devon Energy**
Shaun Wright, Industrial Evolution



Agenda

- About Devon Energy
- Challenge – Problem(s) to Solve
- PI System based WITSM Solution
- Progress and Future Plans
- Illustrations
- Case Study Summary



About Devon Energy



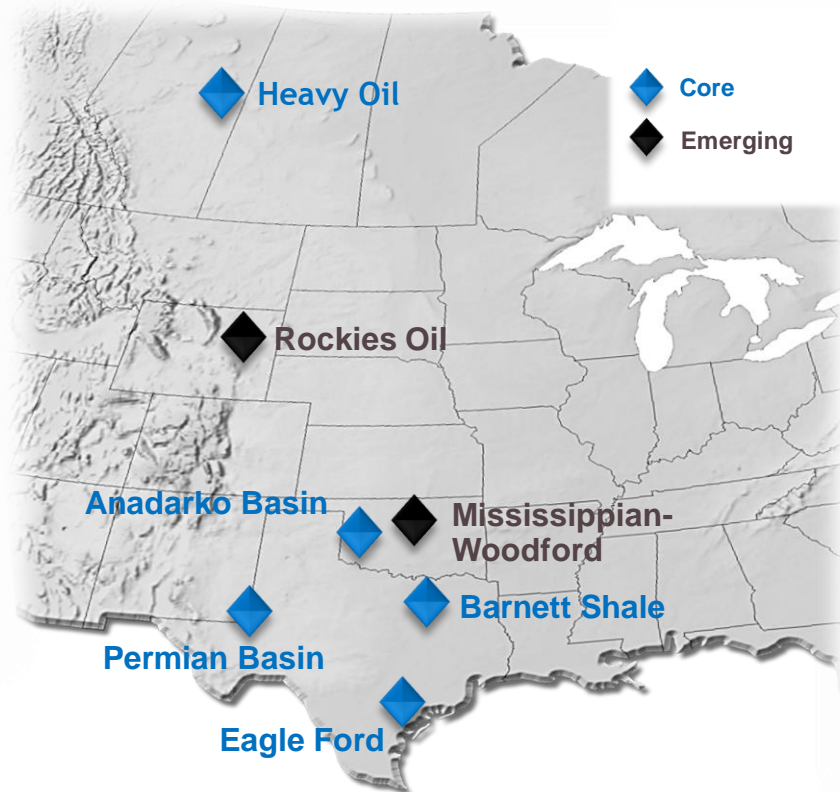
- One of North America's leading independent producers of oil and natural gas
- Engaged in exploration and production
- Corporate headquarters in Oklahoma City
- More than 5,000 employees
- Member of the S&P 500
- On Fortune magazine's 100 Best Companies to Work For list each year since 2008.

Devon Today

- Q3 2014 net production: 640 MBOED⁽¹⁾
- Deep inventory of oil opportunities
 - Top-tier Eagle Ford development
 - Strong Permian Basin position
 - World-class heavy oil projects
 - Upside potential in emerging plays
- Strong liquids-rich gas optionality
- EnLink ownership valued at ≈\$8 billion
 - Additional midstream value in Access and Victoria Express pipelines

(1) Excludes non-core divestiture assets.

Devon's Core & Emerging Assets



Drilling Data Management

- **What is WITSML and what is it used for?**
 - Industry Standard focused on protocol for subsurface data – **Depth** as primary dimension
 - Wellsite Information Transfer Standard Markup Language
 - Based on the WITS (Wellsite Information Transfer Specification) from the 1980s using XML instead of binary files
 - Oil and Gas upstream companies use WITSML to standardize data definitions between themselves, drilling contractors, vendors and regulatory agencies
- **Why we need it**
 - Many systems are reliant on immediate and up-to date down-hole and related top side information
 - Drill operations management: drill bit conditions, revs, torque, bit pressures, down-time
 - Reservoir management: rock type evaluation, oil, gas, and pore pressure management
 - Production planning: reservoir production estimates
 - Drill fleet management: time on site and availability
 - Safety: mud, cement, casing, operations intensity
- **Requirements**
 - Systems integration and interoperability
 - Reliable, high quality real-time data collection, storage, and utilization
 - Standard format (WITSML)



Challenges – Decrease Time to First Oil, Safety, & Costs

Capture “high fidelity” Data for Complete Well Data Set

- **Drill Phases**

- Plan new well
- Set-up and commence drill operations
- Sustain and manage drilling until full completion
- Change status to cap or produce

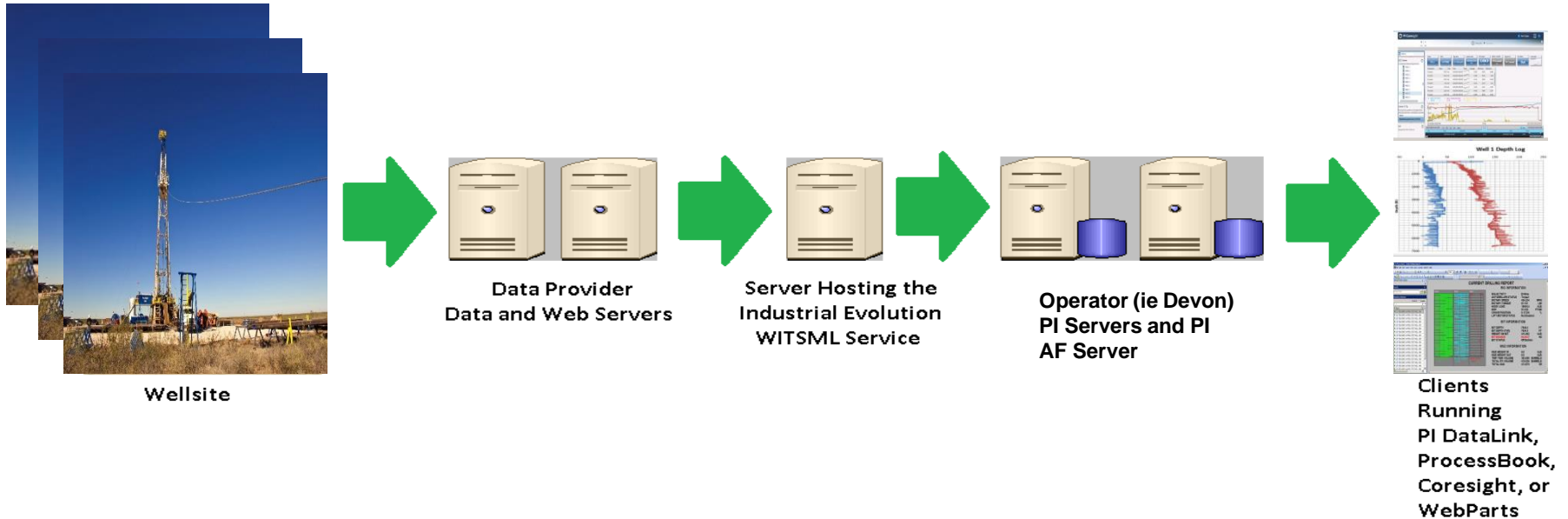
- **Challenges**

- Vast amounts and types of data from and to different systems
- Missing information
- Out of date information
- Information in many different locations
- Lots of manual work that needs to be digitized
- Difficult to follow life-of-well cycle
- Need to search and report on time stamped dynamic and static data (eg time and depth)

PI System Based WITSML Solution

- Use PI System to gather, validate, normalize and manage real-time data
- Use PI AF to establish system over-arching integration framework:
 - Integration with mud, surveys and BHA data through WellView
 - WITSML data is available through the PI AF elements
 - Data from other sources, such as SQL and Oracle databases are also made available through PI AF elements
- Make extensive use of PI AF templates, particularly well templates
- Automate as much data management as possible, eg. WITSML provider selection, addition of new wells, tags and even mnemonics not in template
- Use CoreSight and EventFrames to manage data availability and reporting
- Maintain WITSML compliancy

Data Flow



Example - Element in PI Asset Framework

DAEDTESTPIE-WITSML Test - PI System Explorer (Administrator)

Edit View Go Tools Help

base Query Date Back Check In Refresh New Element New Attribute Search Elements

to

Entities

Wells

REALTIME & WITSML TEST WELL 123X

General Child Elements Attributes Ports Analyses Version

Filter

	Value	Description
ACC_DRILL_STKS	1280230 stroke	Stroke - Acc Drill
ACC_FILL_STKS	1279127 stroke	Stroke - Acc Fill
ACCIN_TRIP_IN	1280670 bbl	Accum Trip In
ACCIN_TRIP_OUT	1281374 bbl	Accum Trip Out
AD_ROP	Pt Created	Ad ROP
ALKALINITY	Pt Created	Alkalinity
ALT_GRAVITY_TOOLFACE	Pt Created	Toolface Thrash
ANN_TEMP	Pt Created	Ann Temp
ANN_PRESSURE	177.605 psi	Ann Pressure
AVERAGE_ROP	450.0166 R/h	
AVG_ROP_FT_HR	0 R/h	ROP - Average
AVG_ROP_MIN_FT	0	
BASE_FLUID_VOL_ADDED	Pt Created	Base Fluid Volume Added
BIT_BOUNCE	60.5037 ft	
BIT_COMMENT	Pt Created	Comment
BIT_DATETIME_OUT	Pt Created	Datetimes Out
BIT_DEPTH	8025.568 ft	Bit Position
BIT_DPT_MD	8025.323 ft	Bit TVD
BIT_NOZZLES	Pt Created	Nozzles
BIT_NUMBER	Pt Created	Bit Number

Name: ACC_DRILL_STKS

Description: Stroke - Acc Drill

Configuration Items

Categories: Well Nomenclature

Default UOM: stroke

Value Type: Double

Value: 1280230 stroke

Data Reference: PI Point

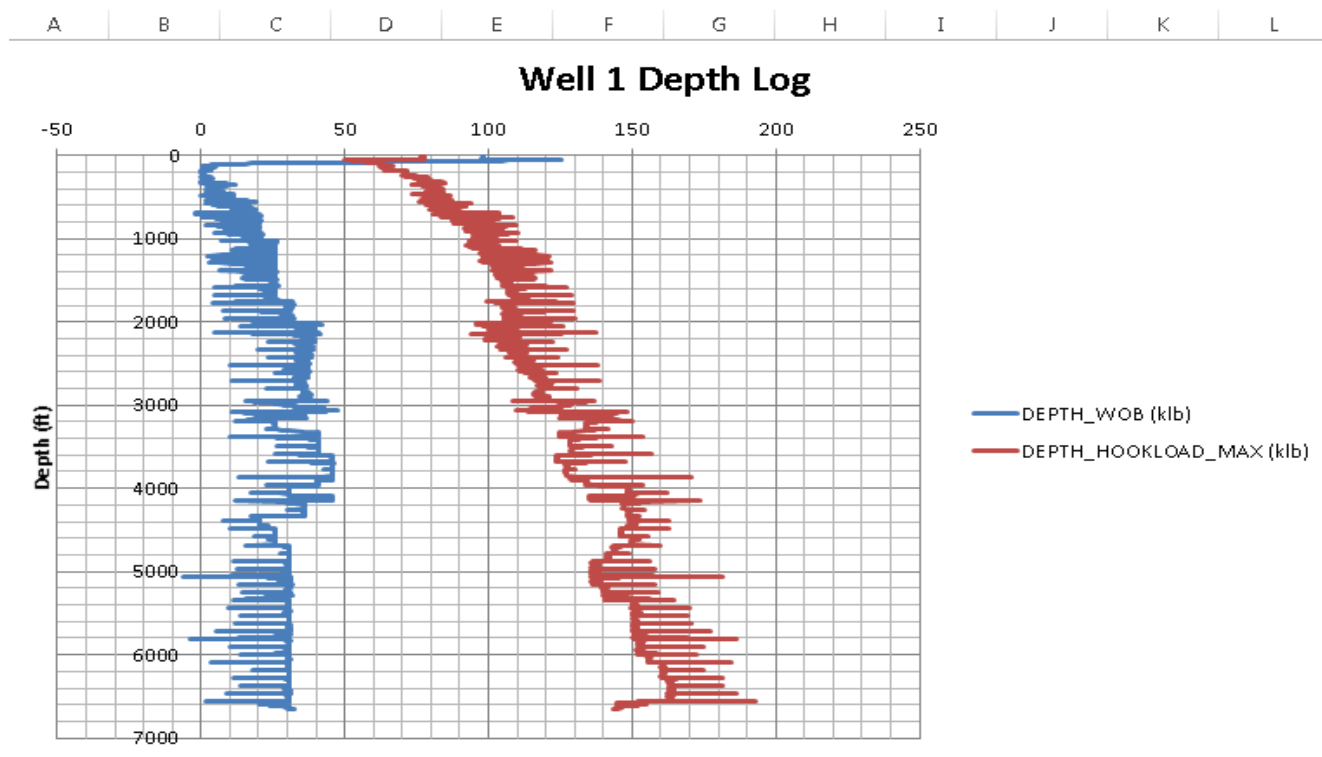
Settings...

YDENPIRG.WITSML: REALTIME & WITSML TEST WELL 123X ACC_DRILL_STKS

Progress and Plans

- **Progress and plans for the future**
 - System is in production at Devon Energy
 - Currently interfaced to 30+ rigs and 2 distinct vendors, NOV and Pason
 - Automatically creates PI AF elements, PI AF attributes and PI tags
 - Automatically creates PI AF attributes and PI tags for new mnemonics
 - Integrating PI Event Frames to organize data
 - WITSML output interface
- **Demonstration and Discussion**
 - Slide 1 utilizes PI DataLink Microsoft Excel spreadsheet
 - Slide 2 utilizes an element relative PI Coresight graphic accessing PI AF
 - Slide 3 utilizes an element relative PI ProcessBook graphic accessing PI AF

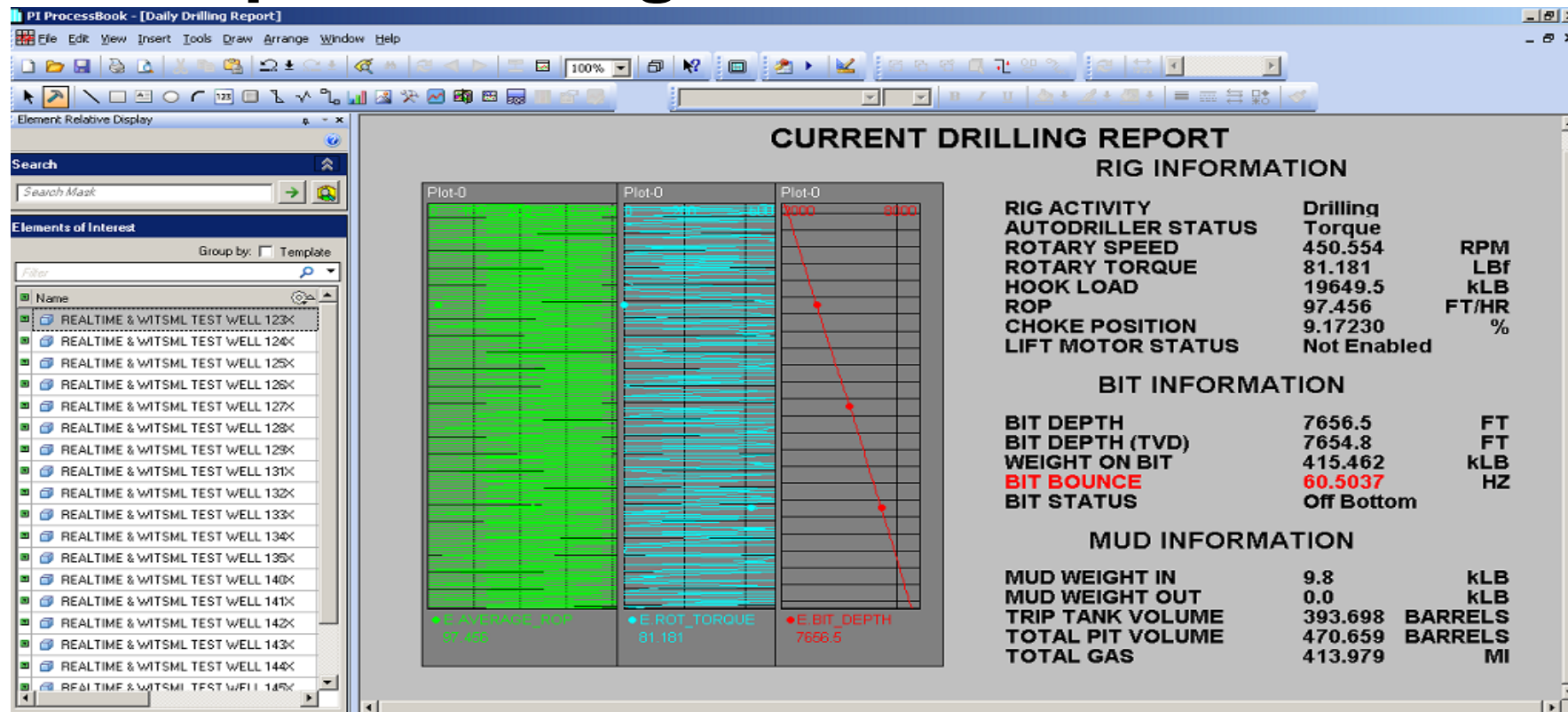
Example - Depth Log



Example - Drilling Data in Coresight

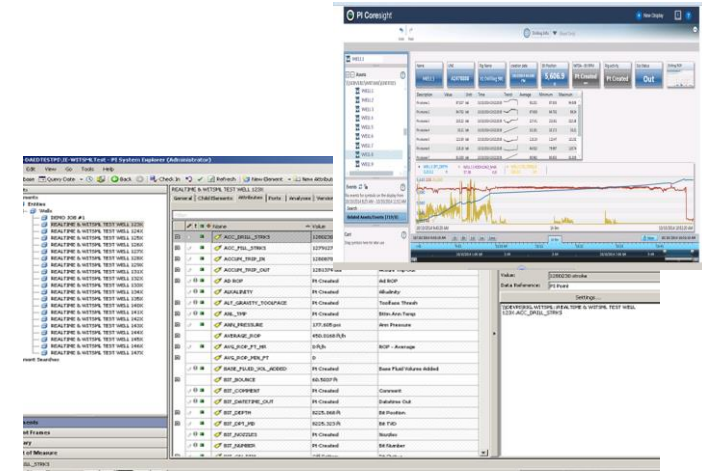


Example - Drilling Data in ProcessBook



PI System WITSM Integration Improves Drilling Performance

The PI System and in particular PI AF provided a foundation to enable integration of real-time drill site data including WITSML sources. The resulting solution is enabling vastly improved drilling analytics, visualization, and collaboration resulting in improved drill fleet optimization, costs, ROP, safety, and reduced time to first oil.



Business Challenge

- Develop infrastructure for acquiring one second drilling data to improve analytics and visualization
- Diverse data sources, many using “WITSML” which is not standard between providers
- Desire to have a complete real-time data set for wells from drilling, completions, to production

Solution

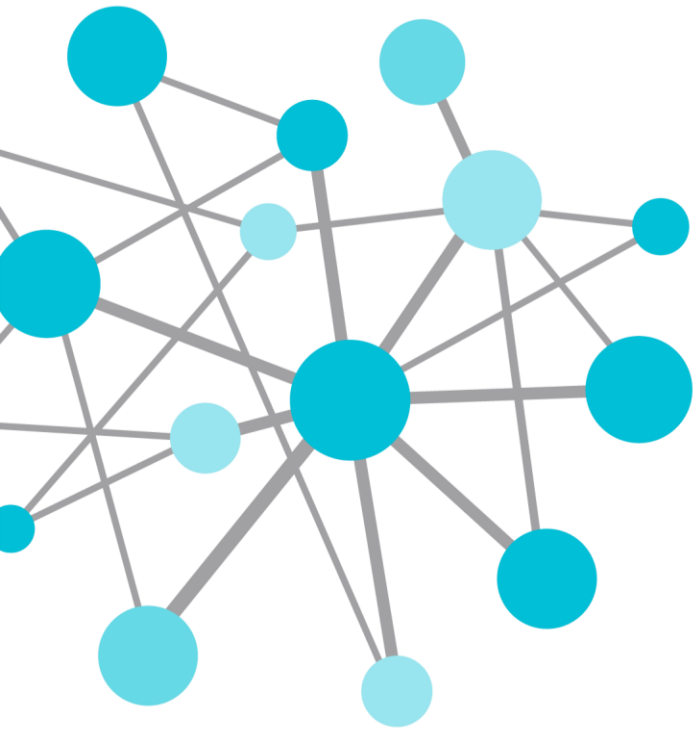
- Used the PI System as an integration & applications infrastructure and the EA
- Developed a WITSM client interface for PI System (by IE)
- Developed PI AF model with heavy use of well templates
- Used PI PSA for WellView integration

Results and Benefits

- System is operational on 30+ rigs, expanding to drilling fleet
- Real-time drilling visibility of current depth vs planned
- Engineering access to real-time data with improved SME collaboration
- Optimized drilling schedule

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THANK
YOU

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