WITSML ETP: Real-Time Drilling Data Assurance and Big Data Analytics

Jay Hollingsworth
Energistics CTO

Nigel Deeks, Pascal Hochart, Sam Marcuccio, Michael Sturm
Schlumberger
A Little About Energistics
Who are we? (Hint: we are not a vendor…)

• Energistics is a global, non-profit, membership consortium developing open data exchange standards for the upstream oil and gas industry
• Evolving from POSC, we have served the industry for more than 25 years
• Our membership is operators, oilfield service companies, software vendors, system integrators, regulatory agencies and the global standards community
• Our standards are developed by workgroups (known as Special Interest Groups, or SIGs) made up of industry experts from our member companies
• In short, the standards are created by the industry and for the industry
Energistics Family of Standards – 1st Generation

UNIVERSAL INTEROPERABILITY

RESERVOIR

DRILLING

PRODUCTION
Energistics Family of Standards – 2nd Generation

UNIVERSAL INTEROPERABILITY

RESERVOIR

WITSML™

DRILLING/WELL

PRODML™

PRODUCTION

Energistics Transfer Protocol (ETP)

Common Technical Architecture (CTA)
Real-time Drilling (up to year 2001)

• Real-time Data Centers
  - Superior/XOM – 1981-present
  - Amoco/BP – 1984-1989

• Proprietary Systems

• WITS - Wellsite Info Transfer Std
  - Pre-Internet, poor interoperability
  - Level 0 [Other levels rarely used]
  - 25 Record Types - 1991

• Statoil & BP (late 1990s)
  - DART - Drilling Automation Real Time

From SPE-14387
Real-time Drilling (2001 – 2016)

• WITSML the dominant standard
  ▪ Some lingering WITS Level 0
• Data is near real-time
• Transfer uses simple XML
• A client program polls a server
  ▪ Rig-site, service co. or internal
• Commercially very successful
• Desire for a technology refresh
The Origin of WITSML

• DART evolved into a multi company effort
  ▪ Statoil, BP, BakerHughes, Halliburton, Schlumberger
• to create a new standard, replacing WITS,
  ▪ based on evolving internet technology,
  ▪ with much improved functionality

  Improves “Plug and play” approach to moving data between systems
  For Operators, reduces costs for moving data, and improves competitiveness (Selecting vendors not driven by impact of IT changes, but on the service provided)
  For Contractors, reduces need to support different systems for different operators

WITSML covers not only real-time data, but also contextual data
Unified Standard Data Exchange Approach
Unified Data Distribution Approach

Service Company Ops Support
Service Company Domain Support

3rd Party / Remote

Web Based and WITSML Enabled Apps

Operator

Data Analytics Packages
G&G Desktop Apps
Drilling Desktop Apps
Browser based RT Visualization

InterACT

WITSML

WITSML

WITSML

WITSML

WITSML

Rig Sensors
Subsurface
Rig Sensors
Subsurface
Rig Sensors
Subsurface
Unified Data Distribution Approach

- Rig Sensors
- Subsurface
- InterACT Inside
  - Browser based RT Visualization
  - Drilling Desktop Apps
  - G&G Desktop Apps
  - Data Analytics Packages
  - Operator

- Service Company Ops Support
- Service Company Domain Support
- Web Based and WITSML Enabled Apps
- 3rd Party / Remote
Unified WITSML Client Approach

• Real Time Connect :

• Unified interoperability via real time standards

• Currently deployed across >30 different Schlumberger applications
  ▪ Supports WITSML 1.3.1.1 as well as 1.4.1.1
    Plus OPC, DLIS
    ETP & WITSML 2.0 support coming
  ▪ Adapters for all major WITSML vendors
  ▪ Reading, Writing, Serving capabilities
Schlumberger Webserver Load

InterACT WITSML Usage

01 WITSML API Access
Across our 2 servers in Europe and North America we see 350 Million req / week – that is 579 requests per second.

02 WITSML Jobs
Over the September-October 2015 time frame InterACT had 473 WITSML Jobs per Week.
ETP: Energistics Transfer Protocol

• ETP is a data exchange specification
• Enables real-time data transfer between applications
• Is delivered as a specification and as sample code
• Works by sending pre-defined messages
  ▪ The messages are grouped together into “protocols”
  ▪ The description of these protocols make up the standard
• No server required, just sender and receiver
ETP Project

• Project to develop a new data transmission method for the oilfield
  ▪ High-frequency, low-latency
  ▪ Firewall / Internet friendly
  ▪ Lead-in to future cross sig platform with reduced barrier to entry / complexity
  ▪ Built on broadly accepted technologies and standards
  ▪ Licensing model acceptable to all parties

• From the business ‘We need this NOW’
Original ETP Use Cases

• Sensor -> Store (Simple Producer)
• Acquisition -> Store (Complex Producer)
• Store -> Store (Replication)
• Store -> Consumer (Subscriptions)
• Store -> Mobile Display (Simple, slower data rate)
• Consumer -> Store (Publish Processed Data)

• These addressed most cases. Other combinations were eventually added
ETP: Technology Choices

• Binary transfer – size on the wire
• HTML5 – ubiquitous support
• IETF RFC6455 WebSocket – full duplex via TCP 80/443
• Apache Avro serializer – dynamic schema, more later
• JSON schema encoding – required by Avro
• JWT – used for security
• URI as identifier
• ODATA – for query in the store protocol (future)
WITSML v2.0 Supporting Data Analytics

• WITSML has been re-designed to reflect data assurance principles which support big data analytics
  ▪ A special Data Assurance object
  ▪ Enhanced metadata on the redesigned Log object
  ▪ Support for PWLS
  ▪ WITSML 2 provides assurance that your data is fit for purpose.
  ▪ The assurance process utilizes business defined policies and rules to verify that the data meets business requirements and can be trusted.
  ▪ Once trusted, the data is readily available for generating actionable insight without the additional need for costly data wrangling and data validation.
WITSML 2.0 – Log Object Enhancements

• Log has undergone significant changes – Primarily to enable streaming via ETP
• Logs are now built from collections of Channels and Channel Sets
  ▪ Channel Set:
    Group of Channels with a compatible index (usually time, depth or both)
    Essentially grouped based on activity or data type e.g. Lagged Gas data
    Can carry aggregated ChannelSet Metadata
  ▪ Log:
    Container for one or more Channel Sets
    Can carry aggregated Log Metadata
• Individual Channels can be grouped into one, many or no Channel Sets
• Channel Sets can exist in one or many Logs
Conclusions

- A Standards-based approach supports commercial interoperability
- Support and use of WITSML is key in Schlumberger applications and operations globally.
- WITSML v2.0 is designed to support data assurance and enable big data analytics
- ETP provides a true low latency, high frequency data transfer
- WITSML & ETP can handle ever growing real time data volumes
- ETP has the Potential to replace WITS at the Wellsite
Q&A
Thank you