Different Approaches to Digital Oilfield Infrastructure – What Makes a Good Solution

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Most oil and gas companies have a plethora of different real-time architectures across their operations. Engineering costs have been high.

Architectures have been designed frequently according to local practices or dictated by vendor preferences – difficult and costly to maintain.

Solutions have not been scalable and there has been limited use of standardisation.

It has been very difficult for the operator to know how secure his data is.
Early infrastructures did not encourage operator involvement
What are the key elements of a well designed standard infrastructure?

• It is the basis of design for all deployments and is fully scalable.
• The design is based on corporate knowledge and integrates with the corporate network.
• It has a trusted security model.
• It uses industry standard communications.
• It facilitates collaboration centres.
• It integrates with the work processes.
• It can be adapted to suit local requirements.
The detailed design of a Digital Oilfield infrastructure will depend on the operational requirements.

- Location – onshore/offshore/degree of remoteness
- Scale of drilling campaign – single exploration well to multi-rig production wells
- Complexity of drilling operation
- Confidentiality of data
- Requirements for integration with existing corporate network
- Third party data access (e.g. service company, JV partner, government regulator)
Example of real-time standard D&C infrastructure using WITSML
An infrastructure must support business functions
Example based on Halliburton Landmark/Kongsberg
Services to support Well Planning and Well Delivery
A multi-layered infrastructure model for real-time drilling data services
The Digital Oilfield promotes smart applications – the infrastructure must support these
Applying data standards to E&P business processes

Business Processes

High Frequency
- Production Surv. & Opt.
- Field Optimization
- Reservoir-Recovery Optimization

Low Frequency
- Seconds
- 1 Day
- 90 Days
- 2 Years
- 10 Years

Sensor Data
- SCADA Systems

OPC Domain
- Models
- Data
- Reservoir Models
- Geoscience Data

De facto Standards, RESQML™ Domain
- After Chevron, ExxonMobil

Many Production Applications
- Application A
- Application B
- Application C
- Application etc.

Maintenance Domain
- Maintenance Systems

PRODML™ Domain
- Drilling Systems

WITSML™ Domain

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Where to next – high performance computing

- High performance computing will offer great rewards in data processing power.
Data storage and transmission – the primary bottleneck?

- The oil and gas industry is having to deal with ever increasing datasets. 3D seismic data can range from 10’s of gigabytes to petabytes and this number is increasing as more detail is added.

- Retrieving large datasets from remote storage devices puts strain on network transmission speeds.
High performance computing infrastructure opportunities

- More detailed geophysical information covering seismic interpretation and reservoir modelling will undoubtedly yield more oil and gas.
- Models of producing reservoirs should be updated to maintain operational efficiency as oil and gas depletion occurs.
- Virtualisation will become more significant:
  - Model based drilling and production to identify problems in advance
  - Remote intervention and decision-making by engineers
  - Unattended operation through enhanced automation
- Lower cost of computing with high end reliability.
Conclusions

- A standard infrastructure should be part of a Digital Oilfield strategy.
- The standard infrastructure should be the basis of design for local infrastructures.
- A standard infrastructure offers many benefits to the operator company:
  - Deployments are much quicker.
  - The company benefits from bulk discounts.
  - Service companies understand the requirements.
  - Data quality and security are enhanced.
  - Maintenance and training are more efficient.
- High performance computing will offer many benefits to oil & gas.

Thank you for your attention.