

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 (eg. 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





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Services to support Well Planning and Well Delivery



Support Services Link Links with Well Team **Well Planning** Well Delivery Setup Real-Time Create / Startup RT Data Feeds from **RT** Data modify Data Feeds **Rig to Shore** Validate Data Displays Monitor/ Validate Viewer Engage IT dept Mapping and troubleshoot to configure Rig Connectivity and create any any issues for RT Data new displays Create Sub-Facilitate trajectory Setup/validate Real-Time Services Visualization Surface 3D Software for well Facilitate trajectory RT data feeds to Include risks Model planning sessions software for well well delivery in well trajectory planning sessions software 8 software Monitor/ troubleshoot data Update risks communications as they are identified Facilitate identification Modify models / plans Monitor Model vs. Engineering Facilitate development Actual using RT Data of drilling risks as required of the well plan (Trajectory, Casing, and Torque/Drag) Facilitate development Identify & communicate Communicate deviations of the models to compare any new risks from plan / models with RT Data Monitoring Monitor & QC RT Data Provide all real-time Reports & data (24x7) Logs Well Team Sub-Surface Drilling Sub-Surface Drilling

Real-Time Services

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A multi-layered infrastructure model for real-time drilling data services



The Digital Oilfield promotes smart applications – the infrastructure must support these









Where to next – high performance computing



 High performance computing will offer great rewards in data processing power.



"The day when the scientist, no matter how devoted, can make significant progress alone and without material help is past."

> -E. O. Lawrence, founder of Lawrence Livermore National Laboratory, on accepting the 1939 Nobel Prize for Physics





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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.





Data Storage

Data Transmission

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Data Standards | + |



- 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.





- 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.