WITSML, PRODML and National Data Repositories could all come together to deliver major benefits

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The UK government, together with a number of other oil provinces such as Norway, have been using the emerging web services technology to deliver real benefits in the way that their oil provinces can be exploited. Web technology improves communication and delivers efficiency benefits but a major leap forward in government / industry cooperation still eludes us because we still do not have agreed data exchange standards.
This article outlines the current "state of the nation" of government / industry cooperation, describes (as an example) what has happened in the UK and then suggests a way forward that is being supported by Energistics through its custodianship of the National Data Repositories movement.

What Regulators do

Regulators of oil provinces all share the same overall goals of exploiting their oil province and maximising the revenue from that oil province. Oil provinces compete with other for the oil company dollars but there are many facets of their business that are a shared burden and from which they derive little competitive advantage.

At the highest level there are a minimum set of shared functions that include:
- Maintaining licensing / concessions data
- A basic permitting system for Seismic operations, Wells and Drilling operations
- Storing well log and seismic data
- Well completions
- Production reporting
- Releasing high quality data

These functions often require support for Environmental issues.

Putting Regulatory Bodies on-line

In principle there is not much argument about the desirability of putting government online. Technology helps to make public administration more open, more responsive and cleaner. Taxpayers save money. Companies and citizens get better services. Rich countries already have the broadband penetration, computer literacy and skilled bureaucrats needed for sophisticated e-government, but poor countries may gain even more: technology may allow them to vault into the modern age, shedding the wasteful public administration that is often the greatest barrier to their development.

So far the story of e-government worldwide has been one of quantity, not quality. Whereas e-commerce has been a spectacular success, transforming industries as diverse as travel and book retailing, e-government has yet to transform public administration. Using e-business techniques in support of oil and gas administration is in many places a late comer to government on-line and it can gain from this and can potentially deliver significant benefits to

all parties. However to really achieve this it will require cooperation between all of these parties.

Regulatory processes

Regulatory bodies typically issue consents/permits for a number of activities and they require some technical information to make this decision. After a permit is issued they will monitor activity and demand certain returns. Throughout they will release data either freely on a web site or through third parties. These activities can cover the following:
- Issue of exploration and development licences
- Issue of seismic permits
- Issue of drilling permits.
- Issue of production consents, such as production and flaring.
- Issue of pipeline permits
- Monitor of well operations – workovers, abandonments etc.
- Monitor oil and gas production
- Monitor of field operations, annual field reports etc
- Issue of environmental permits
- Monitor environmental incidents, oil spills etc.
- Manage decommissioning process for platforms and pipelines

Potential areas for cooperation

There are currently very few accepted neutral standards in support of the above processes. Most Regulatory Bodies will use UKOOA/P1 and SEGY for seismic and LIS for logs but meta data standards for naming wells, seismic lines and surveys, pipelines, fields etc do not exist. How production data, geological data and well completion data is to be reported and released is often defined locally and typically very loosely.

To date there has been no organisation within which Regulatory Bodies can share experiences or work together to develop common ways of working but an embryonic and very informal organisation has emerged that has helped run eight successful National Data Repository (NDR) meetings.

The UK experience

Oil from the North Sea has delivered significant financial and employment benefits to the UK for nearly 40 years. The Department for Energy and Climate Change (DECC) are the body responsible for ensuring the maximum economic recovery of hydrocarbons from the North Sea. Since oil and gas were first discovered in the North Sea in 1965 significant revenues have been obtained from royalties, licence fees and other oil taxes. This has been accomplished in a cooperative, responsive legislative framework that licenses the North Sea and monitors activity.

DECC are also responsible for implementing new environmental consents procedures to ensure that the UK are compliant with recent EU regulations. These procedures cover pollution prevention and detection, emergency response in the event of a potential offshore pollution incident as well as the development of decommissioning policy and proposals for offshore oil and gas installations and pipelines.

The changing nature of the North Sea

In the early days competition for acreage in the North Sea was high but now the North Sea has to compete with more attractive oil provinces around the world. The North Sea has changed from a resource that can be auctioned to a resource that needs to be marketed. This changing situation has required DECC to review their way of working.

DECC implemented a significant internal re-organisation in order to face the competitive challenges and to take advantage of the Portal it was building (see below). This re-organisation fundamentally changed their way of working. DECC were a reactive organisation, regulating companies who wanted to operate in the UK and requiring significant volumes of data to monitor activity. The new culture is still regulatory but with a lighter touch, only sampling activity and more importantly proactively trying to encourage new players. A key element of the new organisation was
…… a new **Information Strategy**
that said DECC would only collect the information it needed, that it would obtain all other information when it needed it **"just in time"**. This was in significant contrast to collecting information **"just in case"** it was needed.

…… and a new **IT infrastructure** to support it**.**
DECC developed an IT strategy to support the new way of working. This strategy is that within DECC all technical staff, such as geologists and reservoir engineers, will be given access to a mapping interface that will index all the data they need to undertake their work. This mapping interface will be based upon the detailed maps that DECC already produce as a part of their business. This will be accomplished by establishing digital exchange standards for maps and occasionally by digitising. All electronic exchanges will be through a firewall that will incorporate authentication processes.

This process is outlined below.
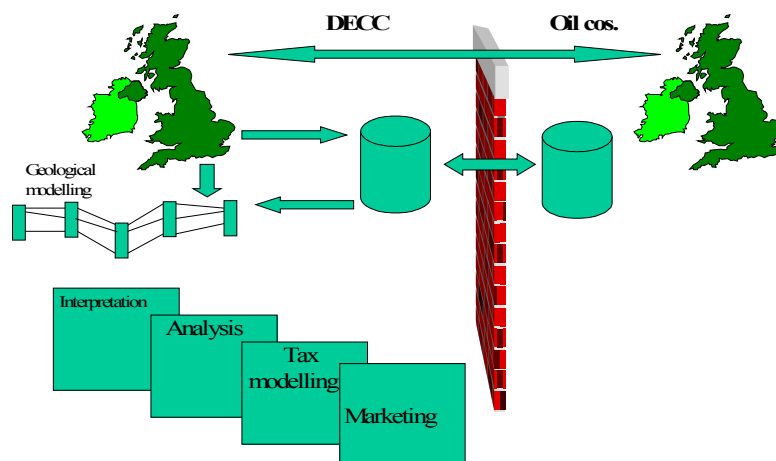
Information overload

The initial legislation, written to exploit the North Sea, specified an open ended obligation for oil companies to provide DECC with regular reports on operational activities. These reports

cover environmental data, regular production reports and a series of other information about exploration activities and well operations.

Today most of the data for these reports exist in the databases of the oil companies, but are often transmitted on paper or other offline means, requiring significant manual efforts for all parties involved. Moreover, DECC have to store the data for potential later re-use and public release. The oil industry's ability to generate huge amounts of data has grown exponentially and this means amassing a potentially huge amount of data at DECC.

E Government targets

Together with all other government departments DECC were set two challenging targets
- to be paperless by 2004
- to deliver all services electronically by 2005

DECC's reaction to the government targets- build The UK Oil Portal

DECC developed a UK Oil Portal for managing the regulatory process between the government and the oil industry. This is shown diagrammatically below.
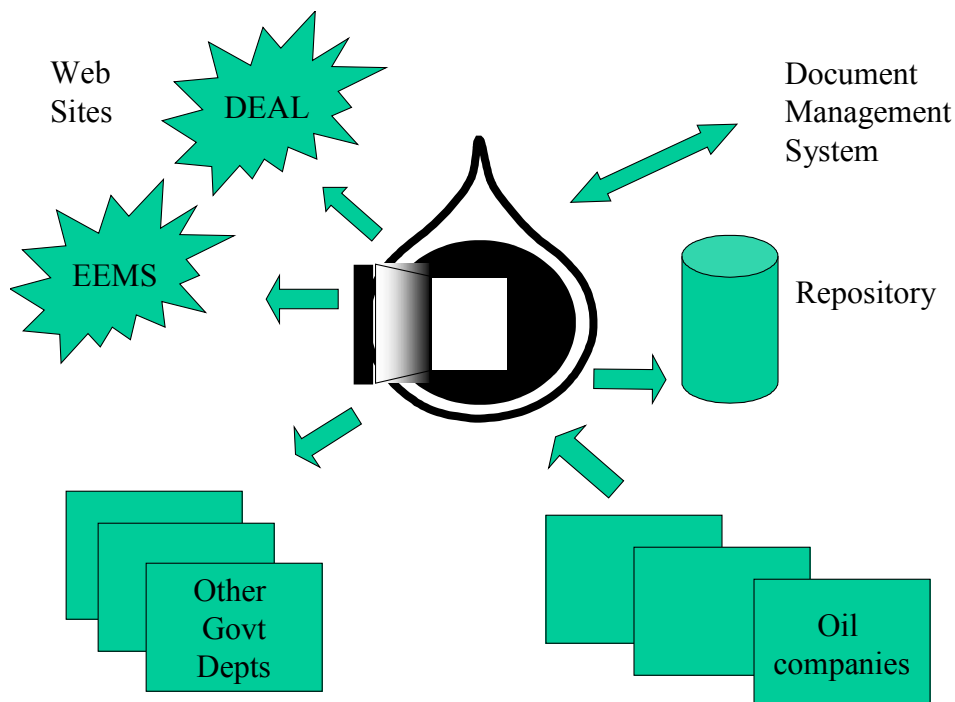

Oil companies use the Portal for requesting consents for oil and gas operations on the North Sea. It is also used to issue Regulatory enforcement notices. The UK are completely paperless in these operations although the system handles paper just as easily. To ensure the legality of the paperless operations DECC worked with the oil industry to develop standards for the use of digital certificates.

The Portal automatically updates two oil industry web sites; DEAL (the UK's National Data Repository) and EEMS (the environmental data repository and monitoring site). This is achieved via web services and the data exchange standards are two Energistics standards WellheaderML and ChemicalML. Both of these standards were developed in the early days of web services and would be regarded as proprietary to the UK.

DECC achieved all of the above by building a set of components that build these systems very quickly. These components are generically called FOX. In line with UK government IT policy FOX is freely available as open source software, the site is www.foxopen.com. This means these components do not cost any money but it is likely that initially some guidance in their use will be needed. DECC believe that they have developed a powerful software tool that will allow oil Regulatory systems to be built very quickly at relatively lower cost than traditional methods. They are happy to share this software with other Regulatory Bodies in the belief that this will reduce overall support costs which can be shared.

Web services

During the early development of the UK Oil Portal DECC (DTI as they were then) worked with Shell and IBM on a web services pilot at a time when this was only an emerging technology. The pilot that was developed was :
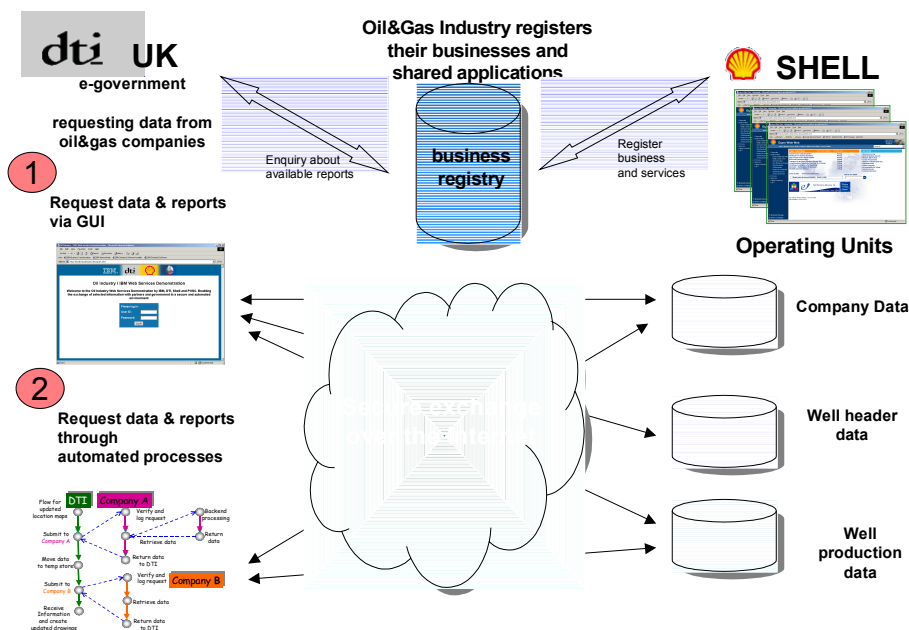
There are four components to the system.

DECC who need to receive regular reports from the industry, either from the Portal or as part of their business processes as described above.
Shell (or any other oil company) who are holding the data
The web over which the data is to be transported using the emerging UDDI and SOAP standards and possibly incorporating authentication procedures.
UDDI registry which is effectively a "yellow pages" directory of which companies can supply what data.

The pilot demonstrated three data exchange scenarios of growing complexity.
- Getting hold of managing director name, address, telephone number, email etc. This is a regular but unplanned activity. Keeping these up to date is a non-trivial task, ask any secretary.

- Getting hold of basic well data in a standardised format to add as a header to other data related to that well. The well data is required as part of a business process and would be requested by the process not by a person.
- Getting hold of monthly oil production data on a regular basis such as the 16th day of every month.

Looking at just one of these in a little more detail - keeping monthly oil production data up to date. Instead of having to phone the individual oil companies up, finding the responsible employee and requesting a report to be sent manually, a web service would:

- Search the UDDI registry for companies and their relevant reporting (data provision) capabilities
- Request data to be transmitted by a mouse click and process it at once with the relevant application after automatic transmission
- Ultimately, the request process can be triggered automatically by the applications from the Portal, just at the time when needed for processing - thus entirely eliminating the step of human interaction.

The pilot was successfully demonstrated in London and Houston to a mixed audience of oil companies, service companies and government bodies. However the web services solution was never fully implemented as it requires a step change in culture in areas such as allowing regulators inside firewalls, trusting data quality etc but importantly there are no agreed XML data exchange standards.

WITSML and PRODML

The recent past has seen two significant standards emerge in the oil industry.
standards in the drilling area, and

standards to support digital oilfields in the production area

Both of these promise to deliver major tactical and technical benefits. They have emerged from the oil industry, with their development facilitated by Energistics, the oil industry global IT standards body. They are both based on XML schemas and both have the potential to deliver a major step change in government to industry communication. One simple example is that all government regulators require details of all well completions. All this data is held in WITSML Another example is that all government regulators require details of monthly production. This is held in PRODML (and the Norwegian government are working on a standard for this)

There is a clear advantage to the industry if there are common regulatory reporting formats but the problem is how these can be developed.

National Data Repositories

Regulators all over the world have the shared problem of receiving, storing and releasing huge quantities of data – initially this is seismic and log data. This problem increases every year as the technology of the oil industry suppliers delivers more and more data. To overcome these problems National Data Repositories (NDR) began to emerge.

As NDRs emerged some 10+ years ago some of the early adopters in UK and Norway started an embryonic movement to get Regulators to cooperate in developing these repositories. To date eight global meetings have been held in most parts of the world; UK, Norway, Canada. US, Columbia and South Africa to name a few. To date there has been very little success in agreeing any standards.

NDRs are different in every country depending upon:
- The particular culture of that country
- Maturity of the oil province
- Importance of oil to that country.

These are the main reasons that no set of NDR standards or best practices has emerged. Also there has only been an informal NDR movement, with no formal method of promulgating or delivering standards.

However all NDRs have a number of basic functions that require certain business processes to be in place and these business processes are increasingly supported electronically. There are three areas initially in which standards and procedures are important:

Maintaining basic meta data
An NDR system needs a sound meta data infrastructure of companies, licences, well numbers, seismic surveys and the like.
The system ideally will also have sound procedures for
- Notifying when wells are spudded, abandoned, completed
- Notifying when well, or concession, ownership changes

Data receipt and storage
Data completeness, e.g. have I got all the logs for this well ?, needs a set of sound procedures agreed between the regulator and the operator.
Each NDR will need to decide the quality checks and levels to be applied to the data before it is catalogued and stored.

Data release
A key element of an NDR will eventually be for it to be used as the basis for releasing data. For the data to be useful users need to have confidence in its accuracy. This requires sound business processes and data quality standards which need to be applied when the data is received and stored.

What is the future for NDRs

The last NDR meeting in South Africa (NDR8) was the best yet. More countries are starting to use electronic means of communication and looking at joining up regulatory processes with NDRs. A major positive to emerge from the meeting was an agreement to ask Energistics to facilitate the next meeting and to bring the NDR community within the Energistics Regulatory Special Interest Group. This should introduce some formality to the work and provide a basis for governments to talk in a neutral environment.

A potential benefit to Energistics, and arguably the oil companies, is that Regulatory Bodies are in a powerful position to mandate the use of standards. A major hurdle once a standard has been agreed is getting it deployed. If governments say "You must do this" then they will; and if a lot of them say it compatibly and consistently this is a real step forward.

There is no competitive advantage in developing discrete standards for meta data (well names, field names etc) for application data (geological tops, well locations etc) or for reporting (production data, well completion data etc). For years we have been trying to get some collaboration on developing standards for these. The emergence and growing acceptance of the WITSML and PRODML standards from Energistics provides an excellent opportunity for this work to begin in anger.

A step forward is imminent

NDR9 will be held in the autumn of 2009 in India and there are great hopes that this will be a breakthrough meeting when cooperation really starts. All the building blocks are in place :

- Regulatory Bodies have started to meet and build trust amongst the community
- WITSML and PRODML are now maturing standards. Much of what is required for regulatory reporting could be defined as XML sub-schemas.
- The community now has a facilitator (Energistics) to take the work forward.
- Well numbering, a major problem, has been addressed in the Energistics/IHS Global Well Identifier initiative.
- The UK is willing to effectively "give away" its electronic portal for regulatory consents and reporting.

Perhaps also the recent worldwide financial crisis and the oil price volatility will focus the minds of people.