Energistics standards are developing and integrating

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Oil and gas data exchange standards body Energistics reports that it is making big advancements in its standards WITSML, PRODML and RESQML, including making the standards more integrated, covering new use cases, and better supporting the transmission of data assurance informations. Its standards cover the whole of upstream, except seismic data.

The purpose of the organisation is to help companies manage and share data more efficiently and cost effectively, through a series of data exchange standards that have been created by subject-matter experts from within the Energistics members. One can therefore say that the standards are created by the industry and for the industry.

Broadly speaking, WITSML covers everything to do with the well and the drilling of it, including both real time and static information. PRODML covers surface and downhole measurements related to production, plus support for fibre optic measurements like DAS. RESQML covers earth model components – and anything to do with subsurface geoscience, reservoir engineering and simulation.

The three standards had different origins, but Energistics has been making major efforts over the past few years to merge the standards together so they comprise a coherent whole, with barriers between them eliminated, says Jay Hollingsworth, CTO of Energistics.

Jan Hollingsworth, CTO of Energistics

"People don't want to be thinking about one standard for one kind of data, a different standard for different data. We've put them together on a common data architecture. They share the same co-ordinate reference systems, and style. Now it effectively looks like one big standard. They can all be co-mingled together in a single data transfer."

WITSML

In the drilling world, there are three sorts of data and they are all covered by WITSML.

Firstly, objects which are fairly static, or "reference objects", such as the well bore header, including names of the operator and their ownership, the location of the well.

Secondly, the "snapshot in time", such as the drilling morning report, operations report from a semi-submersible vessel or drilling rig on a vessel, and fluid analysis reports.

Thirdly, the "growing objects", data which is continually changing. This is data from sensors on the drilling rig, such as the hook load or rate of penetration. In the WITSML world, this is known as "log data". This is where most of the focus in WITSML goes, Mr Hollingsworth says.

WITSML is probably best known for moving real time data, sending data to oil companies' real time operations centres, where they are monitoring critical wells in real time. Data is sent from the drill site into cloud data storage and visualised in the office, with data streaming handled with WITSML.

However, WITSML can also be used to move data between two different software applications, or between software and a database. For example data can be sent automatically to a regulator, and WITSML is used in some places as a regulatory reporting vehicle.

WITSML is used increasingly for data archiving and storage. "If someone wants to give you a set of files that contain all the data about the drilling of the well, it is difficult to imagine what file format you would put that in. You couldn't put it in a spreadsheet," according to Hollingsworth.

"People have realised the WITMLS transfer format is a good way to deliver an archive," he said. "The same way as you would use a SEG-Y tape to move seismic data. You can have a set of WITSML files that represent the entire well construction history."

PRODML

PRODML is for production and surface data.

There are many different types of production data – including real time measurements, well tests, data from downhole sensors, including fibre optics, or production data from flow meters. All of this data can be moved in real time.

It can also be used to describe the way the equipment is connected together in a vendor neutral way, such as which pumps are connecting to which manifolds, or how the wells are connected together, which valves are open or closed, and where hydrocarbon is flowing in the pipes. PRODML covers all these scenarios.

PRODML can be used for regulatory reporting, including for monthly production from wells, or reporting more often. Regulators like it because it means they don't have to develop and maintain their own standard, Mr Hollingsworth says. And operators "sort of like it" because it means they can, in theory, use the same standard for reporting to multiple regulatory authorities, in a vendor-neutral way.

PRODML is also useful for data analysis, such as a PVT (pressure, volume, temperature) analysis of production data, or techniques to analysis the composition of a hydrocarbon stream.

Similar to WITSML, the standard is also well-suited to move data between different software applications, and as a vendor neutral way to archive production data, making it available for e.g. data analytics.

RESQML

The third standard, RESQML, is for moving data in the earth modelling chain. It is not used for moving raw seismic data, but is used in moving all the data generated in seismic interpretation, including velocity models, structural models, grids and voxels, ultimately reservoir characterisation and simulation, and well paths, which can be moved to drill planning applications.

The standard aims to cover all information which might be shared between vendor applications.

In 2018 a sophisticated demonstration was made at a trade show, involving BP, Shell and

multiple different software applications including RMS from Emerson-Roxar, together with Emerson-Paradigm's SKUA, Beicip's OpenFlow and Petrel from Schlumberger. It showed how RESQML could be used to move data back and forth between disparate applications. During the process, the data structure evolved from 3D data arrays to grids, which after simulation in CMG's IMEX were finally viasualized in Dynamic Graphics Inc's CoViz 4D software.

All of the data was cloud hosted, "rather than having people standing around with laptops," he said. And the data was moved from Amazon to Google Cloud and back to Amazon, because of where the different software packages were hosted, showing how RESQML can seamlessly support multi-application and multi-cloud scenarios. Rather than creating a multitude of links between these different applications, they just needed to be able to interface to a single standard format, RESQML.

Transfer protocol

Historically, real-time data itself has been moved between machines using XML standard, which is "the original web server's way of interacting with computers". It has a "call and deliver" mechanism, where one computer requests another computer send data.

Recently, however, Energistics has introduced a new way of moving data, known as the Energistics Transfer Protocol, or ETP. With this new protocol the data transfer mechanism has moved to a more "advanced, true streaming way", with data sent continually "rather than making repeated calls". It is "truly real time", much lower latency (time lag between an event and data transmitted about it), and makes better use of the available data communications bandwidth.

Having faster data transfer gives oil companies confidence to move more of the drilling operations staff to onshore offices, because they can get the same view of what is happening as they would on the rig floor. As well as safety benefits, this has benefits in costs, and makes more offshore bed space available. It also enables more people to get involved, including from service companies.

The Energistics Transfer Protocol has also been used to stream RESQML data between different earth modelling applications. With PRODML, development is underway to use ETP to stream acoustic sensor data (from fibre optic cables in wells) and measurement data in real time.

Trustworthiness

A big theme for Energistics is conveying the 'trustworthiness' of data, or an assessment of how much people can rely on it. A data assurance assessment would ideally be carried along with the data through whatever software or analytics it is used for.

We often hear it said in conferences that geoscientists spend 60 per cent of their time looking for data. The real picture, says Ross Philo, CEO of Energistics, is that, with today's data managemet systems, geoscientists no longer need to spend time looking for data, but they can spend 60 per cent of their time assessing the quality of data and making corrections – verifying, validating and correcting the data before it can be put to use.

Ross Philo, CEO of Energistics

If analysts could access data assurance information, they can save much of that time. And the data assurance information can carry over to the next person to work on the data, so they also don't have to make the same checks.

When data is both structured (as with Energistics standards) and has quality assurance metadata, then it is ready to be ingested into machine learning algorithms, something many oil companies are experimenting with, Mr Philo said.

The data assurance process does not eliminate bad data, it just flags it as 'non-compliant'. Energistics members decided that this approach was better than just removing the 'bad' data, because it might be the only data you have. By flagging it as non-compliant, the data user knows to treat it with an appropriate low confidence level.

Development plans

"We thought it was time to take another look at our vision and mission," said Jana Schey, COO of Energistics. "We did some slight modifications."

Energistics goal overall is to "strive for seamless data sharing in oil and gas. That's a lofty goal."

Jana Schey, COO of Energistics

Strategically, Energistics wants to demonstrate the value of standards to industry and their contribution to digital transformation efforts. It wants to make the standards easy to implement and use. It has a number of tools developed in-house or by other companies to help do this.

Energistics wants to make sure the technologies are compatible with new ways of working, such as cloud hosting, which "wasn't dreamed of 25 years ago," she said. "Now everything is in the cloud."

Energistics wants to ensure it remains relevant and financially sustainable. Currently the sole source of financial support is the membership fees. It is looking for ways to expand the organisation. "Maybe we can do some different things to decrease our reliance on membership," she said.

New versions are being developed for all the standards, to handle emerging reservoir and production workflows, including WITSML version 2.1 (where the scope has already been agreed), and a new version of RESQML (tentatively scheduled for 2020).

A new version of PRODML is already out for public review and testing, with new capabilities including data on how pressure changes over time ("pressure transient analysis"), and better ways to work with acoustic data (fibre optics in wells), including calibration data.

Some members have been looking for ways to leverage the standards in midstream and downstream.

Energistics plans a series of webinars during 2019, and also runs "Special Interest Group" meetings where people working the standards can talk about what they are doing. It runs public training courses 2-3 times a year for WITSML and could also do the same for PRODML and RESQML if there was demand from industry users.