Oil Information Technology Journal

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Wellsite Automation

Highlights

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In this issue:

Shell and the *public* cloud

Shell enterprise platform manager envisages a 'different energy system' and a division of IT labor between 'parity' and internal value-added development. All in the cloud.

Speaking at the 2018 SAP in Oil and Gas conference in Lisbon, Shell's Frank Westerhof had good news and less good news for his hosts. Good news is that the S/4 HANA Cloud will be an integral part of Shell's 'market standard.' The less good news is that Shell does not want the whole SAP enchilada, at least, not on one plate!

Shell foresees a 'different energy system' with an evolving energy mix and ongoing digital disruption across the value chain - from AI, the cloud and more. Shell's strength is doing stuff 'at scale' but this means that, like a big oil tanker, it is slow to change direction.

Westerhof's answer is to divvy up Shell's process into 'parity,' where Shell does not seek differentiation, and non-parity where it does. The 85% of Shell's parity processes share vendor innovation with other users. The remaining 15% is internal development.

While parity IT is essentially outsourced, that does not equate to 'hands-off.' Shell and SAP are moving together into the cloud and Westerhof is keen to shepherd SAP in a direction that suits Shell's vision.

Parity processes will require a public, API-based interface that can leverage the 'super scalability' of the cloud. Instead of a 'mammoth app' that does everything, Westerhof envisages a new paradigm of multiple tenancy and containers. This mandates rethinking Shell's own platform strategy with 'core, asset-focused instances' to roll out 'over the next five years.'

Westerhof sees 'everything' eventually moving to the public cloud with Amazon and Microsoft Azure as the foundations of Shell's digitized assets. Today Shell has around 4,500 applications. But the core application portfolio is destined to shrink in the move to a more agile future. This will entail clusters of applications that focus on assets, customers, finance and people. ERP will remain as a key component but 'ERP processes are parity.' Shell will stay with SAP, 'the market standard,' and is a keen member of the SAP Oil and Gas leadership consortium. In return, Westerhof expects a 'minimum viable' oil and gas industry-ready version of the S/4 Hana cloud by Q4 2018. He advised all to 'get off the SAP ERP central component by 2025 to avoid risk.' Westerhof also approves the changes in Hana from its beginnings as 'one big ecosystem' to a more open, containerized approach.

Shell's new focus means 'withdrawing from a lot of things we used to do' as parity processes are outsourced. But, opines Westerhof, 'SAP needs focus too and the courage to say 'this is what we are not going to do!'

Listening between the lines we felt that Shell is currently leaning more in the direction of Azure than Amazon. More from the SAP in Oil & Gas event in our next issue.

Rockwell Analytics

Project Scio transmutes into Factory Talk Analytics, brings data driven, intuitive 'storyboards' to non specialists.

Originally piloted as 'Project Scio' last year, Rockwell's FactoryTalk Analytics is now available globally. FTA is a 'data-driven approach that lets workers explore production data and create new analytics on the fly, 'without the need for a trained data professional.'

FTA provides persona-based access to structured and unstructured data sources, fusing related data into intuitive 'storyboards.' The solution can be deployed to all levels of the enterprise, at the edge, on-site or in the cloud. Users can perform self-serve drill-downs and bespoke analytics.

Rockwell has chosen the Microsoft Azure cloud as the 'preferred platform' for FTA. The solution 'discovers and connects' data sources, from the edge of the network, up through the enterprise and 'intelligently fuses information to resolve issues close to the source.'

Oil and gas users of Factory Talk solution (pre Analytics) include Enbridge Pipeline which has deployed Rockwell's mini 'machine edition' historian as real time edge device at its remote pump stations in nine states. M.G. Bryan has deployed Factory Talk in the Azure cloud for remote management of its frac vehicle fleet. Watch the video.

Oil IT hits the New York Times

The New York Times reports on GE's 'paring back' of its flagship Predix platform. Oil IT Journal editor Neil McNaughton reflects on GE's hopes and disappointments, unpicking the flaws in GE's push to be 'a top ten software company' by 2020. These include some exaggeration of the 'bigness' of big data that will likely impact other similarly oversold ventures.

It's not every day that oil and gas IT gets into the New York Times. This felt rather curious for one who has been writing about the subject for over 20 years, almost an infringement of one's personal space.

On April 19th, Steve Lohr covered GE's 'pivot' away from its grandiose plans to be a 'top 10 software company by 2020' as the then CEO Jeff Immelt stated back in 2015. Lohr reported that Predix GE has been pared back from being an 'operating system for the industrial internet' to a 'set of software tools to help write applications rather than being connected to layers of code for automating data analysis.' From platform to app. Quite a come down!

Immelt was both a visionary and cheerleader for the big data/artificial intelligence/analytics movement. GE began its digital push for real in 2011, with the opening of its digital business unit in San Ramon, California. As Immelt loved to explain, the idea was to harden the open source Hadoop-esque software environment that has spun out of the Google/Facebook brigade and develop a data and analytics platform for 'big' industrial data.

Immelt managed to convince many that using the GAFA's technology would bring the GAFA's success. It took me a while to unpick this and I admit to being somewhat wise after the event, but in my 2017 editorial, I described this as the 'great misunderstanding.' I highlighted how poorly the business models of the GAFAs mapped across to the industrial domain. This was GE's first problem.

But there was an even bigger problem with the whole notion of 'big' data. When I take a snap with my digital camera, a couple of megabytes eventually find their way into the iCloud (and the Google cloud and, I think, *chez* Microsoft too). Multiply that by a couple of billion photographers snapping away daily and you do indeed have big data. Most of the peta-exabytes of data that we are told are being produced every day, year or whatever, are of this nature. We could call this 'capricious' big data. This is not to be confused with the 'nasty' big data that Facebook and the now defunct Cambridge Analytica purvey, but I digress.

Immelt's plan to recast the GAFA business model into industry relied on the 'fact' of big data. Back in 2013, GE reported that 'a modern aircraft collects around a terabyte of information per day.'

At the time, I found this hard to believe, although I have heard it repeated often subsequently. In a short email exchange with GE I learned that (in 2017) 'GE engines produce data snapshots at various points in flight, such as take-off, climb and cruise. The snapshots include up to 1,000 different measurement parameters, and each engine can pump out between 50 to 200 megabytes of data per flight depending on the flight time.' So we are at most in gigabyte not terabyte country.

My skepticism in the context of oil and gas big data comes from my 20 plus years of tracking the industry. One outfit that has been doing analytics for a very long time is Intelligent Solutions whose 'Top down reservoir model' has been using AI/ analytics for a couple of decades. A while back, I asked CEO Shahab Mohaghegh how they managed with the big data issue. He looked surprised. The software ran on a PC and seemingly there were no problems with data overload. When you think about it, this is not all that surprising since reservoir models are made on *historical* data that predates any data explosion. But does the data explosion even exist?

There are good reasons to think not. Oilfield data (and, I bet, airline data) is extremely un-capricious. Sensors are not ubiquitous, low-cost and 'Nest like.' They are esoteric devices that are very expensive to deploy, especially in Atex/explosive environments. They also require expensive maintenance and regular calibration. Their data may be rather hard to get at, as it can be more or less concealed from the outside world in proprietary formats. That this is an issue today is evident from our report in this issue from the ABC Wellsite Automation conference.

I don't want to give the impression that I am just beating-up on Jeff Immelt and GE. There are many others companies which have promised the moon in this context. The whole world is hooked on the big data/AI meme. But when you hear an oil CEO citing a geophysical processing center as an example of AI/big data, you know that something has gone wrong in the Chinese whispers that emanate from the consultants, through the IT department and into the boardroom.

Another checkpoint in my evaluation of the bigness of big data came from a remark I caught at the 2017 EU Spire conference on the future of plant operations made by BASF's head of R&D, Achim Stammer who opined that, 'in the process industry, I would say that we do not have big data.'

Of course, none of the above will stop 'the media' (Oil IT Journal included) from reporting on the excitement and hype that the big data/AI movement has brought. In this very issue we bring you an on-the-spot report from the Data science in energy event co-hosted earlier this year by France's premier R&D establishments Inria and IFPen. There is indeed a lot going on in this space, as many researchers are enthusiastically developing away with the open source, big data tools.

Elsewhere in this issue we report on multiple AI-related developments, in natural language processing, in AI-driven multiphase flow metering and on developments in DNV GL's Veracity, a competing platform to GE's Predix and on applications of Google's TensorFlow. We also dutifully report on what I consider to be very improbable developments in the tulipomania that is blockchain. Just remember, as the Romans had it, *caveat emptor!*

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on the spot report

2018 IFP Energies Nouvelles DataSciEnergy conference

INRIA on combining predictive modeling with expert rules. CNRS on why AI proofs of concept don't make it into production. Total on AI's 'rough start' in industry and on how to 'fill the empty data lakes.' U Paris on the history of ML, from the Perceptron of 1958 to Google TensorFlow. Total on detecting weak signals in pipeline data to prevent major safety events. U Paris on combining physics with data-driven models. INRIA's topological data analysis of zeolite gas filters.

Olivier Grisel (**Inria**) introduced the Scikit-Learn Python module. Predictive modeling extracts structure from historical records using statistics. Results are summarized and turned into algorithms to make predictions about future events. This is often seen as an alternative to rules written by subject matter experts, but the two approaches can be used together. Tools of the trade include Pandas for data preparation and feature extraction, Scikit-Learn and, for big data, Hadoop, Hive, Redshift and Apache Spark.

Balázs Kégl (**CNRS**) observed that, despite the enthusiasm, 'few AI proofs of concept make it into production.' CIO/CEOs often approach data science by a) installing Hadoop and b) hiring data scientists. In fact, success comes by transforming the business process. Start with 'Why?' and here, 'you don't need a data scientist!' Decide what to improve and what KPIs will be used. Then, involve the data scientists and finally, build the system. Kégl advocates 'data value architects' capable of identifying and labelling historical data. Kégl took a swipe at current data challenges that are often HR/ publicity stunts! To put the industry back on the rails, his team has deployed the Ramp Studio, a sandbox for creating data challenges that emphasizes data preparation and improves on the unsupervised deep learning approach.

In his keynote, **Total**'s group data officer, Michel Lutz, agreed that data science has had a rough start in the industry. The last five years has seen an explosion of AI enthusiasm and buzzwords. A sense of urgency has led to a proliferation of isolated applications that 'addressed empty data lakes.' Echoing Kégl, Lutz spoke of data science proofs of concept with no future and 'unread data governance charters.' Data science has real potential, but it cannot be treated in isolation. Don't hire more data scientists or build more lakes. Rather move end-to-end data projects into production. Total is using data science in every day applications that satisfy real-world needs. In geoscience this means accelerating studies and reducing uncertainties. In engineering, optimizing production. In marketing, a better knowledge of the customer. Total has now marshalled its data resource and is developing a data-driven culture with input from subject matter experts. Other use cases to date include deep learning across a labelled database of nanofossils.

The data science movement has shined a spotlight on regular data management with a renewed focus on reference data, alignment of well names across data resources and more user training on the value of data. Data science needs a dedicated infrastructure, it can't be done on production systems. All of the above is supported with a new digital organization, with a CDO (Lutz' boss) responsible for company-wide data spanning E&P, refining, marketing and green energies.

Total has kicked-off an 'innovation booster' organization, a business incubator for data-oriented startups. A cross-discipline data analytics competence center houses a 'data squad' for iterative deployment. This provides data framing templates and production-ready projects that promote group-level best practices and solutions. 'Appetite' for data science was nurtured with an 'AI for Leaders' workshop held last year with talks from AI luminaries.

Total deploys open source-based data lakes that are developed in-house with help from the major software vendors and from the startups. Under the hood, Total uses the Carbon API, Python, R and TensorFlow to collate data from production data sources such as OSIsoft, Hadoop, Excel and TemisFlow.

Patrick Gallinari (**U Paris**) traced the history of machine learning back to the Perceptron of 1958, inspired by models of the human brain. The modern AI era came circa 2010 with a variety of new techniques. You can run these online with Google's TensorFlow playground. The GAFA and 'BAT' (Baidu, Alibaba, TenCent) jumped on the AI bandwagon and now 'startups are shaping the data world.' Why? Deep, many-layered neural nets can now detect cats and faces in tens of millions of images, recognize and translate speech and handwriting. Gallinari concluded that the important developments are driven by the big companies although, 'the theory is still work in progress.'

Total's Jean Igersheim and Laurent Querella referred to the Concawe Report on EU pipeline leaks, to focus on a major incident on a Total pipeline in Northern France in 2014. A review determined that pipeline monitoring data contained small signals that might have been used to provide advance warning. Total embarked on a program to create a holistic view of pipeline inspection and operating data to reveal patterns and create a data-driven model of degradation risk. Data comes from in-line inspections, pigging, above ground and cathodic protection survey and more. What is hard though, is cross-discipline analysis. This has given rise to an ongoing data science study to detect weak signals across the diverse data set.

Emmanuel de Bézenac (**U Paris**) tempered the enthusiasm for neural nets, observing that it can be hard to interpret the results from such brute force/black box approaches. Moreover, solutions may not be consistent with physical principles such as conservation of energy. It is however possible to inject physics into the ML models. De Bézenac's group has demonstrated that this by blending advection/diffusion equations into a data-drive model of sea surface temperatures in the Gulf Stream. The approach leveraged Flownet, a convolutional neural net originally developed for computer vision.

More technical papers included a presentation by Steve Oudot (**Inria**) on topological descriptors for geometric data. Zeolite molecules are used to filter refinery gasses. Their complex cavity geometries can be used to trap H2S and other impurities in natural gas. Characterizing their porosity is non-trivial, but important. Enter topological data analysis that uses Gromov-Hausdorff distance to normalize topologies. Persistence theory also ran as did the Inria Gudhi project.

More from the IFPen/Inria DataSciEnergy home page.

Review: Reservoir pattern surveillance with streamlines

Batycky and Thiele's book outlines a faster/cheaper approach to surveillance and optimization.

Reservoir pattern surveillance of mature floods using streamlines, by StreamSim Technologies' Rod Batycky and Marco Thiele is a well laid out, 50 plus page book (along with three SPE Reprints) that proposes streamline simulation as the best way of managing mature, conventional floods of water, polymer, CO2 and more. The thesis is that streamlines are a more manageable and cheaper approach to surveillance and optimizing a flood than the 'detailed, calibrated reservoir models requiring simulation expertise, that are time consuming to build and maintain and that may be overkill for managing monthly rate targets.'

The book is midway between text book and a user manual for StreamSim's software. It proposes starting points to improve flood performance with operational recommendations on where to inject more, where less, how much fluid is lost to the aquifer and which patterns perform best.

The authors could perhaps have better argued the case for streamlines vs. the full field simulator. The book takes this as a given and is concerned more with using the technology to enable higher frequency surveillance and intervention. Lightweight modeling approaches are coming into fashion in the trendy world of the digital twin, so perhaps there is another chapter to be written here. RPS was self published on Lulu.com.

Seismics in-the-cloud

Tape Ark demos direct-to-cloud acquisition at PPDM event. Osokey's cloud-native seismic platform.

At the recent PPDM Houston data management conference, Guy Holmes demonstrated Perth, Australia-based startup **Tape Ark**'s cloud-based 'Open petroleum data lake.' OPDL combines PPDM-based metadata management from Petrosys, interpretation functionality from DUG and an Amazon Web Services repository.

Data acquired by a Seismic Source crew operating in Oklahoma streamed into the Amazon S3 archive in real time.

The OPDL also offers Amazon Glacier lower cost, long term storage and the 'Snowball' couriered disk service for really big data transfers to the cloud. Seismic processing is available using the Amazon EC2 compute environment on 'massive arrays of CPU's.' Data 'never needs to be written to tape or touch an oil company's internal resources.' Tape Ark is currently offering a free service to transfer a company's seismic archive into the OPDL.

Another seismic-in-the-cloud offering is now available from UK-based **Osokey** which has announced the Osokey Stream, a cloud-native seismic platform running too on AWS. Osokey Stream provides automated ingestion and encryption of SEG-Y data and pre and post stack access from a web browser. The solution supports real-time global collaboration, on-the-fly attribute generation and 'AI-based' storage optimization.

Google TensorFlow, Scikit-learn extend Ikon's RokDoc

Machine learning used in facies classification and shale porosity evaluation.

Ikon Science has embedded Google's TensorFlow open source toolbox for machine learning into its RokDoc quantitative seismic interpretation flagship. TensorFlow is exposed via a Python API that allows for 'rapid identification of novel predictive relationships across large, multi-disciplinary, multi-scale datasets in both shale and conventional petroleum systems.'

The new functionality was introduced with the RokDoc 6.5.2 release.

Along with TensorFlow integration the Python interface also includes Scikit-learn, another ML toolbox that is used, inter alia, by Spotify, Booking.com and, more *a propos*, by France's Inria for energy-related predictive modeling (see above).

Ikon's Ehsan Zabihi Naeini speaking at the recent London Geological Society's big data event presented two use cases for the new tool in facies classification and shale volume and porosity prediction. Naeini observed that while there is no novelty in such applications, what is new is how easy implement has become with modern machine learning tools and the publicly-available libraries.

Emerson/Paradigm geoscience suite for Total, Repsol

New software sales announced. Total joins Paradigm's 'next generation' OpenDB consortium.

Emerson's Paradigm unit has signed software deals with Total and Repsol for the provision of E&P software. The deal provides Total's geoscientists with access to Paradigm's Skua-Gocad and Geolog suites along with a software development kit that will allow Total to integrate the technology into its own proprietary geosciences and reservoir integrated platform.

The deal also means that Total is now an active member of the OpenDB Consortium, Paradigm's industry-standards-based (PPDM and ResqML) 'next-generation' E&P database.

The deal with Repsol likewise concerns an enterprise agreement for the use of the Paradigm suite. Repsol's Agustin Diz commented 'Following a thorough evaluation, our decision was based on a combination of an outstanding technical offering, a flexible commercial agreement, and Emerson's willingness to provide close, on-site support.'

Software, hardware short takes …

CGG, EnergyIQ, Entero, Geologix, IFPen 'FraC,' INT GeoToolkit, MVE Move, NIST's 'Dual-Comb,' Opto 22's Epic, P2 ES' Qbyte, Red Hat, Sunrise Systems, Rock Flow Dynamics, Yokogawa.

CGG GeoSoftware has announced new releases across its geoscience portfolio, with notably, a data 'load once, use everywhere' function to share seismic volumes between Jason and Hampson-Russell.

EnergyIQ introduces new functionality and enhancements to its IQlifecycle E&P data management solution. Configurable rules and event monitoring enable workflow automation atop the Trusted Data Manager core.

Entero has extended its Entero ONE flagship with 'accurate and auditable' contract management and risking workflows.

Geologix' GEOSuite v7.6 release includes pore pressure and fracture gradient monitoring while drilling.

IFPen has announced 'FraC,' a discrete fracture network modeler for oil and gas, CCS and geothermal applications. FraC interfaces with open source tools such as Dumux and CAST3M to solve complex advection-dispersion problems.

INT GeoToolkit.JS 2.5 adds a new widgets for subsurface correlation and long offset well schematics.

MVE Move 2018.1 sees the addition of elliptical fault flow, a new 2D kinematic algorithm that adds a regional tilt option and new capability to create kriged surfaces with a user-defined outer extent.

NIST's mobile 'Dual-Comb' device is claimed to enhance methane leak detection. The spectrometer uses a laser to detect trace gases and leak locations, leveraging 'Nobel Prize-winning technology.'

Opto 22's Groov/Epic is described as the 'world's first edge programmable industrial control system.' The Linux-based controller offers a device-independent HMI, Node-Red and Ignition Edge for OPC-UA drivers and MQTT/Sparkplug communications.

Release 2.0 of **P2 Energy Solutions**' Qbyte Financial Management sees a refreshed GUI, new search functionality and a more consistent business taxonomy.

Red Hat Consulting has developed a mobile app for tracking performance of electric submersible pumps. The app leverages the Red Hat mobile application platform and OpenShift container.

Sunrise Systems has added network templates to the 1.9.0 Pipenet release.

The 18.1 release of **Rock Flow Dynamics**' tNavigator adds support for Nvidia Volta GPU accelerators.

Yokogawa's new Device Lifecycle Management is an IIoT, cloud-based service for the management of plant asset information.

Rice 2018 High performance computing in oil and gas, Houston

Anadarko's data science. Shell, 'AI heralds major labor force change.' Microsoft's plethoric Azure offering. Park Energy on 'long short term memory networks.' Schlumberger on HPC in the cloud.

Jeremy Graybill of **Anadarko**'s Advanced analytics and emerging technologies unit reported data science successes US onshore basin screening, drilling cycle time reduction and in developing surveillance logic to reduce offshore production losses. Anadarko deploys workstations with Nvidia P6000 cards along with high end DGC computers, each with 8 Volta GPUs. Google's dedicated 180 teraflop TensorFlow processors in the cloud have also been used. Graybill has used deep learning networks to propagate formation tops across a basin and to QC large volumes of well logs.

Mauricio Araya Polo presented **Shell**'s work on 'deep learning-driven' geophysics, to perform feature detection directly from the data and to 'avoid the laborious processing/interpretation/modeling loop.' Shell uses neural nets to reveal features such as faults and stratigraphy in raw, unprocessed seismic traces. Here, Araya Polo invoked 'Hornik's universal approximation theorem' which has it that neural nets 'can compute any function.' The technology is embedded in Shell's GeoDNN in-house interpretation workflow. The technique was co-developed with MIT's Chiyuan Zhang using synthetic data since labeled examples were not available. Deep Learning can also be used as a pre-conditioner for full waveform migration. Araya Polo views the techniques as 'disruptive,' heralding a 'major labor force change.' The first GeoDNN results were presented back in 2014. Real data testing and extension to 3D is still underway.

Curt Smith presented **Microsoft**'s apparently plethoric hardware and software offerings that make up the Azure cloud. These span from entry level virtual machines for everyday workloads, through GPU or FPGA-enabled boxes providing microservices for 'AI/Edge interfacing' right up to 'a real Cray computer configured to you own spec.' Deployment can be truly cloud, on-premises, or a variety of hybrid offerings including a time-variant 'hybrid burst' solution. Deployment is managed with Microsoft's CycleCloud templates for Hadoop, TensorFlow and Spark - *almost anything except Windows!*

Jonathan Mitchell described **Park Energy**'s use of neural nets and a 'long short-term memory network' (LSTM) to analyze pumping data. The LSTM was trained on plunger lift data from 4,000 wells to ride roughshod over the noise and predict production 90 days out. These compared well with conventional decline curve analysis, especially when averaged over the whole field.

Valery Polyakov (**Schlumberger**) observed that, paradoxically, high performance computing is not the primary focus of the massive resources of the cloud. Google, Microsoft and Amazon have instead offer high availability microservices. Leveraging the cloud for oil and gas requires a different approach. This is now facilitated with the Kubernetes framework of clusters and containerized Docker-based deployment which provides a higher level of abstraction than individual virtual machines. Key to the adoption of Kubernetes for HTC is a queue manager. Schlumberger has one, although it's not clear that this will be open sourced.

For its part, **Chevron** uses Altair's PBS Pro in a similar context, as Philip Crawford revealed in another presentation. More from the event home page.

2018 ABC Wellsite Automation, Houston

American Business Conferences Wellsite Automation conference reflects shift from proprietary scada to IoT/MQTT. Whiting Petroleum's open source historian. Microsoft/eLynx on tank level monitoring. Devon on MQTT and the 'future of automation.' Encana - automation may (or may not) reduce lifting costs. GlobaLogix 'IoT won't happen until the procurement process is fixed.' Clariant's strategy for the (chemicals) IoT. Apache on catching-up on automation. Devon on the 'rise of the machines.'

The third annual American Business Conferences Wellsite Automation event, held earlier this year in Houston, underscored a growing need to collect more data in the field and to bring it in-house for analysis, but not necessarily for automation. This has sparked-off a shift from more or less proprietary scada system data formats to more open, 'internet of things' style protocols with the expectation that the venerable MQTT will fit the bill. Another eye-opener is the real world deployment of open source software from the Apache/Hadoop ecosystem that is rivalling PI as a system of record for some adventurous operators. While automation use cases are multiple, the optimization of chemical delivery for production enhancement, stood out.

Our (unofficial) best paper award goes the joint presentation by Eric Saabye and Micah Northington from **Whiting Petroleum** who presented the exploratory, 'Lewis and Clark' approach to the digital oilfield. Whiting's work on scada systems led to the realization that modern IT 'could do a better job.' Whiting previously had multiple systems designed for local operations and firewalls that made data inaccessible. The 'expedition' started with a consolidation of all data onto a historian comprising a Hadoop/MapR cluster running in a secure Tier 2 datacenter. Tools of the analytical trade included Open TSDB and the Apache Drill database, a 'Schema-free SQL query engine for Hadoop, NoSQL and cloud storage.'

The system is fast and 'hugely scalable,' currently handling 1.2 billion records per week. Adding data context is key to the IoT*. A level transmitter may read '4,' but the system needs to know that these are say, 'feet,' and what is 'top' and 'bottom' for the measure. In the past, this could involve a call to the control room! The move from operations-centric uses to fulfilling the needs of new consumers with different requirements means a shift from the 'historization' approach. Units and other metadata needs to be passed along the food chain to satisfy compliance and get meaningful information to the end user. Note though, that the novel IT/big data does little to help out with such contextual information which is managed by Whiting's developers.

Whiting's digitization journey started with production accounting. There are also opportunities in pumping by exception and environmental monitoring with the Grafana open source visualization tool. Open source is an issue for the IT department, although, 'this is not the control room, the system runs a few seconds behind real time.' There are issues with personnel who see their jobs changing. Also, the lawyers were comfortable with daily site visits but hesitate over remote readings.

What did not work? The vendor supplied tier 2 data center was costly. Trials with the cloud failed as Microsoft Azure did not support the required data rates. A commercial predictive analytics package (designed for rotating equipment) did not work. This is not to say that predictive analytics doesn't work, 'but if you want to do it, do it yourself.'

The program showed that data acquired for control may not be fit for purpose in the new use cases. 'So fix it,' change facility design, fix engineering, fix programming to ensure that you have data context. Go for IT/OT alignment and … 'find allies, because the foes will find you!'

Whiting's less-than-enthusiastic take on Azure may have made the next presenters' (Steve Jackson, **eLynx** and Bill Barna, **Microsoft**) job a tad harder. A Microsoft/eLynx/U Tulsa announcement at last year's ABC conference proposed to use the cloud to reduce operational downtime. It is now '100% certain' that this will happen in next 12-18 months. Data scientists (like Barna) need access to all the data. But this is hard because of disparate IT systems, poor data and the lack of qualified people. A common use case is tank level forecasting. In normal operations, tanks may fill up, auto shutdown kicks in and the well stops producing. Data scientists use historical data to anticipate these events and tell truckers when to visit. Maintenance can be optimized using historical data to predict future failure. Streaming analytics on natural gas compressors can detect and identify minute temperature changes that indicative of something amiss. Pumps can be reconfigured more frequently. Data mining can include public domain data from the UT database, Frac Focus, DB and the RRC. Barna warned of 'science projects' led by IT but without support from the business. These may produce impressive results, a PowerPoint show, 'bravos,' and then, nothing! Bad data is a huge problem. Talent is a problem. Universities are cranking out data scientists, but without oil and gas job skills. Data scientists on LinkedIn are snapped up immediately and then 'they jump from company to company.'

What is required is a templated, end-to-end solution. Enter Microsoft's tank level solution in Dynamics365 for field service. But oftentimes companies don't have access to necessary data which may be siloed in vendor scada systems. This is where ELynx comes in, also pooling data across 100 customers to build algorithms. Jackson reported that Elynx has monitored over 40,000 wells across the US for 400 clients, all of which is now in the Azure cloud. Proofs of concept are underway in plunger lift optimization and anomaly detection that can tell, 48 hours in advance, when a well is about to shut in. The real good news, according to Barna, is that 'predictive analytics-based evaluations show increased reserves!'

Brandon Davis presented on the future of automation at **Devon Energy**. Devon has some 15,000 devices and 2.6 million tags spread across its North American assets. Radio (Cambium TDM) connects scada and other data feeds to OSIsoft PI for integration. Optimization tools have been developed for plunger lift, gas lift and automated well test. Trends can be tracked down to a single well and tank and are used in leak detection, water transfer line leak tests and greenhouse gas monitoring. Frack flowbacks are monitored along with oil/water inventory and haul trucks. Real time data is more and more the primary tool for optimizing operations. Future plans include a further shift to the IoT paradigm with edge devices for, e.g., protocol conversion to MQTT, edge

computing and data push to a broker system. Devon anticipates that Emerson and ABB will soon be soon capable of MQTT data delivery to enable push with less polling and lower bandwidth requirements. A message-based system (broker) could be seen as a full replacement for scada, with fewer points of failure and easier integration, something Davis sees as 'a pretty huge thing.'

Encana's Eddie Carpenter rhetorically asked, 'does automation reduce lifting cost?' The answer is no, unless it is combined with many other considerations. These are buy-in from management, communications, the right installed equipment and a clear idea of what end result is desired. Encana's East Texas automation project benefits from 100% reliable communications into its operations control center, experienced people and a central maintenance system. Replacing manual control with automatic chokes 'has really paid off' as constant monitoring keeps production on line. In the last two years, maintenance has shifted from reactive to 'mostly proactive,' and allowed a 20% head count reduction. Automation is seen as crucial to address Encana's plan to add 60 to 100 wells per year for five years while keeping head count flat. So does automation reduce costs? Yes, with the above provisos.

Charles Drobny (**GlobaLogix**) provided an iconoclastic take on the proceedings, opining that preventative maintenance is unlikely to work since nobody wants to shut the process down! In corporate acquisitions and mergers, 'nobody cares about the scada system.' Its value is therefore zero! Despite the enthusiasm for the IoT and analytics, 'none of this exists!' Moreover, nobody can define the 'efficiency' that is the objective of the IoT. Cyber defense in oil and gas is weak or non-existent. In fact, it may not be all that important as there is no money in it! The best defense is a glue gun for USB ports in the field! The upstream procurement process is badly flawed. Folks hear of 'cool stuff' in a conference and decide to do a 'project.' Specs are written but not always with a very good grasp of the situation. 'Customers don't know what they want till after they've got it.' This makes bidding problematical. Projects may include more than one company, but not all are equally involved in project specifications. Options are unveiled late and expectations expand as scope creeps. 'We end up playing the change order game!' The system is flawed and IoT won't happen till it's fixed. For Drobny, the fix includes blockchain, edge devices and starting small, 'never across the whole enterprise!'

A key target for automation is monitoring and metering oilfield chemicals. Paul Gould presented **Clariant**'s digital strategy for the IoT and big data. Chemicals are used to mitigate paraffin and scale buildup, and to prevent corrosion. It is important to know how much chemical is enough and how best to apply. The problem is, 'who pays for IoT chemical management?' Budget is unlikely to come from maintenance or production, even less likely from capex. The answer is that it all (should) be decided in the C-suite! It's about cash flow not opex. For smaller production site, a 'cheap' ($450) ultrasonic level sensor is good for up to 5 gallons/day. Atex (explosion-proofing) ups the price threefold, so it is better done outside the exclusion zone.

The IoT philosophy is important too, fully remote, edge or centralized control? Comms are a key consideration. Older sites may be retrofitted with wireless while more modern pads are wired. Remote control needs to be balanced with process latency. How fast do you need to react? Full remote control may be good for hard to get to locations. Good payback is obtained by adding tank level monitoring to continuously dosed wells to mitigate damage from high chemical concentrations. Gould enumerated a multitude of solutions for secure data transfer including segmented security zones, crypto AES, sFTP, and secure data services from OSIsoft, Veritrax, Tibco, Cygnet and the Skyhub low cost wireless cloud. Finally, read the DoE's Secure data transfer guidance document for industrial control and scada systems.

Mark Bruchmann described **Apache** as 'playing catchup' in field automation. Although there is a standard minimum level of automation for every well, above that, what's put on site depends on considerations such as, are wells interfering? what is the target production? and many other factors including proximity to habitation. Some horizontal drilling pads have multiple lease owners so metering is a big issue. Management bought into a major automation project in 2017 and Apache is now developing its standards and building radio towers. The company operates 450 compressors in Oklahoma and these are undergoing analysis to see how much power is being used. Problems include inconsistent data input, limited bandwidth, nuisance alarms, and a lack of manpower to develop analytics.

One early use case brought some surprises. Having installed guided wave radar for tank monitoring to spot leaks, the main observation was that in August, 60° API oil evaporates away! The remote operations center is working, monitoring slug catcher status, compressor downtime, chemicals, production and trucking via the GIS. Not all benefits are derived from data. Cameras are great too, especially those at Apache's ten wells on a prison farm location!

Another **Devon** presentation, from Tristan Arbus and Jessamyn Sneed looked at practical application of machine learning and AI and … 'the rise of the machines.' Devon's main tool is the SAS Analytics Suite. This has been used to perform text mining in drilling operations, pinpointing causes of NPT**. The system has identified 30 or so words that drillers don't like to hear, 'repair,' 'troubleshoot, 'found leak,' and so on that correlate with NPT events and perhaps with individual drillers, 'some have more issues than others.' Concept maps help troubleshoot as events radiate from their root cause. Numerical analysis provides the 'what and when,' text analysis the 'who and why.' Challenging ESP*** failures were studied by a multi disciplinary team. This started by establishing standard definitions of failure modes. Initially successful predictions led to a published paper. But as time went on, new data failed to bear out the early success. Another project is investigating screen-outs (wells plugged with frac sand) using the OSIsoft AF database and open source SIMA (streaming in-memory analytics) on wireline data. Tests of over 100 models showed that neural nets were best.

** 'Internet of things,' taken as a catch-all term signifying an internet-connected sensor network.*

*** Non productive time/downtime.*

**** Electric submersible pump.*

The 2019 ***American Business Conferences*** *Wellsite Automation event will be held January 30-31 in Houston.*

Folks, facts, orgs ...

Adlink Technology, ARMA International, British Geological Society, BP America, CGG, Chevron, *Comisión Nacional de Hidrocarburos*, Energistics, eLynx Technologies, Heritage Global, Hunter Group, IFS, iLandMan, IOGP, Los Alamos National Laboratory, Mogas, NETL, Microsoft, OGC, Oildex, Gartner, Cortex, PIDX, SAS, Schneider Electric, Shell, Siemens, Spatial Networks, Oxy, SPE, Technical Toolboxes, UK Oil & Gas Technology Centre, ITF, TU Delft, Verdazo Analytics, Weatherford, White & Case, Craytive Technologies, Wellsite.

Joe Speed has joined **Adlink Technology** as CTO. He hails from IBM.

Ben Robbins is now a director of **ARMA International**.

The **British Geological Society** has named Olivier Peyret (Schlumberger) to its board.

Susan Dio is chair and president of **BP America**. She succeeds retiree John Mingé who now chairs the National Petroleum Council's CCS unit.

Sophie Zurquiyah is the new **CGG** CEO succeeding Jean-Georges Malcor. Kamal Al-Yahya takes her previous role of senior VP, GeoSoftware.

Chevron has named David Payne as corporate VP HSE. He succeeds retiree Wes Lohec.

Mexico's ***Comisión Nacional de Hidrocarburos*** has joined the **Energistics** data transfer standard consortium.

eLynx Technologies has named Alex Mannella chief analytics officer. He hails from PwC.

Daniel Beck leads **Heritage Global**'s newly-formed Energy and Construction unit in Austin, Texas.

Vegard Urnes has resigned as interim CEO at **Hunter Group**.

Darren Roos has been appointed CEO of **IFS** following the retirement of Alastair Sorbie. He was previously with SAP.

Tom Wilson is now **iLandMan** mid-continent regional sales executive based in Dallas. He hails from Yooz.

François-Regis Mouton has joined **IOGP** as EU Affairs Director succeeding retiree Roland Festor. Mouton hails from Total.

Tony Redondo is now head of **Los Alamos National Laboratory**'s Richard P Feynman center for innovation.

Mogas has appointed Jose Osuna as VP operations, succeeding Sam Furman, who is to retire. Osuna hails from Technip-FMC.

Sean Plasynski is acting director of the **NETL** following Grace Bochenek's retirement.

Microsoft's Kristin Tolle has been named to the **OGC** board.

Rick Imbrogno (**Oildex**) has been appointed to **Gartner**'s 'Evanta' advisory community in Calgary.

Cortex' Chris Lambert is now chair of the PIDX business messages work group.

Jason Mann is VP of **SAS**' new IoT analytics division.

Kieran McLoughlin is VP of **Schneider Electric**'s EcoStruxure IoT platform.

Shell France has launched Shell LiveWire to support start-ups in the energy and mobility sectors.

Former CEO of **Maersk Oil**, Gretchen Watkins is now EVP Unconventional at **Shell** succeeding Greg Guidry who is stepping down. She also takes up the role of Shell Oil Co. president and US country chair as Bruce Culpepper is also to 'step down' at year-end 2018.

Barbara Humpton is CEO of **Siemens** US.

Spatial Networks has promoted Bill Dollins to CIO and Zac McCormick to CTO.

Oxy's Shauna Noonan is **SPE** president for 2020.

Drew Lafleur is now CTO at **Technical Toolboxes**.

The UK **Oil & Gas Technology Centre** and **ITF** are to merge.

Jan Dirk Jansen has been appointed dean of the faculty of civil engineering and geosciences at **TU Delft**. He succeeds retiree Bert Geerken.

Ryan Bielefeld has joined **Verdazo Analytics** (a Pason company) as US sales manager.

Angela Minas is now member of the **Weatherford b**oard.

Jay Cuclis heads-up **White & Case**'s new Houston office.

Bob Rundle is now CTO at **Craytive Technologies**.

The 'advisory board' for **Wellsite**'s CrudeCoin ICO* includes Guillermo Arango (ex-Schlumberger/Baker Hughes), Sanjay Melkote (ex-IBM) and Blake Burnette (ex-Baker Hughes).

** initial coin offering.*

Done deals

ABB, Arkad Engineering merger. AspenTech acquires Apex Optimisation. Hunter Group's IKM Subsea acquisition thwarted. Intertek to acquire Proasem. Oceaneering acquires Ecosse Subsea. Quorum Software acquires Entero. Siemens acquires Agilion GmbH. SSI management buy-out.

ABB has transferred its oil and gas EPC business into a joint venture with **Arkad Engineering**, Arkad-ABB.

AspenTech has acquired **Apex Optimisation**, developer of the GDOT generic dynamic optimization technology.

Hunter Group's attempt to acquire **IKM Subsea & Technology** was thwarted when key shareholder Arne Fredly indicated that he would vote against the transaction.

Intertek is to acquire **Proasem**, a Colombian testing and inspection business.

Oceaneering has acquired **Ecosse Subsea** for approximately £50 million.

Quorum Software is to acquire **Entero**, developer of the Mosaic software package.

Siemens has acquired **Agilion GmbH**, a developer of real-time locating systems.

CEO Darren Larkins and president and CTO Denis Morais have bought-out the shipbuilding software development company **SSI** from founder Rolf Oetter.

Cyber security round-up

EY infosec survey finds oils 'worried.' NIST posts Federal register notice for energy sector. Schneider Electric teams with Cylance. Siemens signs with Tenable. Cymmetria OK's its own 'hack back' technology. Leidos' 'risk cube.' Waterfall on Meldown/Spectre risk to control systems.

The 2017/18 **EY** Global information security survey included some 40 participants from the oil and gas vertical. EY found that companies are making good progress in identifying and resolving vulnerabilities. Even so, they are 'more worried than ever about the breadth and complexity of the threat landscape.' To bolster defenses, EY advocates 'cyber fusion,' a multilayered response that is integrated into every facet of an organization's operations.

The US **NIST** National cybersecurity center of excellence has posted a Federal Register Notice for the energy sector asset management use case. Technology vendors are invited to participate in the project which is to combine commercially available and open source technologies to provide guidance on how energy companies may enhance operational technology and industrial controls system asset management.

Schneider Electric has partnered with antivirus specialist **Cylance**, a CMMI Level 5 certified solution provider, to harden cybersecurity across its industrial software portfolio. Cylance's AI-powered endpoint protection blocks malware, file-less attacks and advanced persistent threats.

Siemens is to deploy industrial cybersecurity solutions from **Secure-NOK** across its Ruggedcom portfolio. The solution targets, inter alia, oil and gas installations and transportation. Siemens has also signed with **Tenable** to provide energy, utilities and oil and gas companies with a new solution for industrial asset discovery and vulnerability management. Tenable's passive vulnerability detection solution for scada and control systems provides continuous visibility of operational risk.

Jonathan Braverman, legal counsel of **Cymmetria**, has performed an in-depth analysis of the US Computer Fraud & Abuse Act of 1986 in relation with Cymmetria's new MazeHunter product. He finds that Mazehunter's 'Hack Back' technology complies with US and international laws. The standalone incident response product complements Cymmetria's MazeRunner flagship adding a threat hunting capability, enabling direct action against attackers, 'taking the fight to the enemy.'

A new publication from **Leidos** lists eight steps for a successful insider risk program. Insider risk is evaluated as a 'risk cube,' as defined in the following C-Suite-friendly math:

Risk = f (Threat x Vulnerability) AV

(where AV = asset value).

Meanwhile, as **Waterfall**'s Ulf Frisk reports, the Meltdown/Spectre saga continues as Microsoft introduced an even worse vulnerability while fixing the Meltdown vulnerability in Windows 7 and Windows 2008 Server R2! The 'fix' means that 'any program can read or write any word in any other program's memory, or the kernel's memory. The cure is worse than the disease.' The problem is particularly acute for industrial control systems using these older operating systems.

IBM's inaugural 'Think' conference

Maersk's cognitive driller. Maximo extended for Diamond Offshore and KOC. Schneider's 'evil twin.'

IBM's 'Think' Conference is 'the flagship IBM conference to help you modernize and secure your enterprise.' Think's perimeter spans the cloud, blockchain, IoT, VR and AI. From the program we detected a distinct Maximo legacy along side a downplayed Watson/cognitive perfume.

Maersk Oil's Joy Sunday Oyovwevotu presented a 'Cognitive-driven drilling advisor.' A model identifies the onset of borehole instability, predicts stuck pipe and gives a risk assessment prior to running casing and/or cementing operations. Given enough training and data, the model performs well, although early versions suffered from false positives. The ability of the model to self-learn and adapt to new situations needs to be tested. Maersk envisages a future hybrid physics/statistics drilling advisor that can adapt to changes in well design and rig specification. Users will ask Watson to 'Show me the reference wells with similar anomalies' as per an earlier Woodside mock-up.

Tim Osborne (**Diamond Offshore**) dissed today's technology 'enablers' (Oracle, Excel, …) as 'non-standard, disconnected, silos that require manual processes and spreadsheets.' Maintenance and inventory systems are not built on industry standards, have limited capabilities and run on outdated technology. Diamond is working with IBM to extended Maximo with IBM's 'cognitive' Watson IoT, SoftLayer and Blue Mix.

Asim Hussain and Haya Al-Fulaij presented **Kuwait Oil**'s extensive Maximo -based solution for marine operations management. The solution was developed with help from UK-based SRO Solutions and has received a 'statement of fact' from Lloyds. The solution automates many previously manual maintenance processes and has streamlined operations and aligned KOC's operations with classification society standards.

Paul Forney (**Schneider Electric**) presented a scare story of the 'Evil Twin' cyber attack on a Saudi chemical company's control systems. The Triton vector hit the safety network but what raised the danger to critical was the 'Evil twin' that simultaneously hit the plant network.

*The incident has been widely reported, but **Security Affairs**' Phil Neray was scathing of Schneider's account. 'It is comical that Schneider Electric stated that the attack did not leverage any vulnerabilities in its product. OT environments are vulnerable by design and are a privileged target for hackers.'*

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Sales, partnerships, deployments ...

Accenture, Arundo Analytics, Fuglesangs, Emerson, Quantico, Target, Implico, TechnipFMC, Aker Solutions, Cognite, Aramco, MIT, Berkana, CSA Ocean Sciences, HWCG, Expro, Vision iO, Fugro, LMKR, Aram, IFS, Invasystems, Falkonry, Kongsberg Digital, Oil Spill Response, CEDRE, P2 Energy Solutions, Ryder Scott, Millennium, Atos, Siemens, Tessella, IQ Scan, Cenozon, Peak AI, BC IoT.

Statoil has signed a three year master service agreement with **Accenture** to digitally transform its operations.

Arundo Analytics and **Fuglesangs** demonstrated a condition and performance monitoring application at the opening of Norway's new 'Subsea Valley' energy technology center of excellence.

BP has signed off on **Emerson**'s multi-year, multi-million-dollar automation project on the North Sea Glen Lyon FPSO.

Quantico Energy Solutions and **Target** have signed a technology alliance to market data management, geoscience consulting and AI in oil and gas.

Implico has integrated its OpenTAS terminal management system with **TechnipFMC**'s metering and control system, AccuLoad IV.

Aker Solutions and **Cognite** have formed strategic alliance to provide digital solutions across the asset lifecycle.

Aramco and **MIT** have signed a 5-year, $25 million agreement targeting R&D into global energy and climate challenges.

Berkana has relocated Chevron Pipeline's Houston control center in a 'challenging' move and upgrade of a live scada system.

CSA Ocean Sciences is to provide rapid response water quality monitoring services to the HWCG consortium of Gulf of Mexico operators.

Expro has signed a global agreement with **Vision iO** to enhance its downhole monitoring solutions offering with a suite of innovative camera technologies including the WellCAM visual logging platform.

Fugro has been chosen by Statoil to provide rig positioning services to all Statoil operated rigs on the Norwegian continental shelf together with the company's associated vessels.

LMKR has secured a multi-year agreement with the Alaska Department of Natural Resources to provide its GeoGraphix interpretation suite.

Aram has joined the **IFS** partner network to market and support IFS Applications across the oil & gas and maritime industry.

Invasystems is to leverage **Falkonry LRS** machine learning and predictive analytics to reduce oil and gas production downtime and increase recovery.

BP has chosen **Kongsberg Digital** to build a multi-purpose dynamic simulator for its Mad Dog Phase 2 project in the Gulf of Mexico.

Odfjell Drilling has implemented the **IFS** IoT business connector to make data captured by drilling rig assets accessible in its IFS Applications suite.

Oil Spill Response Limited and France's Centre for documentation, research and experimentation on accidental water pollution (**CEDRE**) are to strengthen operational-level collaboration and share personnel and knowledge in the fields of spill preparedness and response.

Cabot Oil and Gas has implemented **P2 Energy Solutions**' Enterprise Upstream, Merrick and AFE packages.

Ryder Scott and **Millennium Energy Advisors** are teaming-up to offer technical and financial expertise for oil and gas property acquisitions.

Atos and **Siemens** are to reinforce their joint innovation and investment program with an additional €100 million, bringing the total to €330 million. The money goes to the MindSphere-Codex strategic co-operation and a joint go-to-market effort.

Tessella has secured a three-year framework agreement from Statoil to deliver data science services.

Wellsite Fishing and Rental Services has deployed **IQ Scan**'s technology to streamline asset management. The system uses a laser-engraved, universally traceable asset code to track location and wear on oil country tubular goods.

Cenozon is now **Peak AI Solutions**' 'exclusive' partner for the Canadian market, notably for PAIS' AI-powered Instant Chart mobile chart reading app for IOS and Android devices.

The **British Columbia Institute of Technology** is piloting a cloud edition of **Kongsberg Digital**'s K-Sim. BCIT is to offer 'simulation as a service' in the Kognifai cloud.

Standards stuff...

Katalyst's PPDM gold. SEC OK's oil taxonomy. CII to head JIP Survey. FOSA pipeline primer. OPC UA goes pub/sub. SEAM floats machine learning for seismics.

PPDM reports that **Katalyst Data Management** has achieved gold-level compliance for its PPDM 3.8-based iGlass subsurface data management solution.

The US **SEC** has now officially accepted the 2018 **FASB**'s XBRL SEC reporting taxonomy that includes disclosures for oil and gas producing activities.

CII, the US construction industry institute, is now program manager of a long lived JIP that tracks capacities, costs and backlog across global fabrication yards. Current partners in the JIP Survey include **ExxonMobil**, **Shell**, and **Total**. The JIP kicked off in 1991. As of 1/01/2018, **Fiatech** has been subsumed into the CII.

FOSA, the fiber optic sensing association has released a primer on fiber optic installation considerations for pipelines with guidance on cable selection and positioning and the benefits of along-pipeline distributed sensing.

The **OPC Foundation** has extended its OPC UA protocol with a pub/sub functionality for low power, low-latency communications on local networks.

SEAM, the SEG advanced modeling consortium has floated new proposed projects for machine learning in geophysics, microseismic processing and full waveform inversion.

Going, going… *green*

NETL open sources CCSI software. DoE funds CCS, ML in energy and CCS geomechanics. Harc's green drilling system. CMI on fate of frac fluids. PTAC's Upstream eco-efficiency handbook.

The US **NETL** is releasing CCSI, its carbon capture simulation toolset as open source software. CCSI is a suite of computational tools and models designed to maximize learning and reduce cost and risk during the scale-up process for carbon capture technologies. Download the CCSI toolset on Github.

The US **DoE** has announced 'up to' $9 million in federal funding of projects that advance 'associated geologic storage of CO2 in basinal geolaboratories.' NETL is to manage the projects under the DOE's carbon storage program. Projects include computational, analytical, bench and field -scale laboratory studies. One 'potentially large' opportunity is seen in residual oil zones and tight oil formations (not, though, according to CMI, see below). Read the announcement on DE-FOA-0001829.

The **DOE** is also looking into the application of machine learning for energy applications, in particular, energy efficiency and renewables. The DEO's Devanand Shenoy, writing in the proceedings of a Google-sponsored workshop, cited IBM's Watt Sun self learning weather model, that is 'more accurate than previous solar forecasting models.' Shenoy also mentioned 'smart wells' that sense temperature, pressure, chemicals and vibrations that are 'deployed to streamline efficiency and mitigate failures in the oil and gas industry.'

Harc Research reports continued benefits from its 'environmentally friendly drilling systems' program. The program has demonstrated the feasibility of innovative biological emissions treatment technology to reduce air pollution. A bioreactor treats air emissions at oil and gas facilities and reduces or eliminates volatile organic compounds. The work was presented at last year's SPE ATCE (SPE-187144-MS).

The **DOE** also recently announced $10.4 million in federal funding for cost-shared research and development projects under DE-FOA-0001826 for the development of technologies to advance the understanding of state of stress and geomechanical impacts in the subsurface. The research addresses the 'safe and permanent' geologic storage of CO2.

Ikon Science has joined the **National Oceanography Centre**, Shell, BP and **OEAGHG** in an initiative to 'close the gap' on missing CCS research. GASRIP (geomechanical assessment of CO2 Storage reservoir integrity post-closure) investigates how CO2-brine induced-salt precipitation/dissolution affects geomechanical integrity and transport in CO2 storage reservoirs.

The 2017 Annual Report from the **Carbon Mitigation Initiative** reports on the fate of fracking fluids in shale-gas systems. The CMI concludes that 'the large volume of fracking fluid that remains underground is imbibed strongly into the host rock and remains there in the long term. Earlier CMI research found that CO2 injection into depleted shale-gas systems is not feasible for most situations (see NETL above). That modeling work has now been extended to study the fate of fracking fluids in shale-gas systems. Modeling results indicate that the large amount of fracking fluids left underground is unlikely to pose any significant environmental risk.

Finally, a belated heads-up for the 2017 **PTAC Canadian Upstream oil & gas eco -efficiency and operations handbook**, a useful compendium of energy efficiency and environmental resources.

Blockchain in oil and gas

Initiatives from BP, Chartwell, Lloyds, Ondiflow, ConsenSys, Petroteq, WellSite.

In its 2018 Technology Outlook, **BP** states that 'sensors and blockchain technology' could play a key role in preventing losses of energy during production, by, for example, tracking methane leaks. BP also believes 'digital technology is the most significant source of system-wide efficiency improvement, although its full power is unknowable.'

A report from **Chartwell**'s Noah Solomon positions cryptocurrencies as 'a new challenge for utilities.' The energy involved in cryptocurrency mining is 'between 18.4 and 57 TWh' worldwide*. New York's authorities recently hiked electricity rates for cryptocurrency miners with excessive usage.

Divestco has teamed with **Bird River Resources** on a 'low-cost cryptocurrency mining center in Calgary, leveraging the companies' joint cogeneration agreement for the production of low-cost electricity from natural gas.

Lloyd's Register Foundation has teamed with **Bloc**, 'Blockchain labs for open collaboration,' to establish a Maritime blockchain lab to assure the safety of critical infrastructure and drive new business models for the global maritime industry.' LR also announced a new report from the Alan Turing institute that investigates blockchain's potential to 'improve safety.'

Ondiflo, a joint venture between **Amalto**, **Logistics and Field Data Management** and blockchain boutique **ConsenSys**, is to form a consortium to develop its block-chain-based field ticketing solution. The Consortium will leverage ConsenSys' TMS and Amalto's Platform 6 to provide an end-to-end solution built on an Ethereum blockchain infrastructure. Rollout is set for December 2019.

Canadian **Petroteq Energy**, with a degree of puffery, describes its oil sands venture as 'America's secret weapon in the oil war.' The company has also announced Petrobloq, the 'first blockchain-based platform developed exclusively for the supply chain needs of the Oil & Gas sector.' Petroteq is to 'harness the hotter-than-hot Blockchain sector to transform energy market deals and data.' To promote Petrobloc and its oil sands development, Petroteq paid $70,000 to OilPrice.com which dutifully enthused about the company.

Wellsite has announced Wellsite Crudecoin, a blockchain marketplace for oilfield services that is set to 'dramatically improve traditional business processes in upstream oil and gas.' A public sale of Crudecoin starts in June.

** per year presumably.*

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DNV GL Veracity learns from 80,000 well dataset

Driller AGR's iQX software now hosted on 'open' well data platform.

DNV GL has extended its 'Veracity' 'open' well data platform by integrating drilling engineer AGR's intelligent well data management tool, iQX. iQX embeds learnings from AGR's evaluation of some 80,000 wells, gleaned from national data repositories since 2011. Veracity users can now leverage cleansed data via a hosted edition of iQX in the Veracity cloud. Drilling engineers, can access metrics on geology and bit performance.

DNV GL promises 'more efficient well processes through automated well design, automated report generation, continuous digital well access throughout the lifetime of the well and more efficient plugging and abandonment operations.'

iQX poster child is Norwegian AKER BP that has standardized well data and operations across its Ivar Aasen development. Speaking at last year's GBC IIoT/digital solutions in oil and gas, AGR VP Software Peter Mathisen showed how iQX is used to 'make structured information unstructured' and to 'plug gaps in current Norwegian reporting and data capture.' AGR and DNV GL are seeking partners for a JIP to further develop joint functionality across Veracity and iQX. More from DNV GL.

ABB, Arundo team on MPM in the cloud

'World's first' claim for cloud-based, virtual multi-phase flowmeter for offshore oil and gas.

ABB and Oslo, Norway headquartered AI software boutique Arundo Analytics have teamed on what is claimed to be the 'first, cloud-based virtual multiphase flow meter' for offshore oil and gas. The cloud-based MPFM will integrate ABB's 'Ability' oil and gas portfolio. The solution targets 'expensive' (but real!) MPFMs, leveraging ABB's fifty year plus experience of physical modeling and simulating intermingled fluids.

The 'cloud-to-cloud' solution connects data in ABB Ability with Arundo's Fabric cloud-based hub, providing operators with an 'analytics-as-a-service' offering that gives real-time insights into the constituent properties of a stream of produced fluids.

Arundo's toolset combines physical models with data science and machine learning. The offering is a component if a growing number of cloud-based, data-driven oil and gas applications. Arundo's Composer allows desktop-based analytical models to be deployed in live, online environments 'in minutes.'

Gazer, geoscience-aware sentiment analysis

Researcher Paul Cleverley unveils geo text data mining with ensemble machine learning.

Speaking at a recent 'big data in geosciences' event held by the London Geological Society, Paul Cleverley (RGU, Aberdeen) showed how natural language processing (NLP) can be applied to 'mine' large bodies (a corpus) of geoscience information. Cleverley contends that the approach can challenge cognitive bias* or corporate organizational dogma, stimulate creativity and lead to a learning event and ultimately, business value.

Cleverley proposes adding automated 'sentiment analysis' to text mining as practiced in opinion and brands analysis. Such techniques need adapting to work in the geoscience field. Cleverley has developed Gazer, a geoscience-aware sentiment analyzer that uses an ensemble machine learning approach. Gazer was developed using the open source Python TextBlob to ingest public domain petroleum system assessment reports. Geologists then tagged some 1,000 phrases ('source rock', 'reservoir', 'trap' ...)

Astonishingly, the geologists agreed on over 90% of the definitions.

Gazer ran against a test corpus of 750 labelled documents and returned 84% accuracy, 'approaching human-like levels.' Cleverley is to present the results again in the Halliburton iEnergy lecture series. More too from Cleverley's blog.

** Provided of course that the bias is not baked into the process. Remember Tay, Microsoft short-lived racist sex-bot?*

Majors' websites: HTML compliant? (No). Tracking? (some).

A quick survey of oil and gas major's websites reveals one user of the Facebook tracking pixel!

With all the hoo-ha about Facebook, Cambridge Analytica and now, 'shadow profiles' that track non-Facebook users via an invisible pixel in a web page, we thought that we would check some majors to see what sneaky tracking they were up to. Oil IT Journal has previous form in checking Oils' websites for compliance with web standards as we reported back in 2002, when we found that, according to the W3C's validator, all oil companies' and standards bodies' websites throw up multiple errors. They still do by the way.

Regarding tracking, most all sites embed tracking cookies from Google, notably the Google Tag Manager, which, so far at least, has not been associated with particularly nefarious behavior*. But what we were looking for was use of the sneaky Facebook tracking pixel that shares your behavior with Facebook without your knowledge, even when you are not on Facebook. All the oil and gas majors we checked were Facebook pixel free. Except for one, Statoil!

You can check a webpage for the pixel with CTRL+U which displays the page source. Look for something like

<img height="1" width="1" style="display:none"

src="https://www.facebook.com... which

indicates a hidden tracker. And OilIT.com you ask? We don't even use cookies. So no third party tracking *chez nous*, neither by Google nor Facebook!

** Although Facebook did call-out Google and Twitter for similarly intrusive user tracking.*