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BRAD SMITH AND THE CLIMATE-FRIENDLY BARREL

Microsoft President backs 'sustainable' oil production, but warns Azure AI smarts may be restricted for oils with no environmental commitment.

On the occasion of the UK-hosted Conference of the Parties N° 26, that's COP26 to you and me, BBC technology correspondent Mark Cheslack interviewed Brad Smith, president and vice chairman of Microsoft on BBC Radio 4. Smith reported that Microsoft is reducing its own carbon footprint. Emissions are down 6% year on year, mostly by shifting to greener energy. Cheslack started out with a softball, 'How does Microsoft view the role of technology in the energy transformation?' Smith opined that, 'This is going to change our lives in many ways. Cars will change, but I think we should continue to be able to drive, to see our loved ones, and fly to see our friends. I hope that we'll have sustainable aviation fuel for our aircraft 20 years from now. You may see some price increases and we may see some areas where we all have to give up a little.'

Cheslack then threw his medium-paced curveball, 'What about the companies you supply .. what about the oil and gas industry? How does that fit with your corporate sustainability goals?' This was no problem for Smith, 'Our number one focus when it comes to working with energy companies including oil and gas companies is to identify places where we can partner with them to make them more climate-friendly. And then, really equally important is helping oil and gas companies shift their exploration and especially their extraction so that even when they are producing a barrel of oil it is a more climate-friendly barrel. It is cleaner oil, the process itself it isn't giving off the methane that people are discussing at COP 26.'

And then came the hardball, 'Some big operations won't deal with those companies. Is that a stance that Microsoft might take?' Smith acknowledged that Microsoft was 'Not ready yet to say that we have the answer' [to this issue] 'Some things we sell are straight off the shelf. We provide Windows and Office products. I don't really see us navigating to a future where we decide what we think of you before we sell you our technology. I don't think that's going to make for a better country or a better world. We may get to a point where we won't partner deeply and provide certain say, AI in partnerships with companies that have no interest in improving their environmental footprint while pumping oil out of the earth.'

Listen to the Radio 4 Today program podcast here.

SOFT LAUNCH OF THE OPEN SOURCE DRILLING COMMUNITY

ExxonMobil-backed industry and academia coalition to support open-source drilling software

Speaking at the MATLAB Energy Conference 2021, Paul Pastusek and Gregory Payette presented the Open Source Drilling Community, an industry and academia coalition that sets out to support an open-source effort for drilling software and encourage the reuse of 'ever-improving' models and code. OSDC span out of DSATS, the Society of Petroleum Engineers Drilling Systems Automation Technical Section in 2019. After a covid-delayed start, the web and GitHub sites opened to the industry with a 'soft launch' in September 2021.

Today's commercial models are often opaque while many academic efforts are of limited scope. Models developed under joint industry projects may not be published, and there is a general need for better math and code verification and model validation with case studies. ExxonMobil's own codebase seeded the initiative and now additional models have been submitted by Scientific Drilling, NORCE, Texas A&M, and the University of Calgary. MathWorks has helped convert the initial ExxonMobil code to MathWorks' Simulink, improving code stability and execution speed and documenting the models. All models, data, and test cases are freely available for academic and commercial use.

The initiative favors understanding over prediction through full physics modeling. 'Modeling the drilling process allows us to understand the physics driving our systems'. Proposed tools and procedures can be tested without the time and risks of rig trials. 'In the near future, it will be inconceivable to put a new tool in the ground or new control system on a rig without fully testing the system for performance and stability'

OSDC provides component models of the complete drilling system, including topsides, coupled drill string dynamics, hydraulics and bit-rock interaction. While simple reduced-order models that ignore couplings may be used in some scenarios, integrated component models are required for comprehensive dynamic modeling of the drilling system. OSDC is working on best practices for the integration of different models with varying time scales and/or spatial sampling.

The open source paradigm has been chosen to enhance collaboration and transparency and to eliminate 'reinventing the wheel'. There is also an expectation that subject matter experts will be able to create 'focused models' for component systems such as the autodriller, bits and motors. It is early days for OSDC, right now at a juvenile V 0.1 release. Currently-available models include a transient torsional drill string model and a yield power law fluid calibration model. The initiative also pulls in prebuilt libraries from the Matlab Drilling Toolbox and PyDrill, the Python Drilling Simulation Library. The University of Calgary is coordinating the organization's web and GitHub sites. More from OSDC.

HUAWEI AND AVEVA MEET UP IN VIDEO LAND

Editor Neil McNaughton ponders a reported 'next big thing' in data – managing streaming video - to conclude that it is all about communications. This leads to a discussion of standards where there is lot more than meets the eye...

In researching the current issue I was intrigued by a serendipitous meeting of the ways as two large service providers both suggested that the ultimate goal in 'big data' was the ability to manage video. In the left hand corner we have **Aveva/OSIsoft** presenting video as the next leap forward in data management (see 'The real reason Aveva bought OSIsoft' in this issue). In the right hand corner, **Huawei**, whose 'digital oilfield' solution is building out from its expertise in video surveillance, aided and abetted by German artificial intelligence solutions provider G2K Group, likewise covered in this issue (see our report from the 2021 Huawei Global Oil & Gas Summit). Digging a bit deeper into these two offerings, you see how much the digital transformation is about communications. For OSIsoft, this means harnessing the 'communications' bus of SCADA and process control. For Huawei, it's about telecoms, 4G, 5G and the surveillance society.

There is a lot packed into these two announcements and into 'communications' in the broadest sense. Both aim to provide the end user with 'situational awareness', the first step in the digital oilfield process. They say you can't manage what you can't measure, but management is even harder if you are not even aware of what to measure. One of the big trends of the digital oilfield movement of the 2000s was getting remote stuff, like isolated well pads and district offices, connected to the central control room. Since then vendors have been falling over themselves to provide such connectivity. Often a robust communications architecture comes at a price, in the form of a degree of exclusiveness. The vendor providing the comms may offer much better comms to users of its own kit, as deployed either in the field or in the control room or perhaps at both ends. Oftentimes their clients have, for one reason or another, expressed concern over such closed single vendor solutions and called for openness in the way of an 'open standard'. So that everybody can 'communicate'.

Many years ago, sitting in on a data managers' meet there was a suggestion that the hosting organization might get involved in creating a new standard for something or other. A very experienced geophysicist who looked as though he might get coopted into the initiative expressed concern, saying that it made him feel 'weak at the knees'. At the time I found this funny, but I did not appreciate quite how much truth there was

in this reaction. After all standards are like apple pie, motherhood and all that, no? Well, with 25 years of tracking the standards I can assure you that the standards movement is not, in general apple pie.

I have been prepping for some time a piece on process control standards. Unfortunately as I 'prep' the world continues to turn and those with stronger knees than my interlocuter of yore continue to pump out new standards or rehash old ones in new clothes. The latest in this space is an announcement from the new 'Universal Automation Organization'. UA promises 'a common automation software layer' and 'vendor-agnostic … software that can run with almost any hardware.' UA sounds great* but this (nearly) 2022, and the process/automation world is already awash with 'standards'. Why do we need another one?

To understand this, we need to dig into 'What is a standard?' as the PPDM folks might say. Some standards, indeed like PPDM's eponymous data model are the fruit of industry cooperation. Folks from oils get together, set up an org and contribute. This model has the merit of vendor independence. The downside is that commitment and resources may be limited and progress may be very slow. This impacts take-up as the user community can't wait forever. As an example of this I would cite CFIHOS, the oil and gas industry's construction data handover project. This work grinds slowly on with the recent release of V1.5. But when we attended an in-depth presentation of a new build LNG megaproject, managed by a CFIHOS-supporting major, there was no mention of the new toolset. Data handover was devolved to the contracting organizations, the EPC, equipment suppliers and so on.

The other kind of standard genesis comes with a push from a vendor. This may mean submitting some code, perhaps a 'reference implementation' (a Word document?) to an International Standards Body such as ISO. Cross ISO's hand with silver and the new standard acquires a quasi-religious status in the eyes of some. The next step is to rebrand vendor specific kit as conformant. One suspects that UA, proposed by Schneider Electric, owner, via Aveva of OSIsoft, falls into this category.

Of course the elephant in the room when it comes to communications is the internet. Here again, folks like to believe that adherence to one level or other of the IP stack makes for a standard. We have heard a lot about MQTT as getting 'traction' in oilfield communications, at least in North America. The question here is who is providing the 'open' MQTT resources. Microsoft does a great job providing MQTT comms in its Azure IoT hub. Microsoft is doing a great job too in blurring the boundary with open source in general with hard-to-resist facilities like Ubuntu on Windows. Amazon likewise offers 'open' solutions that are there to seduce! See our report on Amazon's new TwinMaker and 'Earth' also in this issue.

To summarize, well it's complicated. There is not really a clean split between commercial/vendor based proprietary architectures and standards-based open systems. The simple notion that commercial is bad and standards are good is naïve. A good example of the blurred boundaries is the ExxonMobil backed open source drilling software (see 'Soft launch of the Open Source Drilling Community' in this issue) initiative which builds atop a 'proprietary' programming infrastructure from MathWorks. And why not? Why re-invent the scientific and engineering wheel?

But I forgot, we left Huawei and OSIsoft standing off against each other over the management of video technology. This more an indication of how vendors are tied to their legacy technology and strengths. Video and telephony for Huawei and process control historization for OSIsoft. I suspect that the ability to 'manage' video data may not be seen as a 'great leap forward' for folks in oil and gas. If it does become mission critical, well, talk to Netflix!

** Not to be confused with OPC UA the unified architecture of the OPC Foundation.*

EARTH@AWS

Houston Geophysical Society learns of Amazon's open geodata repository for 'sustainable' data research

Speaking at a recent meeting of the Houston Geophysical Society, Amazon Web Services' Kyle Jones presented 'Earth@AWS', a.k.a. 'open source data' for earth observation, remote sensing and geophysics. The idea is to make getting data 'as easy as shopping online', with a 'seamless self-service cloud-native experience' providing access to real time earth observation data. Earth@AWS promises access to public datasets 'natively integrated' with AWS analytical functionality and cloud-based high performance computing. There are currently nearly 100 datasets online including the NOAA Global Forecast System, Copernicus Digital Elevation Model, bathymetric, Landsa and emissions data.

Oil and gas company users may have to jump through some hoops to make full use of the facility which is a companion to the Amazon Sustainability Data Initiative. ASDI seeks to accelerate sustainability research and innovation by minimizing the cost and time required to acquire and analyze large datasets. ASDI supports innovators and researchers with the data, tools and expertise they need to 'move sustainability to the next level'.

Earth lets researchers build cloud-hosted applications, software, or tools for sustainability-related work. Researchers are encouraged to perform proof of concept or benchmark tests to evaluate the efficacy of moving research workloads or open data sets to the cloud. Amazon wants to train a broader community on the usage of cloud for sustainability workloads via workshops or tutorials. Researchers can apply for AWS Cloud Credits to conduct research using Earth Observation data on AWS. Real money funding of up to $80,000 is available to faculty members at academic institutions worldwide for research in several areas, particularly those that advance the state-of-the-art in machine learning. A Global Data Egress Waiver discounts refunds all data transfer charges from AWS out to the Internet and a Public Dataset Program covers the cost of storage for publicly available high-value cloud-optimized datasets*.

Jones wound up his presentation by introducing the 'Poseidon Dataset', which will be available on Earth@AWS 'real soon now'. While you wait, there is a 'Poseidon Dataset' that is freely available on DataUnderground with data and documents hosted on, err… Google Drive.

Visit Earth@Amazon and checkout the use case videos from NASA, Esri, Digital Globe and others.

** Not charging for storing 'publicly available' datasets is not exactly the height of generosity.*

EARTH-2

NVIDIA announces 'lightspeed breakthrough' climate modeling supercomputer

NVIDIA is to build the 'world's most powerful AI supercomputer' dedicated to predicting climate change. 'Earth-2' will be a digital twin of the Earth, developed with Nvidia's 'Omniverse' 3D simulation platform. Today's climate models run on '10- to 100-kilometer' grids, Meter-scale resolution is needed to model changes in the global water cycle — water movement from the ocean, sea ice, land surface and groundwater through the atmosphere and clouds.

According to Nvidia, at current rates of progress in computing, this would take decades to achieve. Earth-2 claims to 'jump to lightspeed' with 'million-x speedups' that combine GPU-accelerated computing, deep learning and 'breakthroughs' in physics-informed neural networks and AI supercomputers.

The Omniverse platform may have application in oil and gas data analysis. The visualization front end for Earth2 is ParaView, originally a US DOE funded visualization package. ParaView has been used in the DOE's 2015 RVA: 3-D oil field simulator and in Total's in-house HPC/big data viewer. Earth-2 is also a 'twin' to Nvidia's Cambridge-1, the UK's most powerful supercomputer, dedicated to biology and healthcare. More on Earth-2 from Nvidia.

UPSTREAM ML 2021

Rocky Ridge on explainable AI and the Earth System Digital Twin. YFP diversity, diversity, diversity! Battelle ML for CCS and the DOE SMART project. AI at the Repsol TechLab. Roundtable: ML in research and industry.

Rocky Roden (**Rocky Ridge Resources**) believes that deep learning models based on labeled synthetic datasets are best, citing successes in fault delineation with convolutional neural nets. Roden suggested extending the digital twin paradigm to build an 'earth system digital twin*'. An ESDT could allow users to add information to a volume and run numerical simulations to understand the impact. For instance to compare 4D seismics with real time reservoir data. Working around an ESDT would allow workflows to be more flexible. Different procedures involved in the seismic analysis could be run simultaneously as opposed to today's step-wise approach. Work still needs to be done on acceptance of the ML paradigm in geosciences. ML's data-driven approach contrasts with the scientific method and the complex multi-scale and varying resolution of geo data. ML applies relatively simple math across thousands or millions of computations in what is perceived as a black box approach. It is also affected by poor or absent labels and, just like other methods, poor data. This has led to a new field of 'explainable AI' (XAI), involving novel methods that explain and interpret ML results. In any event, statistics on paper downloads from AGU and SEG show an exponential growth in AI-related subjects. Roden advocates combining ML-based tools into pre-built interpretation workflows that require little human input. Combining ML algorithms can greatly improve the overall result as models tune each other and 'adapt to unknown tasks'. Roden concluded that ML is disruptive but it will not replace the interpreter. However, geoscientists who do not use ML will be replaced by those that do!

** see elsewhere in this issue for Amazon and Nvidia's steps in this direction.*

YPF's Teresa Santana addressed the impact of innovation and diversity in applied geosciences. Machine learning has proven its worth over several decades within the energy industry, providing a better understanding of the reservoir. More recently, innovative learning algorithms allow computers to re-learn from their own predictions. AI leverages a diverse set of data - logs, seismic, cores – in support of different subsurface activities from frontier exploration to development. For Santana, diversity includes learning models that provide alternative results, perhaps testing multiple different models, evaluated by a diverse user community. ML is today applied as self-organizing maps (Geophysical Insights' specialty), Bayesian geobody classification and semi-automated geobody extraction using frequency decomposition. But more can be done with AI in geophysics, helping the interpreter with more automation and again, leveraging diverse data types to train neural nets for future innovative use cases. Making AI easier to use, with 'no code' applications will allow subject matter experts to inform models, minimize bias and exploit machine learning to the full.

Battelle's Srikanta Mishra has been using ML models to evaluate carbon capture and sequestration projects. CCS is a mostly proven technology, there have been 'no major surprises' from projects to date but there are uncertainties regarding leakage and induced seismicity. With regard to data-driven modeling, there are two camps. Some geoscientists and engineers may already be applying these methods in an 'ad hoc' manner. Others may be holding-off because of a lack of training. In general, ML is applicable when conventional physics-based models are too computationally expensive or when the physics is poorly understood. Enter the ML 'black box' model. These are recommended when the cost of a wrong answer is low compared to

getting it right (e.g. proxy models in history matching), when they give better results (such as pattern recognition on well tests) or as tools to 'inspire and guide' (preventative maintenance). The big issue here is combining ML with physics. Enter the Science-Informed Machine Learning to accelerate real time decisions in subsurface applications, a.k.a. the US Department of Energy's SMART initiative. Here Battelle and other US R&D institutions are building a 3D proxy model for a full field CCS project. A three orders of magnitude speedup is reported over conventional modeling with CMG GEMS. There remain acceptance challenges for ML, geoscience models are not as successful as those used in consumer marketing or social sciences. The field is immature, perhaps at the stage of geostatistics in the 1990s. Mishra recommends a mindset that sees AI as less a 'curve fitting' approach but 'the extraction of insights consistent with mechanistic understanding'.

Federico Giannangeli enumerated some of the AI projects in the **Repsol** TechLab product catalog. Optimized seismic acquisition is set to reduce today's 'conservative' seismic acquisition design. Sparse acquisition and simultaneous shooting could reduce costs by up to 30%. Sparse data is then interpolated with an ML-based 'blind trace network' which simultaneously de-blends the sim shot data.

MC Michael Dunn (**Geophysical Insights**) challenged the panel to provide some examples of their most used ML applications and especially if any had produced results from data that were 'invisible' before ML. For Repsol, ML is key to many areas such as rock characterization without cores, using cuttings and image processing. Field developments and production can be optimized with deep learning. In other words, it is applicable everywhere! Randall Gentry (Petrolern) stated that while ML has been around for a while it remains emerging technology in terms of adoption. There has not been a 'eureka moment' but Petrolern (a geomechanics company) has recently started using AI to separate out features from drilling records. By monitoring the drill bit it may be possible to run fewer downhole logs and reconstruct core info. This was based on early data from DoE grant funded work.

Lennart Johnsson (**U. Houston**) observed that while ML has changed the game in terms of research activity. Aspects of ML have integrated high performance computing everywhere. But no. ML has not so far brought new insights into computer science itself. ML is currently trying to do as well as human or classical methods. ML is sensitive to data sets. Small changes can lead to wrong classification. And there is one big negative, the compute resources and energy required for model training. Johnsson cited an MIT Review article that reported that 2/3 of research money was spent on HPC heating and cooling, leaving only 1/3 for research! Dunn continued with his quest for the ML killer app. How do you quantify the impact of ML on the business? Has anyone observed changes in the probability of success of finding oil? Repsol cited the case of saving a dry hole with an ML-based analysis. But in general, it would not appear that the real killer AI app has arrived. Unless that is, companies are, as Dunn suggested, 'keeping schtum!'

Geophysical Insights is hosting sponsor of the Upstream ML event.

SOFTWARE, HARDWARE SHORT TAKES …

Upstream: Blueback Avary. Expro Galea. Paradigm 19p4, Geolog 21. Geographix Gverse Connect. IHS Markit EDM and OSDU. Petrosys PRO, dbMap/Web. Ceetron ResInsight. *D&C*: IWS inVisionX. *Operations*: AspenOne 12.2. ElectrifAi ML as a service. Vallourec's Behub-e marketplace. Flowserve's RedRaven IIoT. OspreyData mobile Vision/Flight AI solutions. RigER 'Greeley' release. *Environment*: Kongsberg Maritime's Blue Insight. *Downstream*: Flotek's Verax ISX/IMX analyzers. *Miscellaneous*: Enthought Edge. One Stop Systems' Rigel Edge 'AI on the Fly'. UE Systems' UltraTrak ultrasonic vibration sensors.

UPSTREAM

Blueback has announced Avary, for 'faster, intuitive geophysical insight and analysis'. Avary manages computational operations and data transfer between applications to provide a streamlined, interactive workflow for post stack processing, data conditioning, spectral decomposition and more. Avary was developed in collaboration with Aker BP 'using Cegal's next-gen Flows* software architecture'.

** No information on Flows currently available from Cegal.*

Expro has announced 'Galea' a 'fully autonomous' well intervention system. Galea replaces conventional wireline rig-ups for a range of slickline operations such as solids removal, plug setting/pulling and logging surveys. In fully autonomous mode, Galea deploys a tool string into the well. Remote monitoring removes personnel from the wellsite and is claimed reduce the carbon footprint.

Emerson has released Paradigm 19p4 in a move towards the integration of its interpretation solution on a single platform. 19p4 adds high-end seismic visualization and machine learning-based classification along with new SeisEarth workflows for map classification, a 'complex trace' workflow for post-stack derivative attributes and a new GPU-based visualization methodology. EarthStudy 360 adds support for pre-stack RTM and Q tomography, and support for AMD processors. Emerson has also released Geolog 21 with new automated petrophysical parameter picking, support for LWD NMR tools and rock physics workflows using shared mineral models. Openness is enhanced through connectivity to OSDU, the Open Group Open Subsurface Data Universe, and support for Schlumberger Petrel 2021. Geolog now also supports new energy opportunities in markets such as carbon capture and storage, geothermal energy, radioactive waste disposal and mining. The Paradigm 19 releases are available as both cloud-hosted and on-premise.

Geographix' Petrel data connector Gverse Connect 2019.4.2 offers a more streamlined UI and single-click transfer of well data, horizons, faults, and surfaces between Petrel and GeoGraphix projects. CRS conversions for all data transfers are now handled automatically. The new version also enables transfer of 3D seismic volumes and color palettes.

IHS Markit is working to support the OSDU Data Platform with EDM workflows aligned with the emerging OSDU technical standards, leveraging the published APIs. IHS is offering to support upstream companies as OSDU 'moves into implementation'. EDM's 'data type and data model agnostic' design means that adoption can be achieved without 'complex, time-consuming data manipulation work'. More from IHS Markit.

Petrosys PRO V2021.2 delivers a 'new and improved' 3D Viewer, a 'complete rebuild' around a new graphics engine, along with multi-threading that uses more of the cores of modern processors. The new release now supports 'drag and drop' connectivity from Petrel and DecisionSpace into the Petrosys 3D canvas. **Petrosys** dbMap/Web 2021.1.2 extends support of the PPDM data model including core/sample analysis with screens for specific well test types and better support for palyno/paleo data. Petrosys, a long-

term member of the PPDM community, also reported that dbMap/Web has been recertified as being PPDM Gold compliant. More in the Release Notes.

The 2021.10.0 of **Ceetron Solutions**' ResInsight can now import an ensemble surface to study structural uncertainty across multiple cases and compute the statistics of the ensemble. ResInsight is a component of the Open Porous Media project.

D&C

An upgrade to **Intelligent Wellhead Systems** inVision X digital infrastructure for hydraulic fracturing and wireline operations integrates engineered safety controls, standard operating procedure compliance, and remote valve activation. The V10 release enhances efficiency and safety, and minimizes risk to wellsite personnel with valve position sensors, pressure interlocks, 'digital handshake' processes, and remote valve activation. Since inVision was introduced in 2018, the system has delivered more than 26,000 frack stages without a single wireline or pressure control incident. More from privately-owned IWS.

OPERATIONS

Release 12.2 of AspenOne, AspenTech's asset optimization package adds new models and capabilities in support of sustainability. New models provide insight into reducing CO2 scopes 1 and 2 emissions.

Machine learning model builder ElectrifAi has announces computer vision and machine learning as-a-service for oil, gas and energy. ElectrifAi's library of ML models has been 'built and battle tested over the past 15 years'. Computer vision models address workplace safety and cost reduction. Another MLaaS solution covers spend and procurement analytics.

French tubular manufacturer **Vallourec** has launched Behub-e, a global online marketplace for sellers and buyers in the energy and industrial markets.

Flowserve's expanded 'RedRaven' industrial IoT digital flow control system now offering valve-specific capabilities that improve flow control visibility and promise increased energy efficiency and uptime. More from FlowServe.

OspreyData has launched a mobile edition of its Vision platform and Flight AI solutions for oilfield production. The full Vision desktop capabilities are now accessible on any smartphone or tablet, extending the 'virtual control center' to mobile engineers, pumpers and lease operators.

The V 9.0/'Greeley' release of **RigER**'s eponymous digital field ticketing and asset management solution offers improved dashboards, integrations, and updated CRM and maintenance modules. New communications capabilities connect office, shops, yards, and field crews. Service companies can share information about jobs with operators. QR codes speed equipment check-in/out and inventory control. OpenInvoice integration has been extended. More from RigER.

UE Systems' UltraTrak 850s smart analog sensor captures ultrasonic vibrations from industrial equipment for predictive maintenance, reliability, condition monitoring and energy saving programs. Ultrasound is said to detect early onset failures in industrial equipment. The sensor integrates existing PLC, SCADA, DCS and other automation systems adding real-time data trending and alerting. More from UE Systems.

ENVIRONMENT

Kongsberg Maritime has announced 'Blue Insight', a cloud-based digital toolbox for collection, visualization and management of ocean data. Blue Insight delivers marine and meteorological information for scientific and industrial users of the maritime environment. Data from ships, underwater vehicles and ROVs is accessible from Ocean View, a web-based viewer of historic and real-time data. An early adopter of Blue Insight is a collaboration between Kongsberg and Akvaplan-niva for the collection of meteorological, oceanographic, biological and chemical data from unmanned autonomous glider vehicles. The project has been under way for several years, but recent funding from ConocoPhillips Norway has focused on the Glider Project that is investigating the impact of offshore oil and gas facilities on some marine species in the North Sea.

DOWNSTREAM

Flotek unit **JP3 Measurement** has introduced a new generation of international ATEX/IECEx certified online analyzers. Verax ISX/IMX deliver real-time composition and physical properties measurement including vapor pressure, boiling point, flash point, octane level, API gravity, viscosity, BTU and more. The solution is deployed at stabilizers, plants, blending facilities, pipelines and terminals. A new Automated Interface Detection Algorithm, (AIDA) performs real-time detection of interfaces in a liquids pipeline, said to be a 'a game-changer in transportation of multiple products in a common pipeline'.

MISCELLANEOUS

Enthought Edge is a 'DataOps' solution for R&D data management. Edge takes 'scattered, complex and varied' R&D data and makes it analysis-ready. Checkout the early access program.

One Stop Systems' Rigel Edge Supercomputer offers 'AI on the Fly', bringing AI datacenter performance to 'the edge', including mobile platforms. OSS units span the entire AI workflow, from high-speed data acquisition to deep learning, training and inference. The unit includes an NVIDIA HGX A100 4-GPU platform with the latest NVIDIA NVLink GPU interconnect in place of 'traditional' PCI Express GPUs. More from OSS.

IQPC OPERATIONAL EXCELLENCE IN OIL & GAS CONFERENCE 2021

National Petroleum Council on cyber challenges. Texas A&M balances procedural and judgment-based approaches to safety. Flint Hills Resources mobile digital worker platform. CruxOCM's robotic industrial process automation.

Speaking at the 2021 IQPC OPEX in Oil & Gas conference, Angela Dennis of the US **National Petroleum Council** presented the keynote, 'Dynamic Delivery: America's Evolving Oil and Natural Gas Transportation Infrastructure'. Dennis warned of the 'extraordinary' level of connectivity that has progressively raised cyber challenges to the oil and natural gas industry due to the convergence of IT networks with OT ICS networks. Targeted ICS attacks have increased in frequency and sophistication with the potential for economic impact, operational shutdowns, damaged equipment, and significant environmental, health, and safety consequences.

In 2019, the NPC produced a report based on feedback from multiple stakeholders that concluded with key findings and supporting recommendations. Notably a 'Cyber PHA' (process hazards analysis) to evaluate risks from cyber threat scenarios and establish appropriate levels of protection against cybersecurity attacks. Operators need to address supply chain risks with specific requirements in purchasing contracts with OT suppliers to adhere to industry cybersecurity standards. OT suppliers 'must provide timely updates, such as patching for cyber vulnerabilities'.

The 2019 draft of the report and recommendations is a free download from the NPC. We were curious to know if this ever progressed beyond its 'draft' status but an email to NPC bounced and sending a message from the NPC website contact form gave a 404 file not found!

Camille Peres, an occupational health researcher from **Texas A&M** presented on 'Rethinking human error using the interactive behavior triad'. Peres cited the 2010 Macondo blowout as an example of what can go wrong as drillers sit for 12 hours at a time in front of complex data displays. 'It is no longer acceptable to rely on a system that requires the right person to be looking at the right data at the right time and then to understand its significance despite simultaneous activities and other monitoring responsibilities'. Peres showed a drilling log that purported to show indications of an abnormal pressure build-up well before the blow-out that 'nobody seemed to notice'*.

** See also our report in this issue from the 2021 PPDM Houston Data Expo where Jess Kozman (Katalyst) presented the same graphic and gave some chapter and verse for the analysis.*

A 2014 Industry Survey* found that most oil and gas safety incidents were attributed to 'procedural' issues. TAMU's Mary Kay O'Conner Process Safety Center is researching procedural systems to define best practices and establish new standards based on human factors. The planned framework is to 'increase productivity, human reliability and safety and is applicable to new technologies and interfaces. While there may be consensus on what constitutes a good procedure, there remains the question of how it is best delivered. There is evidence to suggest that a best practice is not enough and that a safety document per se cannot be a reliable hazard barrier. Blindly following the rules in a dangerous situation may lead to disaster. What is needed is a culture that understands the 'gap between procedures and practice'. There is a conflict between the procedure manual approach to safety and one which develops skills for 'judging when and how to adapt procedures to local circumstances'. A balance is required between both. More from the TAMU Next Generation Advanced Procedures program, a joint venture between Peres' unit and the TAMU Ergonomics Center.

* *Moura, Beer, Patelli, Lewis & Knoll, 2014*.

Brook Vickery from **Flint Hills Resources** is 'transforming field productivity' by building a digital worker platform. The DWP begins with a team approach, 'no more working in silos' and has the lean 'Jidoka principle' as its philosophical basis. Once the right team and talents have been assembled, 'make it visual'. This involves deploying tools such as 3D models, the ProCore construction management app, LeanKit and a mobile-enabled CMMS. Other productivity-enhancing tools include Microsoft Teams and laser scans. Onsite comms are a prerequisite with site-wide WiFi or cellular networks providing bandwidth. In construction, Matterport's site viewer got a shout-out along with the Blue Beam on-line digital markup tool and the Faro laser scanner. Vickery presented several applications, some developed by Flint Hills, spanning construction and operations all supported by apps running on handheld tablets or mobile phones.

Vicki Knott showed how **CruxOCM**'s robotic industrial process automation (RIPA) solution is to 'transform the control room'. Operators' workloads are increasingly heavy and complex. Today, most rely on 'procedures, checklists and rules of thumb' with the risk of human error, loss of efficiency and safety incidents. RIPA automates the complex processes and work flows, 'freeing-up' operators to monitor for maximum asset production and ready to respond to any potential safety or environmental issues. Knott claimed that RIPA has produced 'astounding results' increasing throughput by up to 4% and reducing operator workload by 'up to 99%'. More from CruxOCM.

Next year's IQPC OPEX event is scheduled for October 31 - November 2, 2022 in Houston.

PPDM HOUSTON PROFESSIONAL PETROLEUM DATA EXPO 2021

What is a Facility? PPDM and OSDU. Chevron implements What is a Well taxonomy. Resolve and Talus on seismic data prep for OSDU. PetroDataOnline's 'serverless' PPDM 3.9. EnergyIQ as data staging platform for OSDU. Deloitte's graph technology for LNG operations.

PPDM CEO Trudy Curtis welcomed participants to the 2021 Houston Expo, 'our first major PPDM Association event in nearly two years'. She summarized current PPDM Association activities, announcing the launch of a 'What is a Facility?' initiative using the same methodology as 'What is a Well'. The PPDM reference lists and data rules are available to anyone online. PPDM Association products are leveraged by the OSDU Platform to optimize data's value. PPDM material is 'incorporated by reference' into the OSDU Platform when required (Curtis chairs the PPDM/OSDU integration team). PPDM training will focus on supporting data professionals while OSDU Platform-specific certification and related training is owned and accredited by the Open Group.

Patrick Meroney presented the **Open Subsurface Data Universe** or rather just 'OSDU' as we are to call it today. OSDU represents something of an 'all-in' approach to cloud computing. Meroney observed that while the 'rush to the cloud' has brought some of the predicted benefits, the wins come with a cost, notably that 'you still need to manage the data'. A 2021 Flexera 'State of the cloud' report has it that 82% of respondents reported a hybrid cloud (on and off site) as the architecture of choice. For Katalyst (and maybe other PPDM relational afficionados) this means a dual deployment of an on-site PPDM database (possibly from Katalyst) and an offsite OSDU infrastructure. The two are maintained in sync with Katalyst's 'KWSR API' an implementation of the OSDU external data services functionality (members-only content) on GitHub.

Jess Kozman (**Katalyst Data Management**) argued for a 'Data Fit Organization' a concept developed by a steering committee of Australian R&D establishments and industry partners. The DFO movement has backing from the CORE Innovation Hub, an Australian technology collaboration initiative focused on natural resources (petroleum and mining). A Data Fit Organization (DFO) is one where 'data culture is a ubiquitous part of work, like safety is today, where all employees have data competencies and capabilities, and demonstrate behaviors that deliver strategic value from data, and where data roles and responsibilities are measured and incentivized'.The DFO is working on a simple, repeatable and accessible framework, inspired by the 'Fitness-To-Operate' safety competency framework developed for the Australian offshore petroleum industry by the University of Oxford and NOPSEMA, the Australian regulator. This was developed to reduce the risk of an accident in Australian waters similar to Gulf of Mexico Macondo disaster. Kozman drew attention to a 'data management and delivery failure' that was part-responsible for the Macondo incident, citing a 2015 SAS Institute study that found that 'the first clear data indicator of fluid flow imbalance appeared 43 minutes before the blowout' and that 'the rig operators had the data they required to prevent the accident'. Kozman has kindly agreed to let us host a preprint of his PPDM paper giving more of the relationship between Macondo and the origins of the DFO, which will likely for the basis of a future PPDM Data Examiner article.

John Thibeaux outlined how **Chevron** has implemented the WIAW taxonomy in its DIAL staging database. WIAW provides an industry standard taxonomy for various well components, allowing those involved in upstream operations to 'speak a common language'. Data passes through the DIAL access layer for ingestion into consuming applications. WIAW/OSDU terminology is shared across reservoir, drilling and completions and production.

Don Robinson (**Resolve GeoSciences**) and Paul Thompson (**Talus Technologies**) offered advice on preparing seismic data for the OSDU platform. Reliable data is needed prior to OSDU ingestion. Robinson proposes an automated seismic data validation workflow, as this is a chance to scan data and extract as much information as possible. A machine-readable manifest file of required metadata is generated in the process. This can capture data lineage and 'simplify your seismic ancestry management'.

As much of the PPDM community is looking towards OSDU, PetroDataOnline's (PDO) Vidar Andresen offered a back to the future presentation of a 'serverless', hosted edition of the PPDM 3.9 relational database. In this context, 'Serverless' is a compute tier for single databases running in the Azure SQL Database. PDO's Database Manager is a free, open source web based tool to manage PPDM database and data science projects. Current functionality allows users to load a PPDM, manage PPDM, CSV and LAS data connectors and perform other data transfer and QC. The tool is 'built for the cloud'. The user interface is based on Blazor. The serverless paradigm includes 'durable functions', leveraging tools such as CSVHelper, Mathnet and Automapper. Visit the PDO Database Manager on Git and contribute to the project.

Quorum's **EnergyIQ** is now proposed as staging platform for data curation prior to ingestion in to OSDU. Duncan McDonald argued that 'data is the fuel that is driving the digital transformation'. Companies are focused on building an energy data platform based upon established standards and 'The OSDU initiative shows the direction that the industry is heading'.

Deloitte's Nishanth Raj presented on the use of graph technology to combine and analyze data from a variety of sources to support LNG operations. Graph technology provides global users with insights into LNG shipping and transportation, including vessel information, shipping costs, weather and volumes sold. The solution provides 'self-service' data access and analysis of disparate data sources. A 'multitude' of data driven techniques such as pattern recognition and machine learning provides data profiling, data quality rules configuration and further analysis of LNG data, leveraging machine learning. The use case is reminiscent of our 2016 report from the Neo4J user meet where graph technology was used to uncover the bad actors behind the Panama Papers.

More on the PPDM Houston meet in the Agenda.

FOLKS, FACTS, ORGS …

AqualisBraemar, Audubon Carbon, Berkana Resources, CGI, Chevron, Clariant, IFP New Energy, Element, ENG, Forum Energy Technologies, Hart Energy Publishing, Hexagon, Implico Group, IOGP, Intelligent Wellhead Systems, EPC Jōb Industrial Services, Kimmeridge Energy Management, KP Engineering, Lloyds Register Foundation, NOV, Okeanus Science & Technology, Opportune LLP, Orbital Energy, OSI, PPDM, Quorum Software, Schlumberger, Schneider Electric, Schneider, Seeq, Siemens Energy, Technip Energies, UTEX Industries, OSGEO, Hart Energy.

Reuben Segal is to be the new CEO at consultant **AqualisBraemar LOC** following the retirement of David Wells who is to stay on in an advisory role. Segal was previously COO.

Jeremy Zamzow has been promoted to president, **Audubon Carbon**, an carbon capture, utilization, and storage (CCUS) engineering, procurement, and construction (EPC) service provider.

William Giles has joined operational technology/digital transformation boutique **Berkana Resources** as VP strategy and solutions. Giles hails from Spectra Energy.

Samy Youbi heads-up **CGI**'s new global innovation center dedicated to Industry 4.0 in Toulouse, France

Chevron has named Marissa Badenhorst VP HSE succeeding retiree James David Payne.

Derek Blaylock is the regional manager for **Clariant**'s oil and mining services facility in the Eagle Ford technology, sales and operations center near San Antonio, TX.

Martin Gainville is the **IFP New Energy** representative at the **Cape Open Laboratories Network** (CO-LaN).

Ming Chow has joined the **Element** board of directors. She was previously in change of operations at Lime.

Lonnie Smith has joined **ENG**, a provider project delivery solutions for the energy industry, as VP, major EPC projects. He hails from REF-CHEM LP.

Forum Energy Technologies has appointed Paul Rowsey to its board. He was previously with JLB Partners and Valaris.

Hart Energy Publishing has appointed John Hartig to CEO. He succeeds Rich Eichler who moves to chairman. He was previously president of Aviation International News.

Erik Huggers and Brett Watson are now members of **Hexagon**'s board of directors. Huggers previously served as CEO of Vevo. Watson is the president of Koch Equity Development.

Volker Braun is now CTO and MD at **Implico Group**. He was previously with IVU Traffic Technologies.

Omayma Khan has been appointed **IOGP**'s new Communications Director, starting 1 December. She comes onboard as Ritva Westendorf-Lahouse returns to ExxonMobil in Germany. Khan hails from BP. Tosin Oloja has joined IOGP as communications assistant. She is a recently master's graduate from Loughborough University.

Intelligent Wellhead Systems has appointed William Standifird as CEO. Gary Cresswell, a current non-executive director, will become independent non-executive chairman.

EPC **Jōb Industrial Services** has named Steve Wendel as president and COO.

Megan Hays has joined **Kimmeridge Energy Management** as MD of the public investment team. She hails from Cimarex Energy.

KP Engineering has named Mahesh Thadhani as senior VP business development.

Richard Clegg is to retire from **Lloyds Register Foundation** following 10 years as chief executive. The search process for a new chief executive will be conducted by Odgers Berndtson.

Robert Welborn has been appointed to the **NOV** board. Welborn is head of programs data science, small business group at Facebook.

Okeanus Science & Technology has appointed Justin Tyra as Engineering Manager.

Energy business advisory firm **Opportune LLP** has appointed Randy Hill as partner and head of its Dallas office. Hill was previously a partner at KPMG's audit practice.

Nick Grindstaff has been appointed CFO at **Orbital Energy Group**. He hails from Quanta Services.

Ocean Specialists, Inc. (OSI) has named Perry Wright VP and general manager.

The **Professional Petroleum Data Management** (PPDM) Association board of directors now includes returnees Robert Best (EPAM), Tarun Chandraskehar (Syndigo), Allan Huber (formerly Shell) and Curley

Thomas (Chevron), all re-elected for another term. Tony Knight (Geological Survey of Queensland) and Steve Cooper (Quorum) begin their first term. They join continuing directors Ali Sangster (IHS Markit), Daniel Perna (EPAM), David Hood (geoLOGIC systems), Jamie Cruise (Schlumberger), Kolleen Kidd (retired) and Sue Carr (Katalyst).

Kyle Priest is executive VP and CMO with **Quorum Software**. Priest hails from FPX, a B2B marketplace.

Alok Kulkarni has been promoted to integration project manager at **Schlumberger**.

Schneider Electric has appointed Philippe Rambach as its first 'chief AI officer' and has established a global AI Hub focused on data and analytics.

Susan Uthayakumar heads-up **Schneider Electric**'s new global sustainability consulting division, doubling the company's existing consulting practice and adding new services and digital solutions across, climate action and risk management, ESG reporting and more.

Natalie Mina has joined **Schneider** as head of communication, Pacific Region. She was previously with BAI Communications.

Seeq has appointed Lisa Graham as CEO. Former CEO and co-founder Steve Sliwa stays as vice chairman. Ashley Kramer has been appointed to the company's board of directors.

Siemens Energy has appointed Samuel Morillon as senior VP Asia Pacific.

Colette Cohen is to become non-executive director at **Technip Energies** in 2022. Cohen is CEO of the Net Zero Technology Centre.

Mike Balas has retired from **UTEX Industries**. The company now has an 'office of the CEO' comprised of chairman Jeff Cullman, director Piotr Galitzine and VP of operations Wellon Pierre. Galitzine also serves as CEO 'with daily responsibility for the business'.

Deaths

Malena Libman, winner of the 2021 **OSGEO** Sol Katz Award died from COVID-19 earlier this year.

Hart Energy has announced that **Oil and Gas Investor** Editor-in-Chief, Steve Toon died recently from a heart attack.

SALES, PARTNERSHIPS, DEPLOYMENTS …

Upstream: Enovate/Beicip-Franlab/Dsider. Ikon Science/Chrysaor Norge. SpectraLogic/USGS. CGG/PGS/TGS. AspenTech/Emerson. Vine Energy/Baker Hughes. Seeq/Microsoft. Drilling: ExxonMobil/Nabors/Canrig. Cognite/BP. BP/Halliburton. Kongsberg Digital/Aker BP. Nekkar/Transocean. Patterson-UTI/Corva. Operations: Schoeller Bleckmann/Velo3D. TotalEnergies/Azur Drones. Chevron/SAP. HUVR Data/Cognite. Cognite/OPEX Group. Infosys/Shell Global Solutions. ConocoPhillips/Luna Innovations. Moxa Europe/Robotron Datenbank. NOV/Librestream/RealWear. Finance: Petroleum Service Corp/OneStream/Perficient. Retail: BP/Checkit. Pilipinas Shell/UXUS. Miscellaneous: HPE/Eni. ONGC/HPE/SAP.

UPSTREAM

Enovate Upstream has teamed with **Beicip-Franlab** and **Dsider** on 'digital intelligence for the energy transition'. The companies are planning an end-to-end solutions platform for carbon capture, storage and utilization (CCUS) and geothermal initiatives.

Ikon Science has concluded a frame agreement with Chrysaor Norge for the provision of rock physics modelling services. RokDoc-based projects under the frame agreement will be delivered through Curate, Ikon Science's cloud-enabled knowledge management solution. Chrysaor is the Norwegian subsidiary of Harbour Energy, the UK's largest listed independent oil and gas company.

SpectraLogic has supplied the USGS with Spectra Vail, a distributed multi-cloud data management software, along with a Spectra BlackPearl system that stores object data to a 6 petabyte Spectra T950 library. The solution is a component of ScienceBase, the USGS' collaborative scientific data and information management platform.

CGG, **PGS** and **TGS** have announced Versal, a unified seismic data ecosystem giving access to three of the world's largest multi-client libraries via a single log-in. Versal is an 'independent, secure, cloud-based, multi-client seismic data ecosystem where clients can access all their data and entitlements in one place'.

An early result from the planned **AspenTech/Emerson** hook-up sees the combination of Aspen Plus ACM modeler to simulates carbon capture thermal processes alongside Emerson/Paradigm's geological simulators. The combined solution spans carbon capture and process simulation, logistics supply chain planning and scheduling and subsurface sequestration flow modeling and optimization.

Vine Energy has signed a contract with **Baker Hughes** to deploy its ProductionLink Edge artificial lift solution across 100 natural gas wells in Louisiana's Haynesville shale. The automation solution uses advanced analytics and edge technology to boost production and reduce fugitive methane emissions.

Seeq has added support for **Microsoft** Azure Machine Learning, enabling process manufacturing organizations to deploy AML models as add-ons in Seeq Workbench.

DRILLING

Working for ExxonMobil in the US Permian Basin, **Nabors**' PACE-R801 concept rig, the 'world's first fully automated land drilling rig', has reached total depth on its first horizontal well. The rig uses Nabors' proprietary Smart Suite of automated drilling software, along with robotics from its Canrig unit, to create an unmanned rig floor that removes crews from red zone areas and delivers 'consistent, predictable drilling performance'. More from Nabors.

Cognite is to provide a 'single consolidated data layer' for BP's well operations. The two-year agreement builds on a strategic partnership leveraging Cognite's Data Fusion industrial dataops platform to optimize well design and workflows.

BP has also deployed **Landmark**'s Digital Well Program as a core component of its well design optimizer project. DWP is a DecisionSpace 365 cloud application that combines planning and design processes on a 'single and open' platform for well delivery.

Kongsberg Digital is to provide Aker BP with an 'enterprise-scale solution' for real time data aggregation and visualization, helping Aker BP to improve performance, safety and optimize well operations.

Kongsberg Digital has signed an extended contract with Aker BP for its SiteCom enterprise cloud, a hosted edition of the real-time and historical drilling and well operations data store.

Nekkar has formed an 'Inteliwell' joint venture with **Transocean** to commercialize products and services around a digital well construction solution currently under development. The solution interfaces with a rig's control system to autonomously execute tasks outlined in the well plan. An integrated real-time platform monitors drilling progress and evaluates conditions in the well, providing feedback to the drilling control system.

Patterson-UTI and **Corva** have announced a strategic data analytics and visualization collaboration plan that will equip oil and gas producers with the digital tools to drill and complete more 'productive and profitable' wells while hitting lower emissions targets. The collaboration will leverage Patterson-UTI's wellsite and cloud-based data capabilities to enhance Corva's suite of cloud-based drilling analytics.

OPERATIONS

Schoeller Bleckmann Oilfield Technology has purchased an end-to-end 3D printing solution, including the Sapphire printer, from **Velo3D**. SBO is an EU contract manufacturer specializing in the production of high-value metal parts for the oil and gas industry. SBO's US unit Knust-Godwin has validated the additive manufacturing technology in its Houston facility and is using its solutions to build production parts for its customers in the aerospace and oil and gas industries. Velo3D has also opened a technical center in Augsburg, Germany.

Following a 2020 proof of concept at its Feyzin, France refinery, TotalEnergies has now certified **Azur Drones**' Skeyetech for surveillance, inspection and emergency response.

Chevron working with **SAP** as a 'co-innovation' partner to position itself for the cloud future. Chevron wants to replace its 12 distinct ERP systems with one common platform with standard data and processes running in the cloud. This means 'positioning itself for whatever comes next', taking advantage of SAP's future S/4HANA cloud product.

Digital inspection specialist **HUVR Data** and **Cognite** have partnered to provide industrial asset owners new levels of rich data access and analytics, combining HUVR's inspection workflows with Cognite's Data Fusion.

Cognite has also teamed with **OPEX Group** to combine Cognite industrial DataOps with OPEX Group's cloud-based intelligence solutions, emissions.AI and X-PAS.

Infosys is to be the commercialization partner of the 'Shell Inventory Optimizer' developed by **Shell Global Solutions**. The solution leverages artificial intelligence to optimize warehouse inventory levels based on

historical consumption, reduces the time and labor required to complete maintenance operations. Earlier this year, Shell, Equinor and Microsoft announced the Shell Inventory Optimizer, 'running on Microsoft Azure'. Shell also uses the E2Open network and supply chain applications.

Luna Innovations has announced a new production profiling capability based on Luna's OptaSense fiber optic sensing products. The new capability is a result of the joint development and licensing of **ConocoPhillips**' patented transient analysis technology in combination with Luna's high-sensitivity, distributed temperature measurements. www.lunainc.com

A cooperation between **Moxa Europe** and **Robotron Datenbank-Software** heralds 'bundled know-how for IIoT applications'. The solutions cover, inter alia, oil and gas and energy technology. Moxa provides the industrial hardware running on its hardened Industrial Linux OS. Robotron adds various software solutions and platforms for high-performance IIoT applications.

NOV's TrackerVision utilizes **Librestream**'s Onsight collaboration solution and RealWear's hands-free devices to provide remote support to industrial workforces. RealWear's HMT-1 ruggedized assisted reality device navigates the Librestream software with simple voice commands to record and communicate with remote experts. TrackerVision links the augmented worker with remote experts around the world via NOV's global aftermarket organization.

FINANCE

Petroleum Service Corp. has selected **OneStream Software** to streamline and unify its company's finance operations. PSC will replace Excel with OneStream's Intelligent Finance platform across planning, reporting and account reconciliations. OneStream partner Perficient implemented the solution which includes a direct connection to NetSuite and integration to ADP.

RETAIL

BP is to deploy **Checkit**'s intelligent operations platform across 441 forecourts in Australia and New Zealand. The Checkit platform replaces paper-based processes with a mobile to captures the activity of store assistants and provides managers with real-time oversight. The platform includes automated monitoring via fridge-mounted sensors and handheld temperature probes to enhance food safety, reduce waste and save time spent on manual checking routines. Checkit has been in use at some 320 BP forecourts in the UK for the past 18 months.

A 'Site of the Future' in the Philippines launched by Pilipinas Shell Petroleum Corp. in Cavite is set to become a blueprint for Shell mobility stations worldwide. SotF is the result of Shell's collaboration with international retail design agency UXUS which 'emphasized attention to convenience, sustainability, and customer well-being'. The station includes a cyclists' area, high technology vehicle-servicing and digital payments.

MISCELLANEOUS

HPE has upgraded Eni's HPC4 supercomputer, delivered 'as a service' from the HPE GreenLake edge-to-cloud platform. Eni will house the new HPC4 in the Ferrera Erbognone, Italy. The system is built on HPE ProLiant DL385 Gen10 Plus servers 10 petabytes of storage including the Cray ClusterStor E1000 storage system and the HPE Data Management Framework.

India's Oil and Natural Gas Corporation has also selected an **HPE** GreenLake to run its SAP S/4 HANA environment. ONGC claims one of the largest SAP implementations in the world, hosted on the GreenLake platform in ONGC data centers. More on GreenLake from HPE.

AMAZON IOT TWINMAKER

Graph-based digital twin generator includes AI and Grafana front end

Amazon Web Services has announced AWS IoT TwinMaker, a new service that lets developers create digital twins of real-world systems to monitor and optimize operations. Digital twins are virtual representations of physical systems such as buildings, production lines and equipment that are regularly updated with real-world data to mimic the structure, state and behavior of the systems they represent. Twins connect data from different data sources including sensors, video feeds and business applications, 'without having to move the data into a single repository'. TwinMaker also provides a framework into which data from other data sources such as Snowflake and Siemens MindSphere can flow. A digital twin graph shows the relationships between virtual representations of physical systems and connected data sources.

Existing 3D models such as CAD files and point cloud scans can be imported into the 'spatially aware visualization' along with video and sensor data overlays from connected sources, insights from machine learning and simulation services and equipment maintenance records and manuals. A plugin for Amazon Managed Grafana provides a configurable GUI for end users such as plant operators and maintenance engineers. More in the release.

*Amazon would appear to be playing catchup with **Microsoft** whose Azure Digital Twin platform offers a similar service for the creation of graph-based twins of 'buildings, factories, farms, energy networks, railways, stadiums, and more—even entire cities'. Entire cities? Why not the whole country, as per the UK's ambitious National Digital Twin program, already being used to 'tackle the climate emergency'.*

THE REAL REASON FOR THE AVEVA ACQUISITION OF OSISOFT

Oil IT Journal listens-in to contrasting opinions on the $5 billion acquisition of the developer of the PI System by Schneider Electric's AVEVA industrial software unit … before catching the big reveal!

Our first witness is **Russell Herbert** (Aveva's head of oil and gas) who recently provided insights into the rationale behind Aveva's acquisition of OSIsoft earlier this year. Herbert was quizzed by Tom Trapel* who observed that while both companies have been 'dominant players' in the industrial software space for many years, their coming together into one organization has 'left many wondering what new developments these changes will bring' in particular, what will this mean for oil and gas. Herbert responded that there are two sides to the story. Companies like OSIsoft have been talking about data and the value of managing and using data as well as possible. Companies like Aveva are focused on advanced analytics, applications and digital twins. The Aveva/OSIsoft acquisition means that one company now has 'the data, the applications and the analytics pieces of the puzzle all in one portfolio'. For customers this will mean real world use of digital twins in an operational environment, 'combining predictive tools with live operational systems'.

A few years ago, the analytics and digital twin paradigms were new to everyone. In the interim, people have been experimenting and have learned a lot. Some customers have tried to deploy this technology into their operations. Often with their own in-house data science teams that are trying to do these kind of programs. This means being much better at managing data, focusing on context, structure and data quality, exactly what the PI system does. PI is now 'in the middle of all these applications and analytic systems within the Aveva toolset'.

There are 'big trade winds' blowing in the oil and gas world at the moment that are 'pushing the industry towards separating its data and its applications and analytics strategies'. Herbert warned that not all are going in the right direction, in particular, the idea that the historian is 'just a source of information that we can just suck into third-party data platforms … that's definitely going in the wrong direction!'

** On the Aveva Intelligent Oil & Gas Podcast.*

Next up is no less that **Patrick Kennedy** who was OSIsoft Founder and CEO until the take-over. He is now chairman emeritus at Aveva. Kennedy was interviewed by Dale Peterson* and gave an informative account of the founding of OSIsoft, its 40 year-long record of successful operations, and an inkling of the rationale behind the sale. What has characterized OSIsoft's activity over the decades is a focus on occupying a sweet spot between acquisitions systems (Scada/DCS) and applications (ERP, MES).

Back in 1980, the situation in the Scada/DCS world was of multiple, more or less proprietary systems producing data in a range of formats. Kennedy spotted an opportunity and developed the PI data logger/historian along with software interfaces for the multitude of sensors in the wild**. Staying 'in the middle' has been 'in the business plan for decades'. 'We found that were good at what we do and focused on doing it better and better'. 'We stayed away from anything that looked like competing with vendors, our goal was always to be infrastructure'. As new protocols came along, OSIsoft told clients that they would interface with 'anything they wanted so long as we maintained and supported it', initially at a fixed price of $10k. Kennedy thought that this activity would quieten down after a while but no, the company still spends a third of its development effort on interfaces.

And so to the big question, why sell to Aveva? Kennedy reported that there had been offers to acquire the company right from the outset. The first was in 1980! The problem was that the acquirers 'wanted us to be their digital force, this would be good for them but not so good for us. Our plan was to be independent broker'. So why sell now? Kennedy sees a great future for data. 'I think people have underestimated the size of systems by orders of magnitude. Think smart cities with huge systems for water, power, electric cars. Add-in solar on the roof, batteries … the whole thing is beyond capabilities of people. The grid, the supply chain, there are very many systems out there and exploding data volumes and novel data types like streaming video. Reasons which, in our opinion argue for a great future for OSIsoft's staying in the middle approach'.

In recent years, Kennedy was approached by Kleiner Perkins and other VCs who convinced him that the company needed more cash to finance its expansion, 'even though we had plenty of money in the bank!' Kennedy eventually came up with a more compelling reason for selling, 'One of the reasons was that I thought now was a good time is that .. I'm old!' (Kennedy is a sprightly 78 year old). 'It's time for me to not work so hard'. 'But there are plenty of good people in the company and we are going on ahead into the big new systems. It's time to expand, instead of thinking few million points think few trillion. That's really what's coming!'

Comment : It sound a bit like OSIsoft has abandoned its 'stay in the middle' principles with the Aveva acquisition. Another tricky piece of navigation will face the combined company as it tries to prize the 'digital twin' from the hands of its clients' in-house data science teams.

** On the excellent Unsolicited Response/S4XEvents podcast.*

*** As an aside, the situation back in 1980 was pretty much the same as it is today. Many in industry looked at the competing systems and decided that all that was needed was 'a standard'. Kennedy's lot just rolled up their sleeves and got on building interfaces. As for the standards, they too are still going strong, with almost*

as many competing standards as there are vendors. The latest in the ring is Universal Automation, from no other than Aveva parent, Schneider Electric!

CAPE-OPEN 2021 ANNUAL MEETING

Computer-aided process engineering standard body hears from IFPen on pipeline modeling and design in Python. Designing the Co-Lan test suite. Methods & Tools SIG report from US EPA. How SINTEF came around to Cape-Open.

Co-Lan, the **Cape-Open Laboratories Network** is home to CAPE, the computer-aided process engineering standard. CAPE provides models of the physico-chemical processes involved in industrial equipment such as heat exchangers, pumps, pipelines, hydrocarbon crackers and more. Co-Lan manages the standard and facilitate implementation of interfaces to commercial and other process tools. Members include Shell, BP, Linde, BASF, Dow and Air Liquide.

Speaking at the 2021 Cape-Open Annual Meeting, Martin Gainville (**IFPen**) presented on the use of Python code to calculate pipeline unit operations and wax crystallization. Python Unit Operation (PUO) is a scripting environment that can plug into process modeling tools such as those developed by IFPen, AmsterChem and Aveva. These include hydrodynamic models of multiphase flow in pipelines carrying gas/oil/water mixtures. PUO facilitates experimentation with models that simulate an oil and gas production network. Gainville concluded that using Python provides integration with other packages (matplotlib, numpy, scipy, pandas, …). PUO enables custom development of pipeline components for gas production networks, integrating commercial packages such AmsterChem's Python thermo import tool and KBC's Multiflash thermodynamic server.

Bill Barrett (**US Environmental Protection Agency**) presented the activity of the Methods & Tools Special Interest Group (SIG) with notably a work plan for COBIA Phase III. Cobia is the Cape-Open binary interoperability architecture. Earlier Cape-Open development was Windows-specific and C++ native. Phase III introduces platform-independence, with components developed on different platforms talking to each other via 'marshaling'. A presentation from AmsterChem demonstrated that 'generic marshalling works'.

Olaf Trygve Berglihn explained why Norwegian R&D institute **Sintef** is now adopting Cape-Open. Earlier Cape versions were COM and CORBA-based and as such were 'complicated and code-intrusive'. The Microsoft ecosystem and active template library were viewed unfavorably at Sintef as was the 'overly object-oriented focus' and platform-dependance of the standard. All of which contrasted with the simpler application binary interface of Sintef's own simulators. Sintef now appreciates Cape's push to platform independence. Cobia removes the need to deal with COM/CORBA. When required, Windows-based simulators can be run on Linux under the Wine emulator. Sintef is now converting several of its own models into Cobia process modelling components. Sintef's Cobia work was funded under the EU Horizon 2020 Research and Innovation program.

Visit Colan for more.

HUAWEI'S INTELLIGENT OIL & GAS FIELDS SOLUTION

2021 Global Oil & Gas Summit hears about Huawei's 20,000 IT/OT experts, 5G2B communications, the digital oilfield and ROMA. Migrating Daqing data to the cloud. Middle East OpenLab. G2K Group Parsival AI smarts for surveillance.

Introducing the 2021 Huawei Global Oil & Gas Summit, Robin (Yongping) Lu, EVP of the global energy business unit, traced Huawei's investment in ICT and IOCT solutions for energy customers, hiring some 20,000 IT experts for its work on digital and energy transformation. Lu sees a high oil price for 2022 and a continued commitment by Huawei to 'help energy go digital' with 'end to end scenario-based solutions'.

Xu Yan (VP Oil & Gas) drilled down into the Huawei solution set which approaches the digital oilfield from a communications standpoint. Huawei's R&D and 'cutting edge technology' is to bridge the gap between the digital and industrial worlds. This means 5G, IoT, the cloud and specific chipsets running Harmony and the Euler OS that underpins Huawei's Roma platform.

Roma is an integrated data and development platform that has enabled Huawei to consolidate thousands of siloed applications, millions of devices into its 20 worldwide data centers. Yan emphasized the work with connected, intelligent cameras now deployed worldwide at customer campuses in oil and gas and utilities. In the upstream, oil companies can leverage their own cloud infrastructures, deploying a 'unified data lake' for E&P. Key tech here is ModelArts, a 'one-stop' development platform for AI developers, MindSpore, the AI compute framework , and Huawei Knowledge Graph for information extraction, knowledge mapping, and multi-source data 'conflation'. Poster child for the technology is CNPC's Daqing Oilfield.

Zhang Tiegang outlined how the Daqing data was migrated into the cloud. 'Bare metal' servers were used to deploy the HPC system, and a 'scalable file service' in the cloud hoses some 10 petabytes of seismic data. The cloud platform comes with three-level cyber security and tenant-specific security services to meet CNPC's security requirements for core service data. The cloud-based software includes PeroChina's GeoEast interpretation software, and Western commercial software including Schlumberger Eclipse, Petrel and Omega, Paradigm ES-360 and Geolog, and CGG Jason. Tiegang announced that OSDU deployment is scheduled for 2023. More on Daqing in the cloud here.

David Shi stressed the importance of partners to the Huawei ecosystem. The company organizes partner meetings a.k.a OpenLabs where developers can create IoT solutions based on Huawei's open IoT. The Huawei Middle East OpenLab is located in Dubai to cater for the region's National Oil Companies.

All of the above has now been rolled-up, along with some AI smarts from G2K Group into the Intelligent Oil & Gas Fields (IOGF) solution offering '5G2B' connectivity in the UAE. IOGF offers site security, production inspection and predictive maintenance. Its architecture comprises four layers: industrial terminal, IoT network, digital platform, and intelligent application.

Christen Bear explained G2K's role in the project. G2K's Parsifal adds AI to multiple sources of streaming data, notably camera systems. Hardware from a network of partners such connects via APIs for display in the control room. Parsifal is deployed at sites such as Saudi Arabia's grandiose NEOM industrial city and at Farnek's smart city sites. Parsival monitors other critical Middle East operations such as oil and gas pipelines, fleet tracking and perimeter protection. More from G2K on LinkedIn.

Visit Huawei's oil and gas landing page and watch the Global Oil & Gas Summit video.

DONE DEALS …

Accenture/T.A. Cook. Baker Hughes/Akastor. CGG/Topicus/Vela. Dawson/Wilks Brothers. Emerson/AspenTech. Expro Group/Frank's International. ProFrac/FTS. IronSight/ARC Financial. Noble Corporation/Maersk Drilling. Parker Wellbore/Helmerich & Payne. ServiceMax/LiquidFrameworks. Vertice Oil Tools/Gryphon Oilfield. Seadrill's Plan of Reorganization. Petrofac's penalty.

Accenture has acquired **T.A. Cook**, a consultancy specializing in asset performance management and capital projects for clients in capital-intensive industries and infrastructure. The team of 130 consultants, engineers, and development coaches will join Accenture's Industry X group, strengthening its services for digitizing clients' engineering functions, asset performance management, factory floors, project management office services and plant operations. Headquartered in Berlin, T.A. Cook also co-hosts SAP's Oil and Gas events.

Baker Hughes' Subsea Drilling Systems and Akastor's **MHWirth** have merged into a new 'HMH' offshore drilling equipment company. Baker Hughes and Akastor own equal equity in the company.

CGG has completed the previously announced sale its GeoSoftware business to **Topicus** and **Vela Software** for a total cash consideration of $95 million.

Dawson Geophysical has agreed to merge with **WB Acquisitions**, a subsidiary of Wilks Brothers, which is to acquire Dawson's common shares for $2.34 cash.

Presentation material from the **Emerson**/**AspenTech** merger reveals that the Geological Simulation Software (Paradigm and Roxar) business anticipates some $130 million revenue for 2022 with 'single digit growth'. The deal also sees a shift in the geo software licensing from an annual maintenance selling model to a token-based model enabling increased software usage and products exchange. The token based recurring revenue model, features 'annual payments in advance with annual price escalations and improved customer insight'.

Expro Group has completed its announced merger with **Frank's International**, an oil services company offering a range of drilling and completions solutions and services.

ProFrac is acquiring **FTS International** in an all-cash transaction that values FTSI at approximately $400 million.

IronSight the Alberta-based developer of an eponymous app that streamlines and optimizes oil country field services has received funding from **ARC Financial and Lifting Solutions** to accelerate its scale-up and expansion into the US and global markets.

Noble Corporation and **Maersk Drilling** are to combine in a primarily paper-only transaction. Robert Eifler is CEO of the new 'Noble Corporation', headquartered in Houston.

Parker Wellbore has formed a strategic partnership with **Helmerich & Payne**, acquiring all of H&P's casing-running assets. The deal makes PW the 'sole preferred provider' of tubular running services on H&P US land-based rigs.

ServiceMax has acquired **LiquidFrameworks** from Luminate Capital Partners. The deal strengthens SM's energy-targeted field service management offering with LF's mobile field operations management solutions.

Vertice Oil Tools has acquired most all the completions assets of **Gryphon Oilfield Solutions**. Vertice is backed by SCF Ventures, an early-stage investment vehicle within SCF Partners.

The US Bankruptcy Court for the Southern District of Texas has approved **Seadrill**'s Plan of Reorganization. Seadrill is now exiting chapter 11 having raised $350 million in new financing and reducing existing liabilities by $4.9 billion, 'leaving employee, customer, and trade claims unaffected'. Existing shareholders see their holding decrease to 0.25%. More on the case here.

The Southwark (UK) Crown Court has imposed a total penalty of £77 million in relation to seven offences of failing to prevent former **Petrofac Group** employees from offering or making payments to agents in relation to projects awarded between 2012 and 2015, contrary to Section 7 of the UK Bribery Act 2010. The fine concludes the Serious Fraud Office's investigation into the Company.

STANDARDS STUFF …

PIDX announces Standards Adoption Council. API issues 3D printing standard. Digital Twin Consortium teams with AIoT user group and CESMII. DTC open source code on GitHub. Object Management Group joins forces with AREA. IOGP-IPIECA guidance on oil spill surveillance. OPC Foundation's Asset Management Basics. OSGeo, OGC sign MoU. Value Reporting Foundation releases SASB XBRL taxonomy. PPDM Association Marketplace launch. Public Money for Public Code campaign

PIDX International has announced the formation of its 'standards adoption council', working to develop adoption strategies when a standards project is proposed. PIDX president Stephanie Waters (Chevron) explained, 'Developing a new standard can take a significant amount of time and resources. The investment that industry puts into standards development emphasizes their importance. However, beyond just developing standards, we want to encourage adoption so that they are put into practice and the industry can benefit from them.' SAC objectives include defining the real-world problem that the standard seeks to solve, setting clear key performance indicators for adoption success and implementing proof of concepts prior to approval. More from PIDX.

The **American Petroleum Institute** has issued the 1st edition of Standard 20S, Additively Manufactured [3D printed] Metallic Components for Use in the Petroleum and Natural Gas Industries. Velo3D, in partnership with IMI Critical Engineering and an unnamed major industry provider, contributed data to this standard from a project that involved redesigning and 3D printing choke vales for field testing. More from the API.

The Object Management Group's **Digital Twin Consortium** has teamed with the AIoT user group to 'create and develop digital twin-enabling technologies' and 'accelerate the adoption and monetization of digital twins'. The AIoT is an 'expert community' hosted by Germany's Ferdinand Steinbeis Institute. More from the DTC and the AIoT. The DTC has also entered into a liaison agreement with CESMII, the Smart Manufacturing Institute to 'develop digital twin-enabling frameworks and technologies'. The previously announced DTC open-source collaboration initiative is now available to the public on GitHub. Code repositories are available covering a glossary of terms and technologies, a 'Stellar-Transformer' repository that sets out to provide digital twins of the entire solar system, including the earth! and a UA Nodeset web viewer for use in IoT scenarios that 'bridge the gap between OT and IT'.

The **Object Management Group** has also joined forces with the Augmented Reality for Enterprise Alliance (AREA) association to 'drive adoption of interoperable AR-enabled enterprise systems'.

A new joint **IOGP-IPIECA** publication provides guidance on oil spill surveillance planning. IOGP-IPIECA Report 644 proposes a scalable surveillance strategy for use in a response situation, and advice on developing a comprehensive surveillance program.

The **OPC Foundation** has completed its review of OPC 10000-110, UA Part 110, Asset Management Basics. The specification defines basic information modelling constructs that can be used and refined by companion specifications to domain-specific needs. *Curiously the spec does not define what an asset is!*

OSGeo, the Open Source Geospatial association has confirmed its previously announced Memorandum of Understanding with the **Open Geospatial Consortium**. Both parties are committed to 'findable, accessible, interoperable, and reusable' (FAIR) data principles, and recognize that free and open source software benefits all communities. OSGeo is also participating in the development of open standards through a partnership with ISO/TC 211. In the EU, the Inspire Directive has 'showcased the maturity and effectiveness of implementing open source solutions'.

The Value Reporting Foundation has released a Sustainability Accounting Standards Board standard XBRL taxonomy. The machine-readable ESG reporting format is said to be an 'important step forward for structured sustainability reporting'. The taxonomy provides digital definitions to go with the 77 industry-specific SASB standards, allowing reported information to be digitally tagged. The taxonomy was developed in collaboration with PwC and tested using Workiva's WDesk platform.

The **PPDM Association** has announced the launch of its Marketplace, connecting its community of vendors with producers. PPDM has also updated its Reference Values project with 13 'reservoir preparation' object reference lists. PPDM is also working with OSDU to review and update some 20 reference lists from the OSDU Platform. PPDM is calling for assistance from interested subject matter experts for this and the upcoming 'What is a Facility' technical Standard. The Association has also announced that IHS Markit, Katalyst Data Management, Petrosys and Target Energy Solutions all recently achieved PPDM Gold Compliance.

OSGeo has signed the Free Software Foundation's open letter supporting its 'Public Money for Public Code' campaign. The campaign has it that 'publicly-funded software has to be free and open source software'. Free software 'gives everybody the right to use, study, share and improve it' and 'helps support freedom of speech, press and privacy'.

2021 PIDX DOWNSTREAM AND THE FUELS VALUE CHAIN

Transport4 on PIDX standards update. DTN: updating the product codes. BP: 5.02 and the bill of lading project. Shell: using PIDX in 'Chinook' SAP through the cloud.

Elena Mereanu from Transport4 presented the PIDX Downstream standards, a free-to-use XML/XSD Schema that can be downloaded from the PIDX Standards home page. Like other PIDX standards, the downstream suite adds industry-specific terminology that is absent from generic B2B XML standards. The Downstream group collaborates with its EU LEAP equivalent to co-develop international standards and is currently working on barge demurrage. A new initiative, Industrial Data Exchange (IDX) is a new data exchange platform for PIDX. The cloud-based, API-driven platform is to share strategic data across the PIDX ecosystem of operators, suppliers and IT companies. Interested parties can sign up with the development team.

Kris Pronske (DTN) explained the rationale for PIDX product codes for terminal master data. These provide a unique product ID, a numeric code and short product description. Product type (aviation, ethanol … gasoline) and more slots for cetane/octane, oxygenated, sulfur and volatile content. To date the system has been abused with inconsistent or supplier-created codes. PIDX is working to increase awareness of the

official code base. When required, new codes can be added requested for approval by PIDX. An API-driven solution for codes from a PIDX clearing house/master list is under development.

Hanno Schwarz (**BP**) gave an overview of PIDX 5.02 and showed how harmonized communications between oils, terminals and clearing houses are used to announce and authorize product loading at a terminal. The Bill of Landing/TDXS system supports planned movement announcements and response and receipt of delivery.

Neil Grime showed how **Shell** uses PIDX in Project Chinook/Sirocco to exchange data between bulk fuel terminals around the globe. Project Chinook is to remove a 'costly third party application' from the Shell system landscape. The app in question was a business critical system for distribution running between SAP and the Terminal Automation System (TAS). Shell has now developed 'VirtualTAS' running in the cloud, 'built on PIDX standards'. BizTalk also ran. Chinook stared in 2017. Worldwide rollout is ongoing.

More from the PIDX events home page.

IOGP GLOBAL EQUIPMENT HUB

JIPs 33 and 36 to merge. CFIHOS 1.5 released

The UK-based **International Oil and Gas Producers**' association (IOGP) has announced a 'Global Equipment Hub' (GEH). The GEH combines two IOGP joint industry projects JIP 33 (equipment procurement specifications) and JIP 36, formerly CFIHOS, the capital facilities information hand over specification. The GEH is to be a 'cloud-based repository for storing and exchanging vendor equipment information'. IOGP report that some 40% of equipment is common across the industry, and yet 'millions of dollars annually are wasted processing, packaging, and transferring the data associated with it through the supply chain on single projects'. Equipment vendors will be encouraged to upload their information, making it available to package suppliers, EPC contractors and owner/operators.

The concept originated in the IOGP's Digitalization and Information Standards Committee. Following a 2020 pilot, JIP 33 is working with Sharecat Solutions on an initial, minimum viable product and API for operators. The MVP will focus on electrical specification products which account for nearly a third of the 48 JIP 33 specifications to date.

Meanwhile JIP 36/CFIHOS has released V1.5 of its data standard. The new version supports the 'practical implementation' of JIP33 with clearer definition of information on information exchanged and linkage between JIP33 documents and the CFIHOS Reference Data Library. CFIHOS is also now aligned with Norway's EqHub. EqHub is Sharecat Solutions' technology flagship and is now used by 'all the major operators in the Norwegian sector'. Read the CFIHOS release notes here.

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