UNDER THE COGNITE DATA FUSION HOOD

Oil IT Journal Interviews Geir Engdahl, CTO and co-founder of Cognite. Cognite Data Fusion is built atop a PostgreSQL database. A new API, a.k.a the PG3, a 'Pretty Good Property Graph for PostgreSQL' allows for ad-hoc model extensions. Cognite likes standards, graphs and open source software. Has Oil IT Journal's long time skepticism regarding the Semantic Web been misplaced?

Oil ITJ – *How did Cognite get started?*

Engdahl – We set up Cognite six years ago with the idea of doing AI on industrial data. This proved to be hard going because of the diverse data sources. We were fortunate that Aker BP supplied us with a comprehensive data set which enabled us to build a data layer, a foundation for AI/ML. In fact we are now known as 'the data layer company'. Around the time some companies were using the cloud to build data lakes – but they were not realizing the expected value, partly because joining data across different sources meant losing context. We ended up building a large, all-encompassing data model spanning CAD, 3D models, drawings, SAP work orders and asset/historian data. All went into a single data model. Initially this was simple with just values, assets, time series, events and so on.

What modeling technology are we talking about?

The data model is stored in a [PostgreSQL](#) open source relational database. This was hand-coded by Cognite such that customers could not change stuff. This was essential for the stability of the system. More recently we have added a data modeling option, Cognite Data Fusion (CDF), to allow customers to define their own data models.

What technology is used here?

We use using [GraphQL](#) with extensions for things like inheritance. This allowed us to materialize some industry standards. The first was CFIHOS – leveraging work done by Aker Solutions on a digital twin for AkerBP. This allowed CFIHOS to be used in operations.

Although it was designed for handover?

Yes but here is it also used in operations. We also added parts of ISO 15926 concepts and properties for process plants.

Which ISO 15926 parts are we talking about – there are a lot of them!

Parts 2 and 4 with some of the RDF/OWL work done inPart14. What is key here is the actual implementation. Standards are not just on paper, they need to be instantiated, populated and useable.

We have been tracking RDF – the Semantic Web - for a couple of decades and came to the conclusion that it was pretty much un workable for non-specialists. Also that the triple is a frustratingly poor tool for modeling even simple stuff like adding a unit of measure to a property.

You are right. There was no success at rolling out the semantic web at scale and indeed there is the challenge of a 'normal' developer struggling with the whole domain data model. So we developed the concept of solution data models, simple models tailored to a specific domain and task. There may be hundreds of domain models linked into the Cognite data layer.

Where does this leave the standards?

Standards have failed to create a lot of value but they do hold promise if they are populated. Normal people need to be able to access the data. We will have stripped-down versions of these standards over time as we get a better feel for what is being populated and used.

Is the PostgreSQL database still canonical?

Yes, but we use our own graph API which we call PG3 (for Pretty Good Property Graph for PostgreSQL). We use the latest version of PostgreSQL graph traversal[1] to send a query on to PostgreSQL. In fact we may open-source PG3 later on. Another part of our technology is that CDF replicates the PostGreSQL data to an ElasticSearch database, so queries can be relations, graphs or free text. The duplication to Elastic is transparent for users.

So the data layer is also the graph layer?

Data is all in PostgreSQL but all CDF data is accessed through the PG3 interface. This is important to for data integrity[2].

You all are pretty keen on open source!

Our approach, using common open source tools, has been successful, not least because we started out working in the Google cloud environment. When we found that the oil and gas domain was dominated by Microsoft/Azure we had to migrate stuff like Google Big Table to Azure – in fact this wasn't too hard.

What does a user/developer need to have proficiency in to access CDF? GraphQL, C++, Python?

GraphQL if they want to, there is also a Python SDK that uses GQL under the hood. We are adding Java Script and others – all accessing through the API.

This is all quite a surprise to us. We have been tracking the semantic web for a couple of decades and at a recent conference I described RDF/triples as one of the biggest data failures, despite having had enormous support from, especially from the EU. Did you benefit from any of these EU projects?

Some individuals have worked on these for sure. We are also a member of OSDU and are working with the OPC Foundation on CCS.

OSDU is pretty far removed from graph technology!

Yes (*laughs*) – we are just leveraging the well model.

So was I wrong to diss the semantic web?

No – you are correct. It proved too hard to understand and complex for implementation by ordinary developers. The issue with the triple – not being able to simply add a UOM[3] to a node is why we have moved from triples to the property graph which is more explicit that the entity-attribute approach of the tripe store. The property graph[4] is easy to understand and give you what you expect from a graph node/edge.

We have already reported on Neo4J as a popular graph database.

Yes we used Neo4J In an earlier version for AkerBP. We abandoned it as being hard to scale and not so good for a multi-tenant implementation that shared hardware resources between different users. PostgreSQL allows limits to be set on individual jobs.

1) See for instance this [Postgres World](#) article.

2) This is a similar consideration to earlier uses of the relational database where API access was recommended (but not always followed).

3) Unit of measure.

4) An interesting comparison is [available here](#).

See also the Cognite Data Fusion Release, '[Advancing Digital Twins with Data Modeling](#)'.

SIEMENS 'PIONEERS' DIGITAL BOND ISSUANCE

Digital bond on blockchain sold directly to investors. But where are the safeguards for money laundering and tax avoidance?

Siemens is claiming 'pioneer' status with the issuance of the '[first digital bond on blockchain](#)'. The €60 million bond with a maturity of one year is 'sold directly to investors' and is said to have been issued 'in accordance with Germany's Electronic Securities Act*. [Coindesk](#) reported that the bond was issued on the [Polygon blockchain,](#) a Cayman Islands-registered provider of Ethereum-based blockchain solutions.

Siemens stated that blockchain brings 'a number of benefits' compared to conventional issuance. Paper-based certificates and central clearing are no longer necessary and the bond 'can be sold directly to investors without needing a bank to function as an intermediary'.

Siemens has used the new possibilities of the Electronic Securities Act and sold the securities directly to investors 'without engaging established central securities depositories'. Payments were made using classic methods 'as the digital euro was not yet available at the time of the transaction'.

Siemens AG corporate treasurer Peter Rathgeb said, 'By moving away from paper and toward public blockchains for issuing securities, we can execute transactions significantly faster and more efficiently than when issuing bonds in the past'.

* a.k.a. the [Gesetz über elektronische Wertpapiere](#) (eWpG).

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Oil IT Journal was curious to know more about the mechanics behind the novel form of financing. We emailed Siemens with the following query:

'Regarding your release on "Siemens issues first digital bond on blockchain", You state that the bond is issued direct to individual investors. Does this apply worldwide? How is the identity of a purchaser verified? Is the transaction reported to the authorities (in DE or to the country of residence of the purchaser)? Are subsequent transactions between the purchaser and other third parties executed on the blockchain?'

Siemens responded with the following:

'Many thanks for your message. Please understand, that it is a private placement and details of the transaction are confidential.'

We did not feel that this response was adequate and followed up with another request, pointing out that 'these are extremely important issues in the light of money laundering and tax avoidance'. Despite several reminders Siemens has not seen fit to respond to our questions.

AI IN MAINTENANCE – ARE YOU SURE?

What does optimization mean: better or cheaper? Oil IT Journal editor Neil McNaughton ponders the issue in the light of AI in equipment maintenance, with an imagined court case following a future disaster. Discourse overheard at CERA week may play into the prosecution's hands. Oh, and an unrelated footnote on Mr. Fabelman senior.

One of the earliest use cases for AI was in operations – specifically in maintenance. This is not my field and I admit to having been surprised by the notion that there were significant benefits to come from 'optimizing' maintenance. As I see it there are two kinds of potential benefits here. An 'optimal' maintenance program ought to result in less breakdowns, less production loss and consequently more revenue. That's good but it does not necessarily mean spending less. This 'optimal' may cost more. The other potential benefit involves using super smart analytics to achieve the same (or perhaps better) results with a reduced spend on maintenance. The first kind of benefits are like apple pie. The second kind sounds a bit dodgy.

Imagine if an operator is using AI to achieve the same with less spend. And imagine that things go wrong. There is a major accident. An offshore field blows up. There are deaths and a trial. The maintenance program is called into question. Figures are produced showing a year on year reduction in inspection and maintenance which meant that some bad kit was not spotted in time. The judge asks, '*How did you establish this reduced maintenance program?*' The operator is forced to admit that the AI system came up with the new program. '*And how did it achieve such a result?*' 'Well we can't actually answer that question because the reasoning is kind of hidden in the neural net – we don't actually understand how AI comes to its conclusions'. Maybe in a couple of years time defendants will be answering the same question with 'Because ChatGPT told us it would be OK', but I digress.

You may think that this is preposterous. I think it is preposterous myself. But that was before I listened to one of the talks given at the 2023 CERA week on 'Transforming workflows and operations with AI and data'. This was presented by SLB's (formerly Schlumberger) Sujit Kumar who explained how 'Digital transformation is […] helping companies do more and achieve better performance, with less. Using AI, data analytics, and machine-learning techniques, it is now possible to realize tangible cost and time savings across data-intensive processes, reducing tasks that took months and years into days and hours'.

The first parts of Kumar's talk correspond to the apple pie style of benefits, one applied AI to prolific data streams to optimize well performance, the other was a 'smart gas plant' developed for DCP midstream with AI boutique Geminus. But it was Kumar's concluding remarks that made my mouth drop. In his summary he stated, 'Cost reduction was substantial in both examples. Once you have activities like a smart maintenance program [in place], you are not doing maintenance as often as before. You are not doing inspection as often as before. You are reducing a huge amount of human footprint and machinery footprint'. Wow! I would not like to be a defendant with a witness like that! Imagine the CSB video interview of the inspectors who were 'let go'.

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On an unrelated topic, while, as one does, futzing around on my smartphone on the subject of Steven Spielberg's excellent autobiographical film The Fabelmans, I read up a bit on his dad, Arnold Spielberg . Arnold was quite a star in the IT world, migrating from the field of electronical engineering and setting up GE's Industrial Computer Department in 1957, before working on what might be termed the digital transformation of point of sale systems. Why am I telling you this? Well, next time you hear a presenter dissing the old folks who 'don't get digital', think of Arnold. Next time you hear a speaker trotting out the old trope that digital transformation is something shiny and new, think of GE in 1957. Arnold died in 2020, aged 103. More of his interesting life on Wikipedia.

GEOMATICS IN THE ENERGY TRANSITION

New USBL spec. ARC's TIDE data management. Woodside on new IOGP data models.

At the the IOGP-hosted Geomatics in the Energy Transition event late last year a panel discussion with representation from BP, ExxonMobil and Shell reported progress on various technical specifications under development. Work on a spec for calibration and verification of USBL positioning systems[1] that kicked off in 2017 is now in its second pilot with release scheduled for Q2 2023. The event also heard from the Australian Research Council's new solution for data management (Transforming energy infrastructure through digital engineering – 'TIDE') that is to support 'data-informed agile decision making'. Applications include subsea infrastructure integrity management and scour prediction. TIDE is to leverage the 'FAIR' (Findable, Accessible, Interoperable and Reusable) data principles to ensure open data sharing and accessibility, an area which 'might be a space in which IOGP could contribute'. More IOGP geospatial projects were presented by Ian Milligan (Woodside Energy) who is chair of the geo-information subcommittee. A Land Survey Data Model (LSDM) was published in December 2022, and the Offshore Infrastructure Survey Data Model (OISDM) is scheduled for release in Q2 2023. Both will see a phased release, with an initial ArcGIS model to be followed by an 'open format'. A revision of the Seabed Survey Data Model (SSDM) is underway along with the development of a 'comprehensive standard legend' for IOGP GIS data models. More from IOGP.

1) Ultra short baseline.

YOU WANT BIG DATA?

Norwegian Petroleum Directorate's Avatara*-P project builds massive digital palynology dataset. Diskos 2.0 up and running on Landmark and Kadme.

Avatara-P, the NPD's latest digitalization project has produced over thirty thousand digital palynological (microfossil) records from 284 released wells. The huge (57 terabytes) dataset is now available in Diskos, Norway's shared solution for storing and distributing geoscience and production data from the Norwegian shelf. Each microscope slide is captured with a seven gigapixel resolution.

The hardware and software stack was supplied by Budapest, Hungary-located 3DHistech. Scanning was performed with the Pannoramic 1000 whole slide scanner. 3DHistech's 'SlideCenter' image server organizes and stores the digitized slides and streams them to NPD in-house users for quality control and visual analysis. The latter leverages 3DHistech's SlideViewer software, also used for export to the Diskos file server.

The result is said to be 'the world's first public archive of digital palynological preparations'. The system was developed through a collaboration with medical research on digital tissue samples. The project will ultimately enable 'augmented analysis' leveraging machine learning to reveal new aspects of Norway's geological history. More on Avatura-P from the NPD.

* Avatar in Norwegian.

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The latest edition of Diskos has just gone live. Diskos 2.0, a.k.a. 'Diskos in the cloud', introduces new automated processes and API integration and is set to enable seismic processing and interpretation in situ – with no need to download data to a local disk. The new Diskos is based on **Landmark**'s iEnergy platform and user interface. The Trade module for data swaps is based on **Kadme**'s WhereOil product. Some 28 members and 50 associated members are cooperating to on Diskos development. Diskos' cloud-native services are said to be 'compliant with the Open Subsurface Data Universe*'. Diskos is operated by Halliburton/Landmark and administered by the NPD.

* This according to Halliburton. At the 2022 ECIM conference, NPD stated that 'While DISKOS is said to be 'OSDU ready', there are no plans to 'merge' with OSDU. OSDU is not considered mature and 'we need to understand more to see if this is where we want to go'.

SOFTWARE, HARDWARE SHORT TAKES

Altair's RapidMiner converged platform. Aperio DataWise 2.0. ArrayFire Quantum Simulator. AspenTech DataWorks unit. Bluware's InteractiveAI 4. East Daley Analytics' Energy Data Studio. EnergyMarketPrice announces Prophet AI Prognosis. Element Analytics' Unify 5.0. Getech new Exploration Analyst/Data Assistant releases. New Grapher from Golden Software. Ikon updates Curate, RokDoc. Kongsberg Digital launches 'Industrial Work Surface'. Caliper's Maptitude 2023/Online. Optime Subsea's eSCILS deployed. Eliis' Paleoscan 2022.2. Canonical releases real time Ubuntu. New ResInight from Ceetron. Siemens Field Data Enablement portfolio. Volume Graphics' VGStudio Max. WellDatabase 23.1.

Altair has announced Altair RapidMiner a 'converged platform' for data analytics and artificial intelligence. The announcement follows the 2022 acquisitions of RapidMiner and World Programming. The platform is available via the Altair Units licensing program and includes APIs for SAS, Python, R and SQL.

Aperio DataWise 2.0 helps plant users 'accelerate their data quality improvement journey' with intelligent automation, data quality metrics, root cause analysis and early detection of asset health.

ArrayFire has released the open source ArrayFire Quantum Simulator (AQS). AQS is a C++14 library that provides the functionality to create, manipulate, visualize, and simulate quantum circuits with quick and accurate results. The library is built upon the ArrayFire Tensor library For GPUs.

Following its acquisition of Inmation Software last year, **AspenTech** has opened a new DataWorks business unit to offer a combination of the Aspen AIoT Hub and the Inmation solutions. DataWorks promises vendor-neutral connectivity to all major OT and IT interfaces, centralized data governance and integration with advanced analytics, decision support and AI.

Bluware's InteractiveAI 4 enables geoscientists to employ binary or multi-class networks to capture a range of geologic features, from simple stratigraphic or structural frameworks, to more complex facies distributions.

East Daley Analytics' new Energy Data Studio provides midstream data including crude oil and natural gas production forecasts for North America. More from EDA.

EnergyMarketPrice has announced Prophet AI Prognosis a 'revolutionary digital solution' that uses advanced machine learning algorithms to analyze historical data, identify patterns, and forecast future trends. This tool is claimed to help optimize operations, reduce costs and improve the bottom line.

Element Analytics' Unify 5.0 includes a new Time Series Data Mover that streamlines the movement of industrial data to the cloud. The solution includes a connector for PI data import and an export function to AWS RedShift.

Getech has released ArcGIS Pro 3 compatible versions of its Exploration Analyst and Data Assistant software products. ArcGIS Pro 3.0 required an update to Microsoft .NET 6 meaning that Getech's tools needed the update to remain compatible. More from Getech.

The latest iteration of **Golden Software**'s Grapher package for visualizing and analyzing diverse data sets improves the user experience with redesigned functions and a more intuitive interface. The package promises insights into chemical, physical, geologic, and geospatial datasets with some 80 2D and 3D plots. Golden has also updated its Surfer contouring package with new 3D subsurface visualization functionality. More from Golden.

The 2023.2 release of **Ikon Science**'s Curate subsurface knowledge management software includes a dataset preview option, color-coded wells on map views and an upgraded search and filter function in the data explorer. Enhanced administration allows teams to work collaboratively and share data 'effortlessly'. Ikon has also released RokDoc 2023.2, with added functionality for machine learning, rock physics and new visualization measurement tools. The new release includes extreme gradient boost (XGB) algorithms for regression and classification. More from Ikon Science.

Kongsberg Digital has launched the 'Industrial Work Surface' for carbon-intensive industries, enabling the company's software users to work within a single digital environment. IWS reduces siloed access to data to achieve better ways of working and 'smarter, safer and greener operations'. The solution combines Kongsberg Digital's domain and technology expertise in a 'single end-to-end user surface'. IWS received an endorsement from James Maguire, business transformation manager at LNG Canada who said, 'IWS [makes for] a new way of working that will enable our teams to learn from past events, predict future events, and prescribe a path forward to optimize production and equipment performance. The IWS the cornerstone of our future ambitions.'

Caliper's Maptitude 2023 and Maptitude Online introduce new features and datasets, updated demographics, and cloud-based tools for territory creation and routing optimization. More on Maptitude in oil and gas.

Optime Subsea's electric controls and intervention light system eSCILS has completed its first operation for Aker BP at the Alvheim field, Norway. eSCILS, an upgrade of Optime Subsea's original system, is umbilical-less, battery-powered and wireless. Aker BP VP drilling Mads Rødsjø commented, 'By going from SCILS to eSCILS, we have taken further steps of enabling digital transformation, simplification, cost reduction and defining the future of subsea operations'.

Eliis' Paleoscan 2022.2 includes Bluware VDS volume data management, streaming seismic data across local and cloud-based systems including the OSDU data platform.

Canonical has announced the general availability of real time Ubuntu. Real-time Ubuntu provides a deterministic response to an external event, with a guaranteed response time. The new enterprise-grade real-time kernel targets industrial, telecommunications, and other use cases.

The 2023.03 release of **Ceetron Solutions**' ResInsight open source fluid flow simulator includes radial grids, improvements to multi segment wells and time-variant well allocation. More from ResInsight.

Siemens new Field Data Enablement portfolio promises to make 'unused' field data accessible to the IT department, 'making manufacturing companies more efficient and future-proof'. FDE can be deployed without interrupting production and no additional sensors are required. The solution is available in software and/or hardware.

Hexagon's Volume Graphics unit has released VGStudio Max for pore-scale permeability simulations on data such as CT scans of porous or multi-component materials. Virtual flow and diffusion experiments are used to calculate homogenized material properties such as absolute permeability, tortuosity, formation factor and more. Volume Graphics 2023.1 now includes enhanced AI/ML functionality. More from Volume Graphics.

The 23.1 release of **WellDatabase**'s eponymous oil and gas public data platform sports enhanced functionalities and an entirely new appearance. The release brings additions to its analytics, advanced filtering options, exposed through customizable dashboards, 'offering a better way for oil and gas professionals to gain insight into publicly reported data'. More from WellDatabase.

2023 ABC WELLSITE AUTOMATION CONFERENCE

Oxy/ISA on automating CCS operations. Qube on new EPA emissions regulations. Vermillion's VETVision for exception-based operating. Oxy's AVOID hardware for cloud-based fugitive emissions detection. Peavy Energy Ventures on methane and the US Inflation Reduction Act. Woodside's automated data science workflow. Kuva Systems and the EPA 'super emitter' proposal. Signal Fire's MQTT-based 'sensor to cloud' solution. And also … Ndustrial.io, Techneaux, Akinê.

Alan Bryant (**Oxy** and the ISA Chemicals and Petroleum Industries Division - ChemPID) presented on carbon capture and sequestration (CCS) accounting and automation. The oil and gas industry can impact Scope 1 and 2 direct greenhouse emissions that occur from sources associated with fuel combustion in boilers, furnaces, vehicles and from flaring, venting and fugitive emissions. The IEA estimates that eliminating flaring, venting and methane leaks from upstream operations would have the same effect on the global environment as eliminating the emissions from all the world's road traffic. Achieving net zero will be virtually impossible without CCS. The good news is that potential storage capacity is 'well in excess of what will be needed'. 'The world has a vast capacity to store CO2'. Government incentives like tax credits and grants make these initiatives economically attractive. EOR is the biggest and most readily available opportunity for sequestration. To date, EOR typically uses naturally occurring/produced CO2. But capturing CO2 from industrial processes is becoming economically viable with recent incentives. This is where automation comes in to meter sequestered CO2 and back allocate to the different sources. Operators can earn offsets by sequestering more GHG than they produce. Automation can be leveraged to measure the inputs to the credit equation.

Andrew Walsh (Qube Technologies) explained that the EPA recently issued a supplemental proposal* to reduce methane and other harmful pollution from oil and gas operations. To date this has meant voluntary efforts. But from 2023, operators should provide rule-based monitoring and a plan explaining which sites are using alternative continuous monitoring systems. In which context, Qube provides a comprehensive approach to emissions reduction with continuous monitoring, as per the new rules. Qube's Axon device is a self contained, powered unit that monitors flares, tank and fugitive emissions etc. which are captured to a dashboard for analytics and exploitation by leak detection and repair (LDAR) technicians. Pilots across multiple US basins have demonstrated a '65% fall in emissions' from flaring mitigation, improved VRU

system uptime and optimized maintenance. Qube supports auto-calibration for data quality assurance. The EPA regulations make up a 'trifecta of operator, regulator and certifier'.

* *See the* [EPA Fact Sheet](#) *on the new proposal.*

Denis Drolet described **Vermillion Energy**'s use of exception-based operating procedures. Operating by exception means applying AI/ML to 'minute by minute' sensor data and photo analytics for leak detection. Such information informs preventive maintenance, operator intervention, chemicals management and also satisfies regulatory requirements for ESG, emissions tracking and more. Data is combined into a [VETVision](#) dashboard that aggregates exceptions into a forms/map and workflow-based display. Vermillion is currently working on data clean-up, governance and integration with ERP and cloud-based systems. Another issue is the 'production vs opex' battle for resources. Operator/pumper buy-in has been 'less of an issue than you might think'!

Andrew Pruet (**Oxy**) presented his AVOID (Audio, Visual, Olfactory Inspection and Detection) hardware for cloud-based fugitive emission detection. Avoid is a small field-deployed hardware units comprising an [ESP32](#) system on a chip microcontroller with integrated Wi-Fi and Bluetooth. Emissions are monitored with a catalytic bead '[pellistor](#)' sensor and the unit is programmable in MicroPython. Devices feed over multiple wireless pathways to an Azure IoT hub via the Microsoft [device provisioning service](#)) and on to apps (PI Vision, PowerBI; Grafana, Spotfire).

Mark Peavy of **Peavy Energy Ventures** drilled down into the regulatory perspectives of the inflation reduction act (IRA) with regard to methane emissions. The 2022 IRA includes a charge on methane emissions comparable to the 2021 IRA ([HR 5376](#)). Note that this is the first time the federal government has directly imposed a tax on greenhouse gas emissions. The IRA is set to 'fight inflation, lower energy costs and reduce carbon emissions by 40% by 2030'. A component of the IRA is the methane emissions reduction program (EPA 60113) and the IRA methane emissions charge. This starts at $900 per metric ton of methane, increasing to $1,500 after two years. The regulations call inter-alia for the elimination of high-bleed, natural gas-driven pneumatic devices. The new rules are proving problematical for smaller operators, some stripper well operators may find it hard to achieve compliance. But larger companies are all-in, with ExxonMobil planning to spend some $17 billion over five years on lower emissions initiatives. To finance such initiatives, some companies have issues sustainability-linked securities. Over $3 billion ESG bonds have been issued whose coupon rates climb if certain ESG goals are not met. Peavy concluded by recommending that independents get involved with the EPA on emissions regulations. The winners currently are the multi-nationals which will be leaders in carbon capture and alternative energy sources. But the 'bell may be tolling' for the small independent producer!

Richard Xu (**Woodside**) outlined a 'fit for purpose, high level, automated data science workflow'. But first, you need a well-defined business problem to solve and to be sure that AI/ML is the best solution for the problem. Also key is an understanding the business process and the data required. Defining what success means is also a prerequisite and how the modeling results will be evaluated. A 'solid and flexible data platform' is critical for AI. A spatial capability and meta data catalogue complete the picture. Xu did not say what platform was deployed (we did ask) but Woodside has been a high profile user of IBM Watson as is witnessed by its [data science landing page](#).

Robert Ward presented **Kuva Systems**' work on correlating Scada data with time-stamped, colorized methane imagery to pinpoint emissions. 70% of emissions come from 2% of assets and occurrences are very intermittent. The EPA 'super emitter' [proposal](#) targets emissions of over 100kg/hr with penalties of up to $100k/day. Kuva's pole-mounted sensors provide multiple views of a facility. These include infra red and visible RGB cameras with an 'edge compute' functionality. Use cases include leaking valves, unlit flares, corroded pipes and truck loading. Time-stamped imagery is correlated with Scada data and captured into the Kuva Azure cloud. Data can is also available in the customer's cloud to integrate with ERP, SAP and other

platforms (OGMP2.0, MiQ, Project Canary). The system has been successfully tested at METEC, the Methane Emission Technology Evaluation Center at Colorado State University where 'Kuva was the only technology with no false alarms and strong detection performance*'

See: Performance of continuous emission monitoring solutions under single-blind controlled testing protocol on ChemArchiv.org.

Sandro Esposito (Signal Fire) advocated an emissions monitoring solution that is independent of the installed Scada network. Operators want to minimize non-control related data into the control system and to monitor asset health without penetrating the control IT infrastructure. SignalFire's 'Sensor to cloud' telemetry leverages MQTT over LTE-M cellular networks, bypassing the client's infrastructure. The wireless IoT acts as an 'air gap' as cellular is said to be 'inherently more secure' with authentication from the device all the way to the endpoint. MQTT, the message queuing transport telemetry is used in satellite-based pipeline monitoring and to communicate with space probes. New devices broadcast 'birth message' of their data capabilities. Facebook Messenger uses MQTT to minimize battery and bandwidth use. SparkplugB is used to define a topic namespace, the MQTT payload and state. 'Overall, SparkPlugB standardizes an MQTT implementation to realize its benefits in Scada applications'. Esposito categorized the combination of MQTT, Sparkplug and LTE-M as a 'tech trifecta'. A map of Mobile IoT commercial launches to-date is availability from the GSM Association.

Other presentations of note include: Automated energy management by Dailey Tipton of Ndustrial.io. Goff Daily's presentation of **Techneaux**'s Bifrost https://www.bifrostdata.io/ solution for bridging oil and data systems. Kris Palka's exposé of Akinê's Raven IIoT controller. More too on Akinê's 18 month demonstrator project (supported by Alberta Innovates) on the PTAC website.

More from the American Business Conferences Wellsite Automation home page.

FOLKS, FACTS, ORGS …

North Sea Transition Authority. Add Energy. US CSB. BP, Energy Institute. ENG. Eliis. Fern Communications. Flogistix. Genasys. H2 Green. Halliburton. IHRDC. IOGP. Intelligent Wellhead Systems. Petrosys. Process Service Specialists. Rockwell Automation. Ryder Scott. SCA. Shell. Stampede Drilling. TechnipFMC. Validere. Williams. XetaWave. CO-LaN. OSIsoft.

Alistair Macfarlane heads-up the **North Sea Transition Authority**'s new carbon storage development team.

Former ExxonMobil drilling engineer Johari Skymmar is the manager of **Add Energy**'s new location in Malaysia.

Catherine Sandoval has been sworn-in to the board of the US **Chemical Safety and Hazard Investigation Board** (CSB). She hails from the Santa Clara University School of Law in California.

The BP Statistical Review of World Energy is moving to a new home at the **UK Energy Institute**. The Review has been published by BP for over 70 years and is now co-authored by KPMG and Kearney. The 72nd edition is scheduled to for publication in June. Subscribe here for updates.

Former **ENG** CEO William Coskey has been appointed by the company board as Executive Chairman, replacing Mark Hess.

After 16 years with the company, Sebastien Lacaze, co-founder and CEO is leaving seismic software boutique **Eliis** to 'participate more actively in the energy transition and the search for effective low carbon solutions'.

Fern Communications, an OEG Offshore company, has opened a new office in Aberdeen with James Coverley at the helm.

Flogistix has promoted Ali Sylvester (she) to director of business solutions.

Critical communications specialist **Genasys** has named Avnita Gulati VP global marketing. She hails from Cybersource.

Graham Cooley has been appointed as chair of **H2 Green** a Getech company. He was previously with ITM Power.

Halliburton has appointed Shannon Slocum to president, Eastern Hemisphere, relacing retiree Joe Rainey.

Bradford Donohue is now President and CEO of training and competency-developer **IHRDC** as founder David Donohue steps into the Chairman role.

Steve Norton is now Director of the **IOGP Safety Directorate**.

Intelligent Wellhead Systems has appointed Shiblee Hashem as VP Operations. He was previously with AccessESP (a Baker Hughes Company) and Halliburton.

Suri Bhat has been named CEO of **Petrosys** (including Interica, GlobeClaritas, and GPinfo). He hails from Bluware. His appointment follows the 'elevation' of former CEO Scott Tidemann to chief product officer for Vela Software's Carina portfolio.

Process Service Specialists has named Russell Gaudin as VP sales and marketing. He was previously with Excel USA and Merit Electrical.

Rockwell Automation has appointed Hussain Al Khater as MD, Saudi Arabia where he will support the MoU that Rockwell signed with Saudi Aramco last year.

Rockwell also announces the promotion of Robin Saitz (she) to CMO.

Zheng Zhang (she) has joined the **Ryder Scott** Houston office as Petroleum Engineer. She hails from QRI.

Ryder Scott has also announced the appointment of Stephen Gardner and Philip Jankowski to its board.

Hal Miller is now Chairman of **SCA**.

Harry Brekelmans is to step down from his role as Projects & Technology Director with **Shell**. He is to be replaced by Robin Mooldijk, currently EVP Chemicals & Products.

Stampede Drilling's CEO is now chair of the board of directors. Thane Russell is lead director. The moves follow the resignation of the company's current Chair, Elson McDougald.

TechnipFMC has appointed Robert Gwin, former president of Anadarko Petroleum, to its board of directors.

Karen Marsh is now senior advisor, carbon strategies with **Validere**'s market fundamentals team . She was previously with the EPA.

Williams has appointed Carri Lockhart as an independent director on its board. She was previously CTO at Equinor.

Erik Aadland has joined **XetaWave** wireless as VP business development. He hails from Noble Energy.

We are hiring

CO-LaN, the Cape-Open Laboratories Network is looking for an 'energetic professional' for a 'wide-ranging and rewarding' role as Chief Technology Officer. CO-LaN develops, maintains and promotes the Cape-Open for interoperable computer-aided process engineering software. More on the position from CO-LaN.

Death

OSIsoft founder and long-time CEO **Pat Kennedy** has died aged 79. Read his obituary here.

STANDARDS STUFF

API Webstore. Digital Twin Consortium and OPC Foundation 'liaise'. IOGP classifies well control incidents, looks into eye tracking. ISA's 'consensus-based' Scada. ISO 14068 GHG reporting. New Modelica version and user guide. US prototypes 'open knowledge network'. OGC OK's FlatGeobuf, kicks-off GeoDCAT. OPC UA FX and OPAS to converge. XBRL Guide reporting formats.

The **American Petroleum Institute** has announced the API Webstore, the 'definitive source' for all API standards, recommended practices and technical documents.

The **Digital Twin Consortium** and **OPC Foundation** have signed a 'liaison agreement' to 'advance the use of digital twins in manufacturing across industries'. The DTC and the OPCF have worked together on 'several open-source reference projects' on GitHub and are now to collaborate more.

A new report from the **IOGP** (Report 660) provides a classification system for well control incidents. These occur when there is a failure or degradation of barriers that are designed to keep fluids in the well or reservoir. The classification system will allow IOGP member companies to notify each other, and the wider community, of the lessons learned from well control incidents and near misses.

Another report from the **IOGP** (Report 656) is the result of an assessment of eye tracking technology in well control operations. IOGP used eye tracking technology to monitor experienced drilling professionals working in a drilling simulator. The study found that 'eye tracking technology is an effective analysis tool and has the potential to be of value in well operations'.

The **International Society of Automation** has provided an update on the workings of its ISA112 Scada committee. To date, the committee has produced a 'consensus-based definition' for what a Scada system is and how and where it can be used, a system management lifecycle diagram, and a model architecture along with some 800 pages of documentation. Part 1 of the standard is expected to be early in 2024. More from the ISA's InTech online newsletter.

ISO, the international organization for standardization has announced the ISO 14068 standard for quantifying, monitoring, reporting and verifying greenhouse gas emissions and removals and carbon neutrality. The new standard is a snip at 61 Swiss Francs. A preview is available here. The new standard is a member of the ISO 14060 'family' of standards under the auspices of the Technical Subcommittee TC207sc7. See also this summary on the on the Blue Carbon Projects website.

Version 3.6 of the **Modelica** language has been finalized and will released real soon now. The association has also released an implementers' guide to FMI 3.0. The Guide was a joint venture with ProSTEP. More on both topics in the Modelica Association newsletter.

The US **National Science Foundation** and five other US government agencies (including NASA and the US Geological Survey) are to build a prototype open knowledge network, Proto-OKN, a $20 million 'funding opportunity'. The OKN is described as an 'integrated data and knowledge infrastructure', a publicly accessible, interconnected set of data repositories and associated knowledge graphs that will enable 'data-driven, artificial intelligence-based solutions for a broad set of societal challenges'. Proposals are due by June 2023.

The **Open Geospatial Consortium** (OGC) is looking to adopt FlatGeobuf as an official OGC Community Standard. FlatGeobuf is a performant binary encoding for geographic data that can hold a collection of simple features. Because of its simple core design and efficient I/O handling, FlatGeobuf works well as a cloud native lossless format for vector data. Based on Flatbuffers, FlatGeobuf is envisaged as a 'practical replacement for Esri Shapefiles'.

OGC is also forming a new GeoDCAT standards working group to revise, publish and maintain GeoDCAT, the spatio-temporal profile of the W3C DCAT recommendation. GeoDCAT will provide a standardized vocabulary and encoding for spatial dataset descriptions and metadata, based on Web standards. GeoDCAT enables spatial data to abide by FAIR (Findable, Accessible, Interoperable, and Reusable) principles in a web-native environment. A GeoDCAT European profile (GeoDCAT-AP) is referenced by the EU as a 'Good Practice'.

A joint working group of **The Open Group**'s Open Process Automation Forum and the **OPC-Foundation** Field Level Communications Initiative is to develop a set of information modelling recommendations for the OPC UA Field eXchange (OPC UA FX) and OPAS specifications. The aim for a convergence of the two models.

The **XBRL*** organization has published a best practice Guide to its reporting formats. The Guide covers the four XBRL formats, 'conventional' xBRL-XML, inline XBRL (iXBRL), xBRL-JSON and xBRL-CSV, with a 'deep dive' into best practices for different reporting scenarios, to help users understand the key differences and strengths of each format.

* *Extensible business reporting language.*

FLOCON 2023 NETWORK SECURITY CONFERENCE

Aramco's 'Guppy' security data lake. Chevron in-houses cyber intelligence provision. Databricks open-sources cyber detection pipeline.

Speaking at the 2023 FloCon conference in Santa Fe, NM, Faisal Alghamdi and Hafiz Farooq presented **Saudi Aramco**'s 'Guppy', a.k.a. a 'scalable security data lake' designed to handle multiple security-related data types. A typical large security operations center may monitor over 10,000 IT assets, ingesting terabytes of security data every day. This is an emerging challenge for all large-scale enterprises. Traditional security information and event management (SIEM) is not up to the task. A data lake is the way forward and data engineers are replacing SIEM engineers. Aramco's security data lake, code named Guppy, takes syslog and other asset security data into a [Kafka](#) stream processor and an ELK* stack/data lake. The solution leverages a range of open source and commercial tools including RsysLog, Splunk, Confluent and others. The [Splunk GUI](#) is used to query ElasticSearch data for analysis. Splunk also provides a machine learning capability for analysis of data lake events. Guppy provides access to some 300 open source machine learning algorithms for clustering, prediction and outlier detection. Guppy deploys the [Elastic Common Schema](#) that defines a standard naming convention for data ingested into Elasticsearch, allowing data from diverse vendors and technologies to be correlated. Event Query Language (EQL) is used for threat hunting and real-time detection.

* Elasticsearch, Logstash, and Kibana.

Teresa Chila described **Chevron**'s attempts to automate the Diamond Model* of intrusion analysis. The Diamond Model is a methodology for analyzing cyber intrusion events. To date its application is a manual process that does not scale to enterprise-level security. Chevron is working to extend the model, leveraging data science and automation with the aim of using its internal data and traffic to 'make Chevron its own #1 intelligence provider'. The solution uses Python notebooks to ingest and merge security log data and identify phishing and malware attacks. Identified events are saved to a graph database.

* See for instance [Cyware's explanation](#) and this (possibly canonical) [alternative](#) from Active Reponse.

In a similar vein, Markus De Shon presented **Databricks**' work on data-driven detection with [PySpark](#), a Python API for Spark. The cyber security framework was built for Databricks' own operational needs and is now released to the public. Databricks detection engineering team has been using the PySpark platform to build streaming pipelines that can cover basic rule-based use cases as well as 'full ML models' registered with [MLFLOW](#). The system currently processes multi-terabyte/day data streams in over 30 pipelines. De Schon opined 'we believe others will benefit from our example, as well as the code that we're releasing before or in concert with this talk'. Databricks oil industry clients include BP, Shell, ExxonMobil and others. Check out the full list on the oil and gas [landing page](#).

FloCon is an annual network security conference hosted by the [Software Engineering Institute](#) (SEI) of Carnegie Mellon University. Presentations and posters from FloCon 2023 are [available here](#).

COGNITE DATA FUSION COMPLIANT WITH DNV RP A204

Data platform underpins Aker BP's Yggdrasil development. CDF announced as compliant with DNV QA recommended practice. But what exactly does 'compliance' mean?

Cognite has announced that its Data Fusion platform has achieved compliance[1] with DNV's 2020 recommended practice for the 'Qualification and assurance of digital twins' a.k.a. DNV-RP-A204. The RP was originally developed in collaboration with TechnipFMC and is said to be an oil and gas industry first benchmark for building and operating a digital twin. The qualification was a joint initiative with Norwegian operator Aker BP.

Paula Doyle, Chief Digital Officer with Aker BP said, 'Cognite Data Fusion's open Industrial DataOps is the leader in data integration for industrial digital twins. In our Yggdrasil development we are operating the field to ensure high efficiency and low emissions. We are talking about remotely controlled operations, unmanned production platforms, technology and data-driven decisions and work processes. The certification strengthens our confidence that CDF will help us reach our ambitious goals for Yggdrasil.' A recent webinar from S&P Global has it that Cognite Data Fusion is a 'leader across 20 assessed digital twin providers'. More from Cognite.

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1) We were curious to know exactly what 'compliance' meant given that DNV is both providing the RP and certifying the user. Does this mean that DNV is assuming risk as 'independent assurance and risk management provider'? The folks at DNV kindly provided the following which we have summarized.

DNV has traditionally conducted independent assessments of hardware systems and components like oil and gas facilities, pipelines, offshore wind and power grids. Our view is that the digital transformation is key to safeguarding energy supply while decarbonizing and electrifying society. As the energy industry becomes more digital there is an increasing need to assure digital solutions. As a response to this challenge, DNV together with the energy industry, has developed the sector's first methodology for quality assurance of digital twins, DNV-RP-A204. […] We have used a team of experts on software development, digitalization, cyber security, energy systems and organizational models to independently assess Cognite Data Fusion (CDF) to verify if it is in compliance with DNV-RP-A204. DNV's liability for the assessment of CDF, like all other independent assessments and verification carried out by DNV, is governed by the contract between DNV and our client (Cognite). Risks and warranties of using CDF will be governed in the contracts between Cognite and their respective clients.

Read the full response from DNV here.

REGULATORY ROUND-UP

EPA fines for Permian Resources Operating, Matador Production. Texas RRC challenges EPA ozone plan. EU Net Zero Industry Act to accelerate CCS. North Sea Transition Authority team oversees CCS projects. Uganda joins Danr hub. UK launches taxonomy oversight group, releases best practice guide.

WRONGDOING AND PENALTIES

The U.S. **Environmental Protection Agency** (EPA), using a helicopter equipped with an infrared camera, detected VOC* and methane leaks at various sites operated by Permian Resources Operating. The company is to perform corrective actions and will pay a $610,000 penalty. A similar 'Consent Agreement and Final Order' was issued to Chisholm Energy Operating for storage tank emissions, along with a $440,000 penalty. Another operator, Matador Production Co. was hit with a $1.15 million fine and is to spend some $2,500,000 on remedial actions and monitoring.

* Volatile organic compounds.

The UK **North Sea Transition Authority** is investigating an operator for a 'suspected failure to adhere to license obligations within agreed timescale'. The failure concerns seismic survey and work program commitments. The company faces a potential financial penalty of up to £1 million. Another recent investigation concerns a company 'suspected of failing to meet its license' commitments, such as shooting 3D seismic, within agreed timescales.

PUSHBACK!

The Commissioners of the **Texas Railroad Commission** have unanimously voted to refer two actions by the Environment Protection Agency (EPA) to the Texas Attorney General to challenge their validity. At issue is a federal implementation plan for ambient ozone pollution. The EPA had previously disapproved the RRC's own clean air proposal. [More from the RRC](#).

CCS

The **EU** has proposed a Net Zero Industry Act to, inter alia, 'accelerate CO_2 capture' with the aim of an annual 50Mt injection capacity by 2030, funded by 'proportional contributions' from EU oil and gas producers.

The UK **North Sea Transition Authority** has set up a team to oversee the delivery of carbon storage developments. The first carbon storage licensing round was launched in June 2022 and received 26 bids. It is expected that licenses will be offered real soon now. 'Up to 100' separate sites could be required for the UK to meet its domestic storage requirements.

MISCELLANEOUS

The [Petroleum Authority of Uganda](#) has joined the PPDM-backed [DANR Hub](#). Other members to date include the Petroleum Agency of South Africa, SKK Migas, the North Sea Transition Authority, and the Australian National Offshore Petroleum Titles Administrator.

The **Central Digital and Data Office** of the UK Cabinet has launched a Taxonomy Oversight Group (TOG) launched to address the 'absence of a UK central taxonomy' for governance across government data sources. The TOG has already produced a Taxonomy Best Practice Framework to assess taxonomies in the

endorsement process. The Framework also serves as guidance for taxonomy developers. Download the [Framework here](#).

GOING, GOING … *GREEN*

EPA $27 billion GHG reduction fund. AspenTech's Operational Insights. Iconic Air's Emissions Intelligence. UK's Climate Resilience Demonstrator. EU low-carbon Model Explorer. Envana Catalyst. New Mexico OK's Flogistix. PetroMasila uses flare gas. Gas Liquids Engineering. Azuli launched. Inmarsat: 'ESG reporting not believable'. Carbon Disclosure Project: Only 12 companies out of 18,700 merit 'Triple A'. Canada ends for fossil fuel. TSOR teams with Eion on CO2 removal. Chevron, Baseload Capital team on geothermal. EU funds Energy Dome's CO2 battery. Pason Systems' sustainability report. Graforce a winner in Petronas 'Race2Decarbonise'. IEAGHG's CO2DataShare. Kontrol Technologies, LNG emissions and GIIGNL framework. MiQ certifies CF Industries' natural gas. Project Canary certifies Hyperion Midstream operations, teams with Xpansiv. Occidental/1PointFive kicks of DAC in Permian Basin. CanERIC, PTAC and Canada's CRIN. GeothermEx audits Deep Earth Energy. TOG Enterprise Architecture and sustainability. API/Ipieca Guide to sustainability reporting in oil and gas.

The US **Environmental Protection Agency** has released the [initial program design](#) of the greenhouse gas reduction fund, a $27 billion component of the Inflation Reduction Act.

Aspen Technology's Operational Insights is said to advance carbon emission reduction, targeting areas with the biggest potential impact. Operational Insights was originally developed for electrical utilities by the company's OSI business and is now being adapted for the energy and chemical industries. The new functionality is a component of the [V14 edition of AspenONE](#).

Coloradan operator **Civitas Resources** is to deploy **Iconic Air**'s [Emissions Intelligence](#) platform to support its emission reductions and ESG performance reporting. Emissions Intelligence enables operators to calculate, visualize and report emissions data 'more robustly'. The software provides environmental and sustainability practitioners with auditing, reporting, forecasting and scenario planning functionality.

The UK **Digital Twin Hub** has announced the [Climate Resilience Demonstrator](#) (CReDo), a 'connected digital twin of critical infrastructure'. CReDo targets the water, energy and telecoms sectors and is intended to help cross-sectoral networks improve climate resilience.

A more modest contribution to GHG reduction was evidenced in the **EU Horizon** magazine where we read that a new software is to help predict numerous features of a low-carbon society. The 'keenly anticipated' Model Explorer, scheduled for release mid-year, is said to be 'the next advance in computer modelling for Europe's clean-energy ambitions, promising key insights into the impact on societies of the planned switch from fossil fuels to renewable power sources'. The tool was developed under the EU-funded [Locomotion project](#).

Aker BP is to deploy [Envana Catalyst](#) to help it forecast emissions from drilling and production operations, and to track progress on reduction. Envana Software Solutions is a newly formed, $50 million joint venture between Halliburton and private equity company [Siguler Guff](#).

Flogistix's methane sniffing technology has been approved by the State of New Mexico as part of its advanced leak and repair monitoring (Alarm) program. The Flogistix system detects methane, H2S, VOC, and hydrocarbons. Hardware comprises a DJI Matrice 300 drone carrying Sorability's [4Dv2 Sniffer](#).

Yemen-based producer **PetroMasila** has installed GE's TM2500 device to capture flare gas and use it to generate electricity. Four of the aeroderivative gas turbines were previously deployed in Permian Basin to convert gas flared at frac sites into electricity. More from GE.

Gas Liquids Engineering has initiated front end engineering and design on **Whitecap Resources**' CO2 pipeline, compression, and sequestration system for Saskatchewan. Whitecap currently operates one of the largest anthropogenic carbon sequestration projects in the world, transporting CO2 from two major industrial emitters to its CCUS hub in Weyburn, Saskatchewan. The new study involves expanding the facility to multiple additional industrial CO2 sources and new sequestration wells.

A new carbon capture and storage company Azuli Intl. has just launched in the UK. The company was formed by CEO Hamish Wilson and the management team that set up Lapis Energy in the US. Late last year, Azuli signed a memorandum of understanding with Korean SK Earthon for future cooperation on global CCS deployment.

A study by **Inmarsat** has found that 'three quarters of business leaders do not believe their peers' ESG reporting, […] and that a lack of industry trust and verifiable data is driving skepticism'. The study, Accelerating sustainable action through IoT found that in oil and gas, 72% did not trust their peers' ESG reporting72%, that 74% believe their peers are 'focused on perception rather than tangible sustainability outcomes' but that (amusingly) 82% still believe they are 'more sustainable than their peers'.

In a similar vein, a study reported in the **Financial Times** found that 'just 12 companies out of more than 18,700 worldwide merited a 'Triple A' score for their environmental disclosures in 2022'. The study was produced by **CDP**, formerly known as the Carbon Disclosure Project. More than 29,500 companies with a combined market value of more than $24.5 trillion were graded an 'F' after failing to provide any data to CDP. Saudi Aramco, ExxonMobil and Chevron did not respond to the CDP.

The **Government of Canada** has resolved to end new public support for the international 'unabated fossil fuel energy sector' with the signing of the COP Statement on the clean energy transition. Canada was one of the (only) three major energy producers to do so. Canada has issued new policy guidelines to implement measures set out in the Statement.

Supply chain and management consultants **TSOR Group** has teamed with 'verified' carbon dioxide removal company **Eion Corp** on large-scale carbon dioxide removal (CDR). Eion's CarbonLock 'enhanced rock weathering' technology is claimed to accelerate natural geological processes to remove atmospheric carbon permanently at scale.

Chevron, through its Chevron New Energies business, and **Baseload Capital** have announced a joint venture to develop geothermal projects in the United States. The companies will collaborate on driving geothermal opportunities – including identifying the best prospects for development, operations and progressing the next generation of geothermal technologies from pilot to commercial scale. More in the release.

The EU Innovation Council has awarded some €17.5 million Euros to Milan, Italy-based Energy Dome for the deployment of its 'CO2 Battery'. The Battery stores surplus electricity by compressing and liquifying CO2 in a closed system. When energy is needed, the CO2 warms up, evaporates and expands, turning a turbine and generating electricity – 'with zero emissions to the atmosphere'.

Pason Systems has released its inaugural (2021) sustainability report. Note that in this context, 'sustainability' covers a range of topics including drilling efficiency, diversity and inclusion, corporate governance, safety culture and cyber security.

Germany's **Graforce** was a winner in the recent Race2Decarbonise competition organized by **Petronas**. The award was for Graforce's technology that converts flare gas and other hydrocarbons into 'clean hydrogen and solid carbon'. Graforce's 'plasmalysis' methane electrolysis is claimed to be 'an alternative to carbon capture and storage'. More from Graforce.

The **IEAGHG** has announced CO2DataShare, a data sharing platform which allows access to data from four CO_2 storage projects in two countries. The intent is that these datasets can be used in the research and development of CO_2 storage projects and upskilling of future CCS specialists. Current data sets are Sleipner, Longship and Smeaheia (all in Norway) and Decatur (Illinois). The platform was developed at Norway's Sintef R&D organization. More (US) CCS data is available at the DoE's EDX data sharing website.

Kontrol Technologies has entered the liquified natural gas (LNG) market to provide continuous emission monitoring and analytics solutions with a primary focus on the USA. Kontrol's offering includes continuous remote monitoring, real time sampling and enhanced testing supported by robust data and analytics. One objective is certifying LNG operators in line with the GIIGNL* framework for carbon neutrality.

* International Group of Liquefied Natural Gas Importers.

CF Industries has purchased of 2.2 billion cubic feet of natural gas certified by **MiQ** to have '90% lower methane emissions intensity than the industry average'. Certification is considered a pathway to meet CFI's scope 3 emissions reduction goals in ammonia manufacturing. Certified natural gas is produced by companies whose operations are independently verified by a third-party auditor using the not-for-profit MiQ methane standard.

Pennsylvanian operator Olympus Energy and its wholly-owned **Hyperion Midstream** unit is the first integrated natural gas producer to certify its operated upstream and midstream gathering assets with P**roject Canary**. Project Canary's independent assessments analyze some 600 data points per well and deploy on-the-ground continuous emissions monitors. More from Project Carary.

Project Canary has also teamed with **Xpansiv** on a marketplace for verified climate-related attributes for fuel markets. The evaluation is based on high-fidelity GHG emissions measurement, reporting, and verification provided by Project Canary. The Xpansiv platform then enables producers to trade climate attributes as 'registered standardized digital assets'. This (apparently) allows buyers to 'meet net-zero goals with verifiable environmental claims'. More from Xpansiv.

Occidental unit 1PointFive is to deploy **Siemens Energy** compressors at its large-scale direct air capture plant in the Permian Basin. The facility will capture up to 500,000 metric tons of CO_2 per year when fully operational.

Petroleum Technology Alliance Canada's CanERIC is program is currently funding 32 methane reduction projects with up to 50% of eligible expenses. More from CanERIC. PTAC has also teamed with Canada's **Clean Resource Innovation Network** on a Digital Spotlight event to discuss the role of AI and ML in emissions reduction.

Schlumberger (now SLB) unit **GeothermEx** has begun a final review of 'Deep', a Canadian geothermal power plant. To date GeothermEx's due diligence has resulted in 'some 8.5 GW of geothermal power and related investments exceeding USD $14 billion dollars'. This is presumably the GWH per-year potential of the plant, as construction is to commence in Q4, 2023 with first power production estimated by summer 2024. Operator is Deep Earth Energy.

The Open Group has published a short report from a recent online event discussing the use of its enterprise architecture (EA) in sustainability. IBM's Paul Homan opined that 'sustainability and green IT depend on interoperability, both within and between enterprises – which requires an effective, well-designed business architecture'. Sumouli Bhattacharjee (PwC) provided an update on the Open Footprint Forum's development of a data model that is both 'holistic and flexible enough to adapt to future data needs' . Read more of Loren Baynes' report from the event here.

Ipieca has just published an update* to the 4th edition (2020) of its 200 plus page guide to sustainability reporting for the oil and gas industry, subtitled 'advancing environmental and social performance across the energy transition. The 200 plus page report was co-authored with the API and IOGP .

* It is not clear what has been updated since 2020.

DONE DEALS

ABL Group buys AGR. AEGIS acquires ARM hedging advisory. Core Lab delists from Euronext, redomesticates to US. Dawson buys Breckenridge acquisition assets. Energy Aspects has acquired OilX. NV5 buys L3Harris. PetroLedger bags Associated Resources. Repay sells Blue Cow Software to PDI. Risilience closes funding with Quantum Innovation. SLB bags Gyrodata. ADV Integrity acquires Velentium oil and gas division. Veritas Capital has acquired WoodMac. I.Safe Mobile invests in Senseven. mCloud 'exploring strategic alternatives'.

Energy and marine consultancy group ABL Group ASA has entered into an agreement with a subsidiary of Akastor ASA to acquire all of the shares in multi-disciplinary engineering, consultancy and software company **AGR**. The deal will bolster ABL Group's offering within well and reservoir consultancy, enhance the group's position supporting operators' digitalization and decarbonization plans and expand its opex-driven offshore energy exposure.

AEGIS Hedging Solutions, a provider of technology and expertise for commodity and environmental markets has acquired **Asset Risk Management**'s hedging advisory contracts.

Core Lab has voluntarily delisted its shares from Euronext Amsterdam and is to 'redomesticate' its parent company from the Netherlands to the United States. The move is said to ' enhance shareholder value over the long-term by simplifying the corporate structure, improving operational efficiencies and reducing administrative costs'.

Dawson Geophysical has purchased substantially all of the **Breckenridge Geophysical** assets related to seismic data acquisition services other than its multi-client data library. Total consideration for the transaction is 7,000,000 shares of Dawson common stock subject to shareholder approval.

Energy Aspects has acquired **OilX**, a pioneer in AI-driven data analytics for energy markets. OilX's 'nowcasting' real-time data technology complements Energy Aspects' forward-looking analysis.

NV5 has acquired **L3Harris Geospatial Solutions**.

PetroLedger Financial Services has acquired Oklahoma City-based oil and gas land management and accounting firm, **Associated Resources, Inc**.

Repay Holdings has sold its **Blue Cow Software** unit, a fuel and propane management business to PDI Technologies, a provider of software solutions for the convenience retail and petroleum wholesale ecosystem.

Climate Analytics boutique [Risilience](#) has closed a $26 million Series B round to expand its science-based, climate-risk assessment and net-zero planning platform. The round was led by **Quantum Innovation Fund**, alongside existing investors IQ Capital and National Grid Partners. The monies will allow Risilience to expand its SaaS platform to serve clients along their decarbonization journey. The funds will also be used to drive international expansion, with a specific focus on the US where pending SEC rules will require climate and risk disclosures. Risilience, which was spun out of the Centre for Risk Studies at the University of Cambridge Judge Business School, markets 'digital twin' technology that enables businesses to stress test the impact of numerous transitional and physical risks including increasing regulation, potential litigation and changing consumer sentiment.

SLB, the company formerly known as Schlumberger, has completed its acquisition of [Gyrodata Inc](#).. Gyrodata's wellbore placement and surveying technologies will integrate SLB's well construction business line.

[ADV Integrity](#) has acquired **Velentium**'s oil and gas division. Velentium's oil and gas practice provides high-pressure high-temperature (HPHT) test systems and automated monitoring for oil and gas, hydraulics and pneumatics applications.

Veritas Capital has acquired **Wood Mackenzie**, a provider of data, analysis and insights to the energy, renewables and natural resources industry for nearly 50 years. More from [Woodmac](#).

I.Safe Mobile has invested a 'seven-digit figure' in start-up **Senseven**, a 'software and AI-based' mobile inspection system for industrial assets. Austria-based I.Safe develops communication 'robust' devices such as mobile phones, smartphones and tablet PCs for use in hazardous areas and outdoors. More from [Senseven](#).

mCloud has set up a special committee, retaining ATB Capital Markets and Maxim Group as financial advisors to 'explore strategic alternatives' following the 'unexpected departures of key finance employees'. The company is working diligently to complete and file its 2022 accounts 'as soon as possible' and has been granted a management cease trade order by the British Columbia Securities Commission. The Company confirms that there are no insolvency proceedings against it as of the date of this press release (mid April). More from [mCloud](#).

SALES, PARTNERSHIPS, DEPLOYMENTS …

Oracle cloud for Saudis. IP.21 for DuPont. Bell Geospace, Saudi Geophysical team. Shell and Bluware. CGG and 2CRSi, NetApp. Delek rises with SAP. Emerson automates the Golden Triangle. Genasys emergency management for Aramco. DecisionSpace 365 for Hess, Petrobras. IntelliShift, Procore partner. Parsons and Microsoft. Rockwell and Cognite. Sierra Digital and SAP BTP. Seeq process health for Williams. Sinopec buys more Sercel kit. Aker BP and TechnipFMC. Balance e-biz for Vallourec.

Oracle is to invest $1.5 billion to meet cloud computing demand in Saudi Arabia, opening a new public cloud region in Riyadh and expanding its existing Jeddah region. The investment results from an MoU between Oracle and the Saudi Ministry of Communications and Information Technology. More from [Oracle](#).

DuPont has selected **AspenTech**'s [Enterprise IP.21](#) data historian to optimize its industrial data strategy. With help from Tata Consultancy Services, 20 years of historical data was ingested in under two days. More from [AspenTech](#).

Bell Geospace, a provider of full tensor gravity gradiometry data and services, has teamed with **Saudi Geophysical** on future FTG exploration programs in Saudi Arabia. More from Bell.

Shell has awarded **Bluware** an enterprise software agreement covering its software line up of VDS, FAST, and ScaleOut. Also in the deal is 'Pickasso' a custom version of Bluware InteractivAI that was jointly developed with Shell. More from Bluware.

CGG has signed a strategic agreement with 2CRSi to launch a new high-performance computing-as-a-service offering. 2CRSi is a designer and manufacturer of energy-efficient HPC servers which can be located in any of CGG's compute hubs. The deal results from CGG's decade-long internal use of 2CRSi systems. More from CGG.

CGI has announced a global alliance with **NetApp** to organizations across industry sectors 'unlock the potential of hybrid and multi-cloud environments' with a 'single, consistent cloud environment, unified data services, and centralized management that supports full visibility of both on-premise and cloud-based systems and data'.

North American operator Delek US has shifted of its 'highly customized' ERP systems to the cloud, leveraging **SAP**'s 'RISE with SAP' suite of services and standardizing on SAP S/4HANA and adopting SAP standard content activation best practices. More from SAP.

A joint venture of Chevron, Phillips and Qatar Energy is deploying Emerson PlantWeb to automate the $8.5 billion '**Golden Triangle**' ethane cracker facility in Texas. The deal includes DeltaV distributed control and safety instrumented systems, Rosemount gas analyzers, Emerson's Mimic and AspenTech Hysys simulation software. Emerson's AgileOps operations management software also ran.

Saudi Aramco has awarded **Genasys** a contract for the provision of its Genasys Emergency Management (GEM) enterprise services.

Hess Corporation has selected **Halliburton Landmark**'s DecisionSpace 365 Well Construction applications powered by the iEnergy hybrid cloud to construct safe, cost effective, and productive wells. The solution includes AI-powered predictive drilling analytics .

Petrobras is to deploy the **Landmark** iEnergy digital platform in a contract that gives Petrobras access to the entire Landmark DecisionSpace 365 Geoscience Suite including Seismic Engine, Scalable Earth Modeling, Assisted Lithology Interpretation, DS365.ai, and Neftex Predictions.

IntelliShift, a provider of connected fleet intelligence for safety and operations has announced a partnership with construction management software developer Procore Technologies. IntelliShift dashboards and analytics are now accessible from the Procore GUI.

Aveva systems integrator **Parsons Corp**. has announced a partnership with **Microsoft** to combine Microsoft's Azure AI technologies with Parsons' expertise in digital twins, 'X-as-a-service', threat detection and response and smart infrastructure. More from Parsons.

Rockwell Automation and has formed a strategic partnership with Cognite, combining Rockwell's FactoryTalk software with Cognite's Industrial DataOps platform to 'create an industrial data hub ready for enterprise-wide scaling'. The partnership is said to 'enhance edge-to-enterprise capabilities' from Sensia, a joint venture between Rockwell and Schlumberger.

Sierra Digital has leveraged **SAP**'s Business Technology Platform (BTP), a low-code/no-code platform, to develop EnerBridge, an app suite for oil and gas. EnerBridge provides production revenue and accounting users with the ability to enhance, simplify, and automate key features and functions, minimizing costs, implementation time and change-related risk.

Seeq has unveiled its Process Health Solution for process monitoring and diagnostics Seeq PHS leverages advanced analytics and machine learning to address high value, complex process manufacturing challenges related to production, quality and optimization. PHS embeds Seeq ML, a no code multivariate pattern learning and diagnostic technology for near real time process optimization. PHS has been deployed by oil and natural gas provider Williams Co. to accelerated its transition from a 'reactive to proactive' monitoring approach.

China's Sinopec has ordered more land seismic recording equipment from CGG unit Sercel. The deal includes a 25,000 channel 508XT acquisition system and vibrator control software. This is the fifth 508XT system delivered in the past four years and brings Sinopec's 508XT inventory to a 130,000 channel total.

TechnipFMC has been awarded an integrated EPCI (engineering, procurement, construction and installation) contract for Aker BP's Utsira High development. The award follows a two-year front-end engineering and design study to optimize field layout. Contract value is put at 'between $500 million and $1 billion'.

Vallourec has selected e-business solutions provider Balance for its entry into the oil and gas e-commerce market. Balance will power the payments solution for Vallourec's Behub-e online market for tubular goods.

AMG WORLD OIL & GAS AUTOMATION AND TECHNOLOGY WEEK

Corys: 'digital twins challenge best practices beliefs'. Veerum: 'Visual machine learning out-of-the-box'. Streamline Control on MQTT/Sparkplug-based Scada. MagellanX wearables for health and safety. Wazoku/Innocentive and the Oil Spill Recovery Institute. Yokogawa update on OPAS process 'standard of standards'.

Speaking at the 2023 AMG World Oil & Gas Automation and Technology Week in Houston, Graham Provost presented **Corys**' dynamic digital twins. These cross-industry (transport, nuclear, hydrocarbons) simulators leverage Corys' IndissPlus dynamic simulation platform. IndissPlus' chemical engineering first principles-based models match process behavior at normal operations or during transient periods and are used in both dynamic studies of plant behavior or incorporated into an operator training simulator. The digital twin is said to improve operations by removing bias and by 'challenging existing beliefs in best practices'.

Veerum CEO David Lod presented on the impact of unified visual data in operations and maintenance, HSE and productivity. Visuals get a message into the brain '60,000 times faster and with a 400% improvement in information retention'. Veerum's Vision for 3D models technology blends lidar, photo, P&ID information with equipment tag data and geolocation into an 'intelligent reality model' – a.k..a an integrated digital twin. Lod observed that data capture technology is getting cheaper and more powerful and the cloud is making storage scalable and accessible. 'AI/ML no longer requires years of effort to implement'. Visual machine learning is now available 'out of the box'. Models can be trained to detect clashes and safety issues across a plant. More from Veerum.

Peter Boyle and Jeremiah Hannley (Streamline Control) gave a short history of the evolution of Scada systems to highlight the challenges of legacy Scada architectures. Traditional Scada systems are 'brittle' and require multiple applications running to support non-Scada functions. Serial protocols, data latency and

volumes are also problematic and cybersecurity is often implemented as 'security through obscurity'. The advent of middleware (MQTT and Sparkplug-B) is changing the situation with a publish/subscribe mechanism that allows data context to be efficiently captured from edge devices in a secure, encrypted environment with all components password protected. Case histories were presented of implementations of the middleware approach leveraging MQTT platforms from OASys and Ignition.

Daniel Alcantara presented MagellanX's IIoT wearables for worker health and safety. Alcantra observed that while safety has improved since the noughties, it has plateaued recently. Wearables such as MagellanX's SOL-X SmartWatch help assure worker wellbeing by tracking wellness, controlling work and assuring regulatory compliance. Accompanying software can be adapted to workflows, checklists and permits. Data from wearables is consolidated in the control room, providing situational awareness and ensuring that safety barrier management is observed. A graphical interface displays worker wellbeing and allows drill down into issues such as engine room heat exposure or enclosed space entry and condition monitoring.

Jon Fredrickson presented **Wazoku**'s (formerly Innocentive, an Eli Lilly online network) 'innovation challenges', outsourced solution finding for problem solving. The idea is that 'there is always somewhere someone smarter outside of your organization', and that 'getting a diverse range of fresh perspectives is key to effective problem solving'. Fredrickson presented two oil and gas related challenges that were solved by Innocentive. The Oil Spill Recovery Institute (OSRI) leveraged open innovation to solve residual pollution from the Exxon Valdez. In 2008 Paradigm Geophysical leveraged a radiologists' expertise to 'prevent dry-holes' in the Gulf of Mexico (see Oil IT Journal). To date Wazuko/Innocentive has funded some 2,500 innovation challenges with over $60 million awarded. More from Wazoku.

Mark Hammer (**Yokogawa**) provided an update on OPAS, the ExxonMobil-backed Open Process Automation Standard from The Open Group. OPAS is said to be a 'standard of standards', notably those from OPC Foundation, ISA, ANSI, DMTF Redfish and ISO. Field devices connect through the OPAS Connectivity Framework and on to various consumers – notably an 'advanced computing platform' (ACP), an on-premise OT data center providing virtual DCN and IEC 62264 Level 2 & 3 functionality. An enterprise business platform executes IEC level 4 functions. Yokogawa's ACP provides process control system-related workloads, control engineering functions and more. ExxonMobil's OPAS testbed is now in its third year of operations. Other trials are underway including Petronas' INSTEP field trial and testbed deployments by Reliance, Shell and Aramco. Hammer observed that 'multiple industry efforts are driving out niche standards' and that OPAS is 'inevitable'.

Next year's AMG World Oil & Gas Automation and Technology Week will again be held in Houston on the 13-14 February 2024.

SIEMENS AND THE IIOT DIGITAL DATA CHAIN

Digital Data Chain Consortium work leveraged in 'digital nameplate' for plant components.

At the 2023 Hannover Messe tradeshow Siemens presented its interpretation of a suite of process industry standards developed under the auspices of the Digital Data Chain Consortium (DDC), a cross-industry association of over 50 companies in the process industry, founded in 2021. The aim is to assign a 'digital nameplate' to every physical plant object. Under the DDC hood lies three data technologies. Plant components are 'automatically' identified, leveraging the IEC 61406-1 standard. Manufacturer information is captured according to VDI guideline 2770 for standardized data provision. IEP, a cloud-based information exchange platform completes the stack.

Siemens is increasingly delivering devices with a DDD-compatible tag to enable access to the cloud-based backend for product information. The DDC enables component specifications to be exchanged with an ERP

system as they enter the plant. The Hannover Messe demonstrator involved a pilot project executed with Bayer where Siemens Sitrans P320 pressure transmitters were assigned unique IDs. This meant that 'instance-specific digital documentation according to the VDI 2770 standard could be transferred directly to the Bayer's ERP system'. Also, plant components can now be scanned and identified from a via mobile device. More from Siemens.

STATE OF OPEN SOURCE SOFTWARE

Perforce Software surveys open source software in industry. Energy, oil and gas usage 'up significantly'. EOG category N°1 in 'planned nonfungible token implementation'! Small sample size argues for caution.

A '2023 State of Open Source Report' covering open source usage, market trends and analysis from **OpenLogic**/**Perforce Software** and the Open Source Initiative received input from 872 respondents worldwide working in 20 major industries. The top level finding is that 'open source continues to be a thriving space, with more people and organizations adopting open source technologies for cloud-native development, DevOps, AI, and more'. The survey received a total of 872 qualified responses. 80% reported an increase in open source usage. Containers and container orchestration technology, together with software development lifecycle tools, are 'the most invested in and most commonly used open source technologies'.

2% (22) of the sample work in the 'energy, oil and gas' (EOG) category which, along with telecommunications, has 'significantly increased its use and adoption of open source software in the past year. 66% of EOG respondents reported open source usage as 'up significantly'. Motivation was cost reduction, and, particularly for the EOG group, 'access to innovations and latest technologies'.

Popular open source tools (particularly in EOG) included AngularJS, which 'reached end-of-life at year-end 2021'! In the EOG database category, PostgreSQL and SQLite came out tops but (surprisingly to us), only 5% (i.e. one respondent) reported use of ElasticSearch. EOG development (continuous integration/deployment) preferred tools are Gitlab and (another surprise to us) 'Travis'. Oil & Gas is reported as being the 'top industry' that 'open-sources previously closed source software'.

Overall we question how representative this study is. The sample is small and it is unclear what company sizes and geographies are involved in the 22 responses in the EOG category. Our misgivings were heightened when we read, in the concluding section on 'how particular industries might innovate with open source in the near future', that EOG is 'Number 1 in the planned implementation of nonfungible Tokens (NFT)'!

SERIOUS GAMES IN THE GULF

National Academies' Gulf Research Program conducts oil spill preparedness exercise and plays 'path to net zero' game.

The US National Academies' **Gulf Research Program** (GRP), a grouping of government, industry, academia and Gulf communities, has been conducting 'serious games' exercises to test oil spill preparedness, infrastructure resilience and look into the nation's energy transition. In 2021, the GRP set up a virtual Offshore Situation Room to explore the possible impacts of an offshore oil disaster in the Gulf of Mexico and to plan mitigation and response. The Investing in Resilient Infrastructure game explored ways to prioritize energy infrastructure investment around the Gulf region.

Another 'Path to Net-Zero' game assumed that the US had met its goal of 100% clean electricity by 2050. Participants were asked to identify impacts this would have on local communities, governments, academia and industry. An alternative scenario, 'Steadying the Transition' assumed that 'no strict government

regulation had been put in place' and that the goal of net-zero by 2050 had not been reached. Here the Gulf 'continued to play a significant role in supplying natural gas and, to a lesser extent, oil to an economy gradually reducing carbon emissions'.

More on the Games in Maeghan Klinker's feature story on the National Academies website.

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