

# Assessing organisational data competency The "data mesh" at Equinor Ross Philo's farewell talk The 'brutal truth' about IIOT A better way to stop phishing

## January - February 2022



Why blockchain is good for smart contracts, with payments triggered by live equipment data



Official publication of Finding Petroleum



#### lssue 94

#### January - February2022

#### **Digital Energy Journal**

United House, North Road, London, N7 9DP, UK www.d-e-j.com Tel +44 (0)208 150 5292

#### **Editor and Publisher**

Karl Jeffery jeffery@d-e-j.com Tel +44 208 150 5292

#### **Advertising sales:**

David Jeffries, Only Media Ltd djeffries@onlymedia.co.uk Tel +44 208 150 5293

#### Production

Very Vermilion Ltd. www.veryvermilion.co.uk

#### **Subscriptions:**

£250 for personal subscription, £795 for corporate subscription. E-mail: **subs@d-e-j.com** 



# Opening Assessing your organisational data competency

It might be helpful for organisations to get a sense of their organisational data 'competency' and where they can improve. Data management consultant Jess Kozman is running workshops in Australia to help companies to do this

Jess Kozman, a data management consultant based in Perth, Australia, is running workshops with the Data Fit Organization Steering Committee for natural resource companies to model and assess their data competency.

The Data Fit Organization Steering Committee is a collaboration between CORE Innovation Hub in Perth, Australia; The Future of Work Institute at Curtin University (also in Perth); Unearthed, a community of start-ups, developers, and data scientists with a goal of "making the energy and resources industry more efficient and sustainable" based at CORE Innovation Hub, and National Energy Resources Australia.

The 'deliverable' from the workshop is that the company has a map of all categories of data work in a company and can develop a set of behavioural competencies which a "data fit" organisation would have.

It should help companies identify which competencies they need to develop further, including in which functions and which disciplines.

It treats data in a way that is agnostic to the applications used to interpret or analyse it, and whether it is legacy or real-time data.

This should guide energy and resource organizations in developing competencies across functions and disciplines. As our digitalisation systems grow, working with data can no longer be the domain of just a few experts.

With this map, the company will be able to identify and prioritize data related behaviours, which will help navigate digital transformation, transitions to new forms of energy, and leverage smart and autonomous data systems.

The model building approach builds on a model included in a recent white paper about data competency, by the CORE Skills Innovation Lab in Perth, the University of Western Australia, the Curtin University Future of Work Institute, and National Energy Resources Australia (NERA).

The approach was recently piloted with a major Australian oil and gas operator and an Australian based mining organization. The pilot projects demonstrated the need organisations have, to get a bet-



Jess Kozman, a data management consultant based in Perth, Australia

ter understanding of individual roles and responsibilities in a data driven culture, Mr Kozman says.

The work also builds on a report commissioned by NERA in 2018, "Preparing Australia's Future Oil and Gas Workforce", as well as the document, "A conceptual framework and practical guide for assessing fitness-to-operate in the offshore oil and gas industry".

That framework was published in 2013, written by the University of Western Australia, Australia's National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), and the University of Oxford. The report was commissioned following the Macondo (Deepwater Horizon) incident in 2010.

The model is based on assessing fitness to operate in "Three Capitals". Human (knowledge, skills and experience); social (interaction of teams); and organizational (processes & systems).

#### Next steps

The data competency model building has now been trialled in industry pilot projects. This demonstrated the robustness of the model with more industry partners across the resources sector. It applied the model to different embedded data workflows, including petroleum exploration, reservoir management, and mining ore processing. It has also helped expand the depth of the model.

The intent is to work with the collaborative Steering Committee to guide development of the Data Fit Organization framework, and publish the model for open use.

### **Data skills**

The need for this sort of modelling of data skills is driven by the growing use of data in organisations.

The study noted that everyone in the industry will be collecting, managing, analysing, and sharing data in some way. Working with data is no longer in the domain of a few experts.

This means that every employee in oil and gas companies will need to have skills for using and interpreting data. Data will also be shared increasingly around the organisation. "Successful companies in the new energy transition will be those where data has become a ubiquitous part of work, in the same way that safety is today," Mr Kozman says.

### Learning from subsurface

Within the oil and gas industry, skills to work with subsurface data can be much more developed than skills to work with operational data, Mr Kozman says.

The data formats are very different – subsurface data is based on surveys and modelling done in the past, while asset management data can be real time.

The Data Fit Organisation steering committee is looking at which behaviours have led to success in subsurface data management, and how they might be applied in operations, including with digital twins of equipment, design data (CAD), control system data (SCADA), and sensor historians.

The framework can leverage existing industry data standards across functions and disciplines.

As an example, some of the data aggregation and historian technology designed for well production data is now being used to store massive data sets from distributed acoustic sensing (fibre optics) on carbon sequestration wells, he said.

The capabilities and behaviours that distinguish a Data Fit Organization will also lead to less risk as organizations transition to new data types supporting new energy.

digita cucros

# **Data mesh at Equinor**

Equinor is finding the 'data mesh' concept very helpful in its digital transformation. Sun Maria Lehmann and Jorn Olmein explained how they use it

Equinor has been following the ideas of the "mesh" architecture in how it develops its use of digital technologies in the organisation, said Sun Maria Lehmann, Leading Engineer, Enterprise Data Management and Architecture in Equinor. She was speaking at a webinar organised by the Society for Professional Data Managers (SPDM) in November.

This idea was originally conceived by Zhamak Dehghani of consultancy Thoughtworks in a 2019 paper (which you can download at https://martinfowler.com/articles/ data-monolith-to-mesh.html)

The model can be described as "distributed accountability," with different departments and offices responsible for their digital systems, but with corporate wide oversight to make sure it all works together, she said.

Each department becomes a node on the mesh, and treats its data outputs to other departments as a 'product', where it takes responsibility for delivery and customises it to what its 'customer', whoever is consuming the data, needs.

It can be described as a 'federated model' of digital technology. Just like a federation of states, it means a union of partially self-governing entities, with some overriding authority.

The data products provided by any mesh node can be further split into 'portfolios', which makes them more manageable. Examples of data domains can be seismic, well, production volumes, environmental, renewables.

### **Data product principles**

One of the principles of mesh is that Equinor has established the basic principle that data is an asset and should be safeguarded, and also made available to others within the company, and sometimes externally, she said.

This principle has led to data sharing initiatives, data standardisation efforts, and Equinor's contribution to initiatives like OSDU, she said.

In 2020 Equinor's corporate executive committee approved the idea that the company should have a "data product focus", where individual departments provide data in a suitable format for others to use as a core 'product' of their work.

This also means working together with the data 'consumers' in other departments, to find out exactly what data they need and what their priorities are.

Ms Maria Lehmann uses the analogy of a pancake restaurant, to show people making data how they should think about it.

Just as the management of a pancake restaurant would think about what kind of pancakes to make, who they are for, what suppliers they should use, people who provide data as a product should think about what data they provide, who it is for, and how they supply it, she said.

For example, a pancake restaurant may decide to serve large families. In the same way, a 'data product' could be orientated around meeting the needs of many individuals in the company, rather than what one person needs.

Equinor aims to be 'domain driven', which in this context means recognising that people who use the data have the best idea about how they need it.

To try to develop good data products quickly, Equinor encourages the use of techniques like personas [imagining specific people who would use it], use cases [thinking through how someone uses it] and value stream mapping [working out how the data is useful]. Rapid iterations and quick deployments are encouraged.

Continuing the pancake shop analogy, this is like imagining what sort of people would want to eat your pancakes, when and why, and why they would prefer your pancake shop to another one.

Sometimes you are reliant on others to make your system work, such as to provide good input data. The pancake shop analogy is being reliant on certain suppliers, she said.

Key principles about data products are that they should be managed, owned, and valuable, she said, with known quality and rights to use them. To continue the pancake analogy, if you make pancakes, you should have managed processes, and re-usable recipes, owned by your pancake restaurant.

### **Consumption patterns**

It is important to try to understand how data is 'consumed', added Jorn Olmheim, Enterprise Data Architect, Equinor. For example,

data can be consumed by individuals in the business functions of the company, or by the enterprise software. It can be consumed by new digital projects, including analytics, machine learning experiments or other jobs.

"We try to gather as much as possible, in order to help us, or guide the business, to where they need focus when they develop their data products," he said. "We try to use these consumption patterns both to find the right data products and to decide on the priorities of which data products to start with."

Then you can work out what kind of integration method would work – for example can it be done just with a simple API interface.

### Working with mesh

There are four "pillars" to how Equinor implements the mesh idea, he said. Working with data in the right way, a 'federated' system made up of individual units with some internal autonomy, which are 'domain driven', so working around their own business needs. Data is stored on Equinor's own 'Omnia' cloud platform, and there is 'product thinking' throughout, in how data is provided to others.

"It is important to look at this as much more than data," he said.

The data product also includes consideration of how data is ingested into each mesh 'node', how it is transformed or updated, and any infrastructure which is needed, such as data pipelines, storage and databases.

According to the Thoughtworks concept of mesh, there is an overall governance layer for the whole company, ensuring the various nodes can interoperate, such as by setting standards, definitions, or master data management.

There is also a platform for the whole company, upon which people can build services.

Between the platform and the governance layer, is a layer where domains are responsible for building their data products, using the tools provided by the platform, and according to the standards set by the governance layer.

"It is important the business [units] take responsibility for their data, it really drives this development forward."

Departments within Equinor do not have the same levels of complexity in their data. For example, renewables have a lot less requirements than oil and gas subsurface, he said.

The 'mesh' evolves as the data products from the various departments work together, and build on each other's data, he said. The whole idea is very abstract. "It is important to have some concrete examples. We're starting to get those now. The best way to explain it to people is to show them," he said.

"We have to look at delivering data to the end user as a software development product. Once you think about it that way, it's easier to think about what this about."

Perhaps surprisingly, the hardest people to convince to work with data in this way are old school data managers. "They have already worked in their ways for a long time," he said.

### **Equinor and OSDU**

Equinor has been involved in OSDU since it started, he said.

"The problem is, its quite limited in what it can do and what it can store," he said. "Once OSDU gets more mature and ready for more data types we will consider that."

"We will never come to a place where we can get all our Equinor data in OSDU. For example, financial data will never be part of OSDU. Also co-called "industry 4.0 data" from sensors in facilities."

"It's going to be interesting how we fit data products in OSDU with data products digital not in OSDU."

# **Integrating engineering data like Google Maps**

The oil and gas industry would benefit from having an integrated digital platform, like Google Maps, to run on. Gunnar Staff, head of technical consulting, Cognite, shared some ideas about how to get there

"Grown-ups remember when we had to sift through the phone book to find a restaurant, call to make a reservation, open a map to find out where it is," said Gunnar Staff, head of technical consulting, Cognite, speaking at the Society for Professional Data Managers online forum in November.

"With Google Maps we see where the restaurant is, how to get there, when is the opening hours, what are the reviews."

Google "starts analysing information like phone location, sees where you are moving. They can see when the restaurant is busy and the expected traffic, when to leave home and be there on time."

"Then they open the API for others to build applications on this, like Uber. You can search for a restaurant and book an Uber to get there.

It's an ecosystem of solutions based on the same data."

But if you look at the most modern oil and gas

platforms in the North Sea, there is still a lot of information initially recorded on paper, which is later manually input into a digital system. "It's very cumbersome, not very digital."

"How can we move the paper-based industry to a Google Map version?"

### What's holding us up

Oil and gas companies today are making digital investments, but not getting the maximum value from them.

One possible reason is "you don't have digital maturity, your organisation is not ready."

Another possible reason is "too many competing needs / lack of focus."

"Or can it be you are approaching the problem in the wrong way? Are we employing new flashing tech just to show we can do it? Or are we trying to build capabilities that soon become a commodity?"

"Lack of data" is not a reason for being slow

on digitalisation in asset heavy industries. Studies show that their data volumes continue to go up.

The problem is more about data usability and trust in data, which are obstacles in using it to make decisions. This needs to be done in a way which is efficient and feels "naturally intuitive," he said.

"These are questions we've been asking ourselves for years. The answer isn't that obvious. The industrial world is extremely complex and it's not getting any less complex."

### **Unified model**

Cognite believes that the answer is in what it calls a "unified semantic data model", which enables a company to have all of its data in a single understood structure, showing how it fits together.

This can include data from IT (software), OT (operations technology) and ET (emissions technology).



Gunnar Staff, head of technical consulting, Cognite

It can include the results from data from a range of sources, including output from simulators, maintenance and inspection data.

Using this data model, you can build a software tool, which can be known as a "digital twin", for people to work with the data.

Mr Staff's definition of a digital twin is a system which can provide you with all the right data about the real world, such as when you search for a restaurant in Google Maps, it can provide all the data you need to decide whether to eat there. "This is about finding the data in the right context," he said.

"Once you have the data foundation ready you can tap into the big value."

### Struggling to roll it out

One challenge many companies face is that while they can make a single project work, known as a 'proof of concept', they struggle to roll it out across the whole company.

"We cannot do this one asset at a time. The true value lies in rolling this out to all assets."

This rolling out is needed if we want to "enable the entire organisation to access the data, build the right advisor, and present the results to the right user at the right time to make the right decision," he said.

Almost every company in the industry has grand digital ambitions, most have done some proof of concepts, some of which have been successful. But few of those are still in production six months later, and very few of those get scaled out to all assets.

A common problem with scaling up proof of concept is that final decision makers and end users don't trust it.

"We have to remember the person who is using these advisors - they are responsible for what's happening," he said. "A wrong decision can have a fatal outcome in our industry."

Another problem is when senior management don't select the right use cases, prioritising something which would look impressive over something with the biggest value. "You need to engage the broader part of the organisation to map out where we see the potential for improving," he said.

One of the biggest challenges can still be getting access to data.

"Once you have approval to access, getting the technical part of connecting is usually not a big problem," he said.

"The data is owned by a branch in the company, they are reluctant to share the data with other parts of the company."

#### Be fast

If software applications can be developed faster, then it gets much easier for budgets to be approved to roll more of them out. The development costs of the different applications is lower, and the returns come in quicker.

Developing applications in this context includes first making something valuable that is possible to scale, scaling it, and being able to maintain and enrich it easily over time. Cognite calls this a process of "industrial data ops."

It generally works better when you roll out many different solutions quickly, rather than try to implement large integrated software, Mr Staff said.

Two techniques to help roll out digital tools quickly are "data contextualisation" and "use case templatization," he said. Data context information and templates can be provided to the solution developers so they can develop solutions which work across the company faster.

As an example, Cognite recently worked with a client to develop a single maintenance planning application. It required data to be extracted from 14 different data systems, including SAP, Primavera, and simulation tools.

"Once this application was developed on one asset, we rolled it out to about 33 assets in a matter of 16 weeks, this included a connection to all the different data sources," he said. "Very few of these data sources were shared between assets."

"You have a clear separation between data and the application. That is handled in this data ops platform. "The application only needs to ask the data platform for the right information, Google Maps style. You get all the data connected to that equipment [such as] time series, maintenance orders."

### Citizen data scientists

According to a recent study by Gartner, quoted by Mr Staff, many companies believe that in future, most data work will be done by 'citizen data scientists'. This means people who work with data as part of their normal role, not specialist data scientists.

"A company is digitally mature when it is able to have the citizen data scientists able to do the advanced data manipulation themselves," he said.

But for this to happen, it should be possible to build data tools like Business Intelligence (BI) dashboards without specialist expertise, he said.

"We had clients who had to wait a month to get a dashboard up and running."

### Value

Ultimately, Cognite clients believe it is possible to achieve 30-50 per cent equipment uptime and 10-40 per cent reduced maintenance cost from maintenance optimisation, using digital tools like this.

They believe that production optimisation could lead to 3-10 per cent increase in productivity and 10-20 per cent increased yield or quality, he said.

Giving workforce better digital tools, so they can pull up relevant information wherever they are, could lead to 30-55 per cent increased productivity, and fewer hours worked offshore.

Similarly, it could be possible to reduce energy use by 10-20 per cent.

"You don't reach this number unless you are able to efficiently scale [digital technology]," he said.

"The operation optimisation is the real goal here. It is not a single value pool, it is the intersection between all these value pools, for the entire operation and not just a subset. Production optimisation influences maintenance and vice versa."

In the calculation of return on investment, the 'investment' costs must include both the cost of the software platform and the further development to make it work in the company's environment.



# Making it easier to migrate to OSDU

One challenge with the OSDU platform is that many people in oil and gas companies are reluctant to move all their data to 'yet another platform'. CGI's Michaël van der Haven shared some ways to move forward

Despite the advantages of a new data platform, people can be reluctant to move to it – much as they might be reluctant to move to a nicer flat, even if it is offered to them free. If people are comfortable where they are, and moving is an effort, you can see their point.

This is one of the challenges behind roll-out of the OSDU platform, said Michaël van der Haven, Vice President Consulting oil and gas with CGI.

"Any migration that you do in software land, in practise means replacing what you have," he said. "You cannot go back any more."

"When your CEO, CTO says, 'we have selected a new platform and we're all going to move, open platform, new standards', you have to deal with the population that says, 'I have a dozen applications that don't work with that new platform," he said.



Michaël van der Haven, Vice President Consulting oil and gas with CGI

There can also be 'migration fatigue', with people saying they have not finished the pre-

vious data migration completely yet, he said.

With OSDU, "the industry is finally developing standards on how to store data and make data accessible. Open standards, not just on data but on the platform itself," he said.

Once you have moved to OSDU, "data is going to be available at any time that you like it. Your existing tools can operate the way they are supposed to."

But "opponents just see that as 'yet another advertising game that's not going to work.' They ask questions like, can you tell me how many vendors are actually supporting it, how many deployments are there, what does it mean to do a legacy conversion."

The data is stored in the cloud, which can be expensive. Many oil and gas people point out that some of their data is not allowed to be stored on cloud servers due to regulations of the country it is in.

Mr van der Haven has a background in reservoir engineering, and also as a digital solution architect building massive data platforms. He has been very involved in the development of OSDU. CGI is an IT and business consulting company.

### Data mesh

One concept which can help move things forward is that of the 'data mesh' – where individual departments take responsibility for their own data systems and making it available to others.

So, the data systems mesh together along the same lines as the company departments mesh together. It requires a strong 'governance layer' applying standards for how each department manages and presents their data.

"Data mesh is a term which is growing in our organisation, based on stuff which is happening in different industries, not just oil and gas," he said.

OSDU can be used to store data for each of the individual nodes in the data mesh. You can have multiple separate OSDU 'instances', each as mesh nodes.

### An OSDU instance

Within each OSDU 'instance', you can include meta information about what data you have and how it relates.

An owner needs to be defined for every piece of data, with responsibilities.

"You can add delivery pipelines to pick up the data from where it is, if necessary, transform it [on the way]. You need to build infrastructure components which pick up legacy data and transform it.

"It is very flexible, it has quite strong guidance on how you define those data types," he said. "It makes all the data discoverable."

Although you don't necessarily need to convert all your data before you move it. "Our recommendation is to store the data as an artefact of legacy [previous format] data in OSDU, so you are slowly migrating legacy data into new formats."

### Data lake house

OSDU could be defined as a "data lake house", a cross between a "data lake" and "data warehouse", if a data lake means all data is thrown into it, and a data warehouse is highly structured, he said.

"A traditional data lake is about dumping all your data in there. A lot of us have been on that journey and create those swamps. Not a lot of people realise that OSDU is acting as a data lake house."

# **Organising data before OSDU**

If companies are going to move data into integrated data platforms like OSDU, they have to decide whether they are going to organise and connect it before ingesting it, and whether to go for an automated or manual method. Jamie Cruise of Schlumberger outlined the options

Since about 2017, there has been work going on to integrate oil and gas data in cloud hosted structures. For example Schlumberger had its "Delfi" project. The OSDU (formerly known as Open Subsurface Data Universe) is similar.

But the platforms only have a value if the data in them is good to begin with. "We have

the challenge to take multiple streams of data and bring this into the OSDU platform," said Jamie Cruise, head of Products, Data, Schlumberger, speaking at the Society for Professional Data Managers (SPDM) Online Conference in November 27 2021.

To understand where we are, it can be helpful to understand where we were before. The period of 1990 to 2017 could be called the "database era", where information was gathered into different databases but never unified. So there was friction any time a company wanted to use data from more than one database, Mr Cruise said.

OSDU was originally designed to only handle subsurface data. But now it is moving

beyond subsurface data, to incorporate real time drilling information, production information and emissions data.

The challenge is "how can we populate the [OSDU] environment with content from our existing sources, which are often very diverse," Mr Cruise said.

"Let's assume your company has bought into the idea of a data platform, the next challenge is how to put content in there."

Some companies take a 'data lake' approach, which can mean ingesting large amounts of data at high speed, but no data clean-up along the way. So you end up with what people call a 'data swamp', he said.

On the other end of the spectrum, you can do labour intensive tasks to make sure everything ingested is high quality, the files are connected to the right objects. But the downside is that you might end up with a lot of data not finding its way into OSDU "because there's not enough time or people."

### Automation

So the challenge is to do better to use automated techniques, perhaps with AI / ML, to improve data quality as it is ingested, including 'weaving it together' – showing how different elements relate.

For example automated tools which can extract all the data from documents. "In OSDU we're not just a big flat collection of records and files, we're building a corporate knowledge graph of relationships and lineage."

One project Mr Cruise's team is working on is to convert well log data in raster images into digital form, using machine learning techniques.



Jamie Cruise, head of Products, Data, Schlumberger

A second example is machine learning based "raw record reconstruction" from unstructured data, trying to recreate the raw data which was used as a basis for a document.

Many companies have a 'master golden record' problem, where there are gaps in the data in their corporate database, or data they are not sure about.

"We're mining report documents, and using feature extraction / entity extraction, to find attribute value pairs from unstructured data, and correlating that with attributes [for example] in the master well record," he said. This is "an exciting way of tapping into unstructured, unprocessed data."

"Natural language processing" – where computers understand people's normal written language – can be useful, if it means that people can explain how data fits together as they would explain it to a person, rather than "having to learn some of the difficult language around data management and schemas and structures and query languages," he said.

"We're often searching for IDs with special characters in them, or searching through lots of fields. If we write the queries in natural language or use voice capture technology, we can make it a lot easier for people to discover data sets and content they want to use."

This is a way to "enhance the productivity of users who are discovering information in this large set of data."

It is useful to have metadata about the background of any piece of data – which version it came from, or where it was captured from. "The OSDU environment is a place where we can put every piece of data in context," he said.

"That's one of the things we want to achieve when we talk about enterprise OSDU."

### Making the change

Mr Cruise was asked what companies need to do, to get ready for OSDU. For example, should they do all the data clean up and remediation work upfront, or can some of that be done after you have got data into OSDU.

"My view, and the view of people in my department [is that] we don't think you should have to remediate the quality of all of your data outside [OSDU]," he said. "We like the idea of using OSDU to migrate your raw source format data.

"The OSDU services are flexible enough they can take all sorts of schemas, not only standard OSDU schemas."

There have not yet been cases of companies switching their data stores entirely to OSDU, we are still in early days of adoption. For now, "people are using this as a supplement or alternative," he added.

# What good search looks like

Intelligent search systems can bring you exactly the results you want, search multiple systems at once, and have taxonomies you can re-use in other systems, said Lee Hatfield from Flare Solutions

From a data point of view, digital transformation means "ensuring people have a full awareness, full understanding, full availability of data," said Lee Hatfield, Principal IM Consultant, Flare Solutions, an information management consultancy, speaking at an online Society for Professional Data Managers event in November.

So that means good search. Good search can "empower people to use the data and gain value from the data," he said.

A good data search system doesn't just give you a list of results, it ranks the results as to which it thinks are most relevant to you. It provides you exactly what you want so that "Staff are not overwhelmed with stuff of peripheral value," he said.

A good search system can simultaneously look in multiple data stores, such as SharePoint and other shared drives and documents and return relevant items.

### **Multiple layers**

Creating such a search system can be seen as a project with multiple layers, he said.

The first layer is the information sources themselves, such as network drives, documents and e-mails.

The second layer is the means of 'ingesting'

these information sources particularly those that are not digitised to begin with. Such as scanning files and doing optical character recognition. This stage may involve identifying titles, headings and contents tables, and some initial analytics of documents.

The third layer is known as the 'semantic layer', which is where the software matches the documents to your search term. "It's a quite complex layer," he said.

This is where relationships are defined along the lines of "if it is this type of file, it belongs to this type of well or field," he said. "You're coming up with tags for each individual item."

"You will have taxonomies in there, they have things such as hierarchies, aliases and synonyms based on Technical Language Processing. It is about contextualising and classifying all the information, the information sources, and adding the understanding."

### What good search can do

A good intelligent search solution offers a choice of interaction methods, including free text search, filters and drop-down menus, he said. The search can also connect to another application like GIS, for example to display results on a map.

Good search solutions function as a means of integrating different data stores together, so existing systems can do more. Companies often have separate data systems, each with their own search capability, but they are not integrated. It means that users need to know which search system to use, or try more than one, he said.

Intelligent search is more precise. So, for example if you search for a specific well report for a specific well, you only receive that report in the results, not a list of hundreds of tentative results.

For e-mail search, better search systems might be able to search attachments as well as the e-mails.

There may be opportunities to re-use the taxonomies or definitions in other software systems across a company's application landscape.

When setting up a search solution, it is important to test it out, to see if it delivers the results you expect, he said. Undertaking a search audit ensures that companies understand how good their search is.



Lee Hatfield, Principal IM Consultant, Flare Solutions

A search system will never be 100 per cent perfect, but "you can strive to get a lot better than a lot of search [systems] are nowadays," he said.

# **Data maturity of the UKCS**

A survey of the data / digital maturity of companies in the UK Continental Shelf found that companies sit along a wide range. Dave Mackinnon of TLB discussed the results

The Technology Leadership Board (www. the-tlb.com), a UK continental shelf focussed industry and government body that works together to develop technology in offshore oil and gas, led a "Data and Digital Maturity Survey" in 2020, with participation of 73 companies in the offshore energy industry.

A number of organisations were involved in the study including industry body Oil and Gas UK, Opportunity North East (ONE), the Oil and Gas Technology Centre (OGTC) and the Oil and Gas Authority (OGA), said Dave Mackinnon, Technology & Innovation Manager, Technology Leadership Board.

The survey found that companies responding had a wide range of digital maturities, and there was no obvious pattern. Smaller companies were no more likely to be mature than larger ones.

61 per cent of companies "have a data management strategy," but it can vary from just having an idea to an active participation - identifying digital roles, he said.

35 per cent of companies have dedicated digital skills training. The pandemic may have been a factor in driving this.

60 per cent of companies state they have a "digital strategy" although some were not able to put their finger on it and produce it.

"Not many were able to show the dividends at the far end of the digital process - what has been rolled out," he said.



A discussion of oil and gas data managers during the SPDM event. **Top row:** Jess Kozman, Data Management Practitioner; Kerry Blinston, VP smart data solutions, OASIS Group. **Bottom row:** Jane Hodson, information and samples lead, Harbour Energy; Alan Smith, director, Luchelan

"Only about 7 per cent of technologies we listed were widely utilised."

"We found that the transformation barriers were all in the organisation," he said.

One barrier was a sense of digital deluge. An overwhelming number of technologies, methodologies, terminologies, trying to fight for space, he said.

For many organisations the biggest difficultly was keeping the focus on challenges, not [digital] solutions. And having governance of digital technology processes to ensure this happens, he said.

For people, "there's a new language and skillset in play. Don't be intimidated by it. Ask the underlying questions. It's about running a business. Ask, 'how does this impact my business, how do I get value from it?' You should only fund technologies which provide business value."

It is useful to have a process for generating ideas in the company. But so often, ideas only get to the proof-of-concept stage and are never scaled up.

### **Digital ecosystem**

"When we think about data and digital, we often think of specific data solutions and analytic tools; an app, a wearable device, a remote visual inspection of an offshore operation."

"Instead, we should be thinking about the

entire ecosystem that brings all of these solutions together."

Mr Mackinnon believes that the UK oil and gas sector is "holding ourselves well" compared to the oil and gas industry in other parts of the world, but with some exceptions. "There's more competency in robotics in Norway for example," he said.

Mr McKinnon sees digital technologies in three segments – physical to digital (such as sensors, providing digital information about the physical world); purely digital (including integrating, analysing, visualising and augmenting data); and digital to physical (including robotics, and 3D visualisations and digital twins of the physical world, which are useful in managing the physical world).

#### **Prioritising data**

Data management is frequently misunderstood and definitely underinvested.

Without a coherent management strategy, everything falls apart," he said.

"The biggest challenge that we see is how do you get value from data. Everyone typically thinks "data is just there - something on the W drive". The need to put governance around it, which probably involves spending money on staff, "is not as well understood as it could be," he said.

"As we go further on the digital journey, we see the wrangling of ETL [extract / transfer / load] is taking a lot of time. Data is not in the right place, not of the right quality."

"We've got to make it simple, and understandable.

"Everyone [needs to] understand that data is the foundation. Or you're spending more money than you need to."

# **Taking O&G data skills to new areas**

Which oil and gas data and digital skills are useful in emerging areas of the energy industry? Jess Kozman, information management consultant, shared his thoughts in the SPDM conference

Many oil and gas data managers are asking themselves which of their skills are transferrable to the new energy landscape. "This is a conversation I've been having quite a bit, in response to obvious issues around climate change and shareholder activism," said Jess Kozman, speaking at the SPDM event in November.

Mr Kozman is an oil and gas data management consultant based in Perth, Australia, and has just finished a 4-year contract with Australian gas producer Woodside.

Most oil and gas data professionals have a background in subsurface data, a role which has been described as having an "unusual mix of scientist, technician, IT guru, business person," Mr Kozman said. "Not all IT [people] and technologists have this perspective."

Oil and gas data managers have also been described as "explorers and geologists with a data fetish".

Their skills may be increasingly in demand in other areas of upstream oil and gas he said. Growing volumes of data on upstream company cloud servers include video streams from ROVs (underwater drone vehicles), emissions monitoring data, ML/AI data, microseismic data, and fibre optic data. Data from robots is also growing, he said.

### Geothermal

Looking beyond petroleum, an energy domain similar to oil and gas subsurface is geothermal energy.

"You've got companies that are drilling wells into rocks and trying to understand what the physics of the rocks is. So very closely allied to what we do when we extract hydrocarbons," he said. "A lot of the data that is required to produce a geothermal reservoir can probably be already stored in the systems we use today as oil and gas data managers."

For example, one company in Australia is looking at a reservoir of hot water, below its existing gas discoveries. "They are saying, by deepening wells a little bit we can have a geothermal opportunity that adds to the decarbonisation plan of our company."

"To manage and produce that energy they are going to need some [familiar] data types, 3D seismic, heat gradient, PVT and geomechanics."

#### **CO2** sequestration

"CO2 sequestration is another area where it's pretty obvious the overlap in the data we work with today," he said. [For example] "examining suitability of a reservoir, log and core analysis, to understand how the reservoir will behave under injection of CO2."

The VP of carbon business in Woodside mapped out the skills and types of thinking and behaviour that were necessary for an oil company employee to work in carbon capture and storage. The list included reservoir understanding, drilling, development planning, understanding big data, analytics, decision making under uncertainty. Oil and gas companies already have people with these skills, Mr Kozman said.

"Carbon sequestration projects also require a lot of high-end engineering data and information to understand how CO2 will react with facilities."

### Hydrogen

Another domain could be hydrogen production. There are some natural hydrogen sources on the planet, formed from interaction between basement rocks and ground water. To tap into that, we need to know where to find it, and how to drill and recover it, he said.

"There's some evidence now being gathered by the Geological Survey of Western Australia (GSWA), [such as] satellite imaging, which can lead us to where natural hydrogen is seeping up," he said.

Also, the GSWA as an organisation is very focussed on the mining sector. "They are hiring data managers from oil and gas to come and work in the mineral industry."

"GSWA has appointed a chief geoscience information officer. He's asking for things very familiar to us."

For example, many government agencies are adopting standards like the FAIR Guiding Principles for scientific data management and stewardship, where FAIR stands for the four principles of Findability, Accessibility, Interoperability, and Reusability.

Oil and gas geoscientists are used to building predictive models which take uncertainty into account. "We should be pretty good at understanding how that data works," he says.

### Carbon in procurement

The subject of monitoring carbon emissions embedded in the supply chain "comes up quite frequently," he said.

One company's scope 1 (direct emissions) becomes another company's scope 3 (value chain emissions).

"We have to have clear transparency about the way we are measuring the scope 3 emissions. We have to find ways to share this data. It is a clear area where there's a need for standardised data, especially around units of measure. I think that's an area where oil and gas data managers can help.

# OGA – public dashboards of production data

The UK's Oil and Gas Authority is providing public dashboards of daily production data. Robert Swiergon, OGA's technical data manager, explained how it works

Under the UK's 2016 Energy Act, operators have to report daily production data for the life of the field, said Robert Swiergon, technical data manager with the UK's Oil and Gas Authority (OGA), speaking at a SPDM forum in November.

OGA has the right to make this publicly available, and it is keen to make daily production data public as much as it can, he said.

Fields which ceased production before January 1, 2018, fall under earlier legislation, the Petroleum Act, where OGA is only able to disclose production data with the consent of the operator.

This only counts where the OGA has approved the cessation of production, and production has in fact finished - sometimes operators state intent to cease production but then continue.

For fields still in production, OGA has been issuing "Section 34 Notices" which specify the accepted data types, which attributes are required, and time scales for reporting. OGA also provides a Microsoft Excel template and user guide.

"I have examples of operators which had difficulty getting the required data out of their systems in the required manner," he said. "We still encounter field operators who are unaware of their commitments."

If the data requires manipulation, that in-

creases the chances of error, such as the same production being submitted twice, he said.

OGA has seen data inconsistencies, such as different operators involved in a joint venture using different names for the same wellbore, or inconsistent reporting periods.

Some companies have supplied low quality data, sometimes covering specific periods of time, or there are periods where no data was reported at all. There have been fields where the number of hours of production reported is negative.

One challenge is satellite wellbores, tied back to a main wellbore, where sometimes there is very little data. Or fields with multiple sidetracks. There might be wells which have stopped, restarted, or converted to injection wells.

"The majority of these issues we can overcome but some we cannot," he said.

The data is shared in two ways - as raw data which can be used directly by data analysts, or via an online "Power BI" dashboard interface.

The dashboard is refreshed every Monday morning. "My hope is that we can work with the system to automatically refresh as soon as a new submission has been validated," he said.

Currently data from 58 fields is in the dash-



Robert Swiergon, technical data manager with the UK's Oil and Gas Authority (OGA)

board - but there should be data from around 80 fields available, he said. If data is not provided in the right format, it cannot be added to the dashboard.

OGA hopes to be able to add additional data, such as data about CO<sub>2</sub> injection. Currently there is just production data. It also plans to add new graphs to the dashboard.

OGA is planning a portal for uploading data, with automatic quality control tools, which enable operators to quickly identify and correct inaccuracies.

The data is being used by "lots of academics", and also companies interested in acquiring fields which have reported COP (Cessation of Production), he said. "We've had a few companies come to us with specific data requests. The data is there for anybody digital to get their hands on."

# **Ross Philo's farewell talk at Energistics**

Ross Philo gave a farewell talk as CEO of Energistics, during the SPDM meeting in November – and had an unexpected send-off from past colleagues

"Some people say standards inhibit innovation. I would say it's the opposite. They allow small companies to compete with big boys. You get away from proprietary formats," said Ross Philo, CEO of oil and gas standards organisation Energistics up to the end of 2021.

Mr Philo was speaking at the Society for Professional Data Managers online forum in November, in a farewell talk as CEO. And at the same time, perhaps showing some of the biggest motivational drivers behind Energistics.

Mr Philo discussed some of Energistics' achievements over the past few years, and where things go from here, as Energistics becomes an affiliate of standards organisation Open Group.

Energistics began life in 1990 as the "POSC Foundation", rebranded as Energistics in 2006.

The latest version of its standards were introduced in 2016. These provide "universal interoperability across the different data objects" - so you can combine drilling, reservoir and production information.

The Energistics Packaging Conventions (EPC) is a set of conventions which allow multiple files to be grouped into a single file or package, so you can share all the files which make up a model together. It was initially developed for RESQML. "You address all of the issues of moving data around," he said.

EPC is based on the Open Packaging Conventions (OPC), a widely used container-file technology that allows multiple types of files to be bundled together into a single package.

Another important new standard is Energistics Transfer Protocol, a system for moving files. It was conceived as a way of improving real time data transfer from offshore operations to monitoring centres. But it can also be used to link applications together.









Energistics also publishes a standard for units of measure.

They all form a "common technical architecture" for oil and gas companies. By using all the standards, companies can know they have the data in a standard format, they know the context of the data (the relationship between different objects), and they know what the units are, he said.

For example, an earth model contains horizons, faults, and spatial relationships between them. "You want to make sure you haven't missed anything, there's no ambiguity in the data, you haven't left something out as an orphan, and you can track each of those objects through the multiple iterations."

Oil and gas wells have lifespans of decades – you need to make sure you will always be able to read the data. Often companies are searching for oil and gas in places where it has been found before, perhaps decades previously, he said.

"If it is in a proprietary format the chances are that format is no longer supported. If you are archiving information in an industry standard format you can be sure you can go back and re-use all that information."

Energistics standards also help companies put together a number of different software systems, rather than being tied to go to one vendor with "monolithic" software which does everything.

For example, in subsurface modelling, you might want to make a subsurface grid, do facies modelling, do separate fracture porosity calculations, then start reservoir simulation and visualise the results. It is possible to export and import subsurface data between different applications with complete fidelity if it is in RESQML format, including with data moving between cloud servers.

Standards should help ensure that the data is trusted, and that can lead to better business decisions, and also better data to feed into other analytics or machine learning systems.

#### **Open Group transition**

As of January 2022, the Energistics standards are being looked after under the Open Group. While the organisation will continue to exist, it will no longer have dedicated employees.

"The idea is we wanted to hand over to the Open Group a completed set of the latest standards, so they have something as a well-established baseline, rather than asking them to take over something in flight," he said.

A new version of RESQML, 2.2, is expected to be released early in the first quarter of 2022. A new version of WITSML, version 2.1, and PRODML version 2.2 will also be released shortly. The latest version of ETP, version 1.2, was released in September 2021.

After Jan 1, 2022, the Special Interest Groups (SIGs) will continue, although may be renamed 'workgroups', because that is the term Open Group uses for its communities.

"The membership, the activities, the cadence of meetings will be very similar to what it was under the current Energistics model," he said.



Former directors of Energistics joined Ross Philo, outgoing CEO of Energistics, in a farewell session after his talk at the SPDM conference.

**Top row:** Daniel Brown, chair of SPDM; Eric Toogood, Elinor Doubell, BP DISKOS.

**Bottom row:** Matthias Hartung, formerly with Shell, Ross Philo, Energistics

### **Former board members**

The Society for Professional Data Managers invited a number of former directors of Energistics as panellists in the webinar, to recognise the contribution which Ross Philo had made.

Matthias Hartung, former VP technical data with Shell (2012-2017), elected to Energistics board in 2013; Eric Toogood, manager of DISKOS at the Norwegian Petroleum Directorate, elected to Energistics board in 2012; and Elinor Doubell, VP digital science with BP, appointed as chair of Energistics in 2019.

"Now we have to put our faith into OSDU so they can build on the excellent work," Mr Toogood said.

"Your team have taken so much commitment and you've created something very special - a consortium that seeks for the common good," Ms Doubell said.

"I'm incredibly touched, particularly for the [Energistics] team," Mr Philo replied.

"We compiled this list of people who had been involved in standards, we ended up with a compendium of a few thousand people. It is a team effort.

The work is also reliant on the engagement of the industry."

"It won't continue without the sort of support you've seen over the past 30 years. I am optimistic that it will continue. It will be different; it may take a little bit of time for the new model to settle down."

"From a personal perspective [Energistics] has been an absolute blast."

# Remote working – cybersecurity, productivity and MSPs

An IT Managed Service Provider (MSP) can do a lot to help companies meet the cybersecurity and productivity challenges associated with remote working. *Scott Davidson, managing director of MSP ISN Solutions explains* 

Managing a remote workforce's IT is no different to a traditionally dispersed workforce. Managed Service Providers (MSPs) have been supporting traditionally dispersed workforces for many years, addressing cyber security, productivity, and business development concerns.

For example, businesses wanting to equip employees with the best and most secure equipment, and to manage the transfer of critical data from remote, satellite locations back to HQ, while maintaining resilience and security.

The principles apply to any company looking to transition into a hybrid workforce.

### Cybersecurity and home working

A 2021 report from cybersecurity firm Tenable states that 74 per cent of organisations attribute recent business-impacting cyberattacks to vulnerabilities in technology put in place during the pandemic.

Phishing constitutes 83 per cent of all breaches. The number of phishing sites has increased by 27 per cent.

Criminals prey on the uncertainty surrounding sub-standard IT infrastructure and protocols often seen in a mismanaged hybrid workforce.

Costly and business-compromising attacks can result from the hacking of just one unsecured device in a single employee's home.

With both personal and company devices sharing the same home network, the risk of planted malware, ransomware and banking Trojan software, transferring from an employee's personal device over to a company machine, and going on to infect the entire company network is high.

It is extremely difficult to discover, intercept or monitor any threats from personal devices that may have transferred over home networks.

An increasing number of businesses now implement zero-trust security architecture, where the system is assumed to be compromised, and staff access to data is severely restricted on a need-to-have basis.

The draw-back of this approach is that poor

planning can slow speed, productivity and collaboration.

A Managed Service Provider can advise on and deploy the most appropriate security architecture for business needs.

In many cases, the solutions to these issues are more cost effective and affordable than business leaders may think. Companies may already have licenses that have unused tools or features that can assist.

Most solutions in today's world are cloudbased and 'as-a-service', which incur monthly OPEX fees, rather than one-off capital investments on software and hardware.

The solution is maintained by the provider, with the latest security updates and patches.

### **Insider threat**

The initial pandemic lockdowns saw a disturbing growth in attempts to bribe or trick employees into sabotaging or releasing private and sensitive company information.

Now companies have grown more knowledgeable about good security hygiene, hackers still increasingly try to exploit a company's people, who may lack knowledge of good security practices and how to recognise a scam.

Home working introduces more risk of 'insider' attacks, particularly in shared housing accommodations. A housemate could discover an employee's passwords to company equipment, and if the home workspace is shared, it's possible to look over a person's shoulder as they log in.

Multi-factor authentication (MFA) may help to reduce the risk of insider attacks from people in the immediate vicinity. An IT MSP can deploy robust security measures, including MFA and firewalls, and back-up systems, to ensure yours and your customers' critical data is always protected.

### Productivity

Many business leaders raise concerns about productivity in a remote environment. They cite the lack of specialised tools and equipment found in the office as a major issue hampering effective work.

Staff need to be able to perform to a high level, not only for the purpose of staff well-



Scott Davidson, managing director of MSP ISN Solutions

being, but also for the positive impact on customer retention and business reputation.

However, in my experience of working with industries where remote workforces have always been the norm, when staff are supported with the right IT infrastructure, their productivity, customer retention and business reputation can be enhanced with a hybrid workforce.

A major development for hybrid work environments is Windows 365. This puts Windows in the cloud, making 'your PC' available from any device, anywhere. This improves accessibility, benefits from Cloud based security and has clear scalability.

A plethora of tools exist to facilitate automation of repetitive administration, freeing up staff time to focus on tasks that increase business value.

Businesses need to be prepared to cope with the demands of a modern workforce and an onslaught of new security and financial threats.

An MSP can provide a solution tailored to the needs of your workforce, ensuring that they can perform their job efficiently without being limited by substandard IT provisions.

If the MSP has a true understanding of a business's complexities, it means a company's IT, and the transfer of critical data, can be as robust as it was before the pandemic affected the way we work.

### Operations

# Siemens – and the 'brutal truth' about IIOT

Industrial IoT projects rarely deliver quick wins, need more than CEO support, and can fail if you insist on building your own software, or getting returns after one year. Some advice from Siemens on how to make them work

It is a commonly heard mantra in digital technology that customers should seek quick wins, or a fast 'minimum viable product', which proves that the investment is worthwhile.

This mantra is heard in the world of networked industrial sensor devices (otherwise known as 'the Industrial internet of things, or IIoT) as much as everywhere else.

But real-world experience shows that even successful use cases very rarely generate enough financial returns to justify all the effort. But a good IIOT implementation can lead to many small benefits which add up, even some which were not anticipated, says Peter Schopf, Head of Sales MindSphere for EMEA (Europe, Middle East and Africa) at Siemens.

He was speaking at a Dec 14 webinar, "The Brutal Truth about IIOT" [available online, see link below].

MindSphere could be described as cloud hosted software designed to store and manage data from industrial sensor devices. It is much more than cloud hosted data, it includes digital tools to gather and work with the data.

### Lack of a goal

A common reason for failure is embarking on projects without a common understanding of what a successful destination would be. Project teams get into the details of defining requirements, products and services, but with little more than a hope that it will take them where they want to go. This is important both to industrial customers and IOT system vendors.

"Rather than think about the purpose of what they are doing, they start with 'I'm going to create an application, system monitoring, predictive maintenance, energy monitoring.' Then they think about how to do it, cloud based, on premise."

"You should think about why you should start the trip," Mr Schopf said.

One answer to the 'why' question is that you are doing IOT to ensure your company stays relevant for the future, he said.

### **Outcome orientated**

There can be a conflict between technology companies which want to sell products and services, and industry clients who generally want an outcome.

At some stage in the past, "we did a mistake of providing services for services sake," Mr Schopf said. A better way to align the interests of clients and technology providers can be the 'outcome orientated' approach, where the project is considered successful based on the outcome the client gets from it, not the specific services provided. "We need to take this journey together with our customers."

Otherwise, a vendor is "just positioning the product, selling services on top and hoping that everything will work out," he said.

To do this, technology providers need to sit together with stakeholders and define in advance what success looks like.

"If you define success differently and put that together with clear accountabilities for these topics, it becomes clearer where the project is moving."

### It takes time

In the AI world, studies have shown that it can typically take 6 years for a company to see value from its investments. But by this time, they have reached a point where their competitors can never catch up. The same goes for industrial IOT investments, Mr Schopf said.

"Every CFO scratches their head and says, 'if there's not a return on investment after one year, we don't do it.' That's short-term thinking."

"It is about creating a new business model, changing how things are done around here. It takes time, there's hardly any short cuts."

### Failed project example

In one example, a CEO had a vision for what the technologies should do and gave Siemens a one-year contract to deliver it, and the journey started.

The agreement was, "we [Siemens] connect the machines, in parallel we do workshops. We create the data and new business models on top."

But then the company did not provide much further commitment, or any of its own employees for the project. "Our [Siemens'] service team did not have anybody to talk to," he said.

There were 3 months of delays before work was able to start on connecting the devices together, and then it proved very difficult to connect them.

An industrial facility is not like a smart home, Mr Schopf said. "Newer products are easier to connect. If you want to talk about older machines, there are hundreds of different protocols. It's possible [to connect them] but it does take time."



Peter Schopf, Head of Sales MindSphere for EMEA (Europe, Middle East and Africa) at Siemens

By this time, "there were already rumours that the project is not going well."

There was a very young, talented solution architect working on the project, who developed useful apps using low code.

Then, the CEO left the company, the CFO did not understand the value of it, and the project was stopped.

From Siemens' perspective, the learning was that "we did not guide the customer enough," he said.

The customer had asked for a specialised solution to be built, and Siemens team started building it.

But this proved very difficult due to a mix of ideas in the customer organisation about what was needed. "There's never one customer, there's always a bunch of people with different opinions, different strategies, different stakeholders want to go in different ways."

This approach would never work for a seafarer. "If everyone is walking up to him and giving his opinion on where the journey should lead, the course, the speed, you probably won't get anywhere soon."

From the customers' perspective, it might have been much better to begin using pre-built software and see if it can do what the client needs, such as using MindSphere®, Siemens' industrial IoT as a service solution.

"If you start with a [solution] like MindSphere, putting in a new use case on top can be as easy as downloading another app on your tenant," he said.

### **Expectations too high**

High expectations can kill a project. It is very rare that people find a 'killer use case'. "You will find gold dust not gold nuggets, generally speaking," he said.

"You need smaller use cases implemented. At some point in time, you have a handful of gold."

## Operations

"Even if the first use case is implemented, it might not be yet paying for all your investments."

"The biggest problem is that companies don't find the big use case to start with, then they never start. Or they start with a proof of concept and find there's not much value."

"You start connecting machines, you start creating transparency. Simple use cases. You might not be successful with them. The value comes later with different use cases on top of each other."

Having a 'gold dust' rather than a 'gold nuggets' approach also implies having an open mind about where you will end up, he said.

"I believe strongly the C level needs to understand and overcome this effort curve."

To make starting easier, MindSphere has functions which companies can try out for free, "that's giving them an easy entry."

Some of the benefits come in places they were not expected. One customer had two departments, one making punching machines and the other making cutting machines. The punching machines department wanted to change their processes with new digital technology, but the cutting machines department did not.

But as a result of the systems implemented, and monitoring capability, the cutting machines department were able to see 18 per cent efficiency gains, he said.

Another example of an unexpected benefit was a factory which used its new IIOT systems to monitor its energy consumption and became aware for the first time that it had machines on standby which were consuming a lot of energy.

"Out of the box solutions are a great way to start." But you need to make sure that if the outcome is not as great as expected, it does not kill the project, he said.

### Not invented here

Many companies have a 'not invented here' attitude, where they have a bias to solutions developed in-house.

The same attitude does not prevail in our consumer lives, when many of us are happy to buy furniture from IKEA rather than have something built for our homes.

"I would rather go to IKEA - it is all preconfigured, I know what I get, it's much easier and faster," he said.

Similarly, in industry, "it does make sense, for most of the use cases, to start with an integrated solution instead of building everything yourself." IT departments sometimes compare the cost of MindSphere cloud hosted software with the cost of just cloud hosting. They forget there have been 600 developers plus further external contractors working on MindSphere. "We have a really stable platform that allows for many use cases," he said.

One customer had five developers in a team, with a cost of Eur 100k a year, and was not making much progress in its digital solutions. But when Siemens offered them software for Eur 50k a year, "It was too expensive for them," he said.

This customer could have seen a better outcome from buying Siemens software, deploying one developer to manage it, and deploying the other 4 developers perhaps making differentiated services for their own customers.

"It is painful if you see companies taking these wrong decisions."

### **Different arguments for cloud**

Also, many companies have spent money on their own IOT system, which they don't want to walk away from, he said.

The reason for moving away from this to a cloud hosted system is that you can access software which has been developed for a bigger pool of customers, and so the cost each company pays is lower.

This is different to the normal arguments for moving to cloud systems – to get away from the cost, complexity, trouble and inflexibility of having a company server farm, he said.

### **Tendering wrong**

Another example of a mistake, in Mr Schopf's view, is when companies are too segmented in what they are looking for.

One large French corporation put out an IIOT tender but said it just wanted a company which would connect the devices together, rather than thinking about what to do with the data.

"We stopped our participation in that tender. It was obvious their journey would take them in the wrong direction," he said. "For sure they started on the wrong foot."

To be nice to them, "IOT systems is not an established market, so how should they know."

#### Sometimes it can work

When customers have enormous enthusiasm, they can make projects work. One customer had implemented 'proof of concepts' with 4 teams, connecting assets, making dashboards, finding insights.

"They presented their result to the CEO in the end. They were very engaged, they spent weekends, evenings, just to show they could be successful."

"Either you want it all, or you don't want it enough. that's what we often see in the market."

### Edge computing and low code

Siemens MindSphere can fit alongside other useful systems.

It can work together with edge computing systems – software systems which run at the same location as the sensors or other IIOT devices. These give the data an initial layer of filtering or processing, so you don't need to send all the data the sensor generates to the cloud.

MindSphere can also work together with the Mendix<sup>™</sup> low-code application development platform.. (Mendix is a low-code software provider which Siemens acquired in 2018).

There are around 200 pre-built low-code applications on Mendix which work with industrial IOT. These help with "everything from forecasting to economic planning," he said, and are easily adaptable.

All the systems are open. "It's not an integrated stack where you get locked in."

### **Future of software**

Going into the future, Siemens is very keen on the 'digital twin' concept, which it sees as combining "reality with the digital world."

"That's a very exciting approach, it's a complex approach," he says.

It sees the digital twin as the final stage in a number of different ways humans can interact with the real world. We can work with the physical world directly; we can use 'augmented reality' with data superimposed on the real world (such as with glasses); we can work with a scanned model of the real world (such as laser scan); or a fully simulated virtual version of the real world (or digital twin).

Mr Schopf is also interested in the metaverse concept. Although it is "mainly driven by Microsoft and Facebook / Meta, coming from this consumer environment, I believe this has a strong impact on the industry," he said.

One interpretation of the metaverse is that it shows how humans might interact in the future, and this may impact how they interact with industrial devices, he said.

This article is based on a Siemens webinar on Dec 14, "The Brutal Truth about the IIOT – learn from the mistakes of others". It is available online free at https://www.plm.automation.siemens.com/global/en/webinar/the-brutal-truth-about-the-iiot/102597

# Cyren - a better way to stop phishing e-mails

Rather than try to scan all messages for phishing before they arrive in an inbox, there are technologies which follow all the links in them to see where they lead. Cyren explained – and gave some advice on how hackers work

One of the biggest cybersecurity 'entry methods' of concern to oil and gas companies is the phishing e-mail. While a lot of attention is given to ransomware, it is the phishing attacks where the hacking starts.

When we see that the e-mails are getting better and better disguised as legitimate messages, and our existing e-mail systems (such as Office 365) not completely successful in screening them, it is easy to think that screening them is impossible.

But rather than try to stop them from reaching the inbox, there are technologies which actually follow the links in your e-mails to see where they go. With a system from cybersecurity company Cyren, the message is delivered immediately, but the technology works on the basis that it will generally be a few seconds before anyone clicks on the link – which is time to check where the links go.

A challenge is that many phishing companies maintain IP addresses of security companies, and if someone clicks on their link from that IP address, it will show a 404 "page not found" message. "We go to a lot of trouble to fool phishing websites into thinking we're not a security company," says Pete Starr, Global Director of Sales Engineering at Cyren.

Robust scanning of all messages in this way before they appeared in someone's e-mail box could take a few seconds, which would be unacceptable for many users.

"People tend to assume e-mail is an instant communication method," Mr Starr says. "Actually, it's not, but the way people use it, it is. Once you start adding a few second delay - people start noticing. One of the most important metrics for an e-mail gateway is 'how much does this slow my messaging down.""

Another problem with trying to filter e-mails before they arrive in inboxes is false positives. The higher the 'bar' for whether messages are stopped by the scanning system or not, the more legitimate messages will get blocked. Customers may prefer to have a few phishing e-mails get through than risk not receiving an important e-mail. But with Cyren's approach, no messages are blocked, just the dangerous links inside them.

Once a company is set up with Office 365,

they can deploy Cyren's technology "in 5 minutes flat" as an add-on. There is no need to mess around with MX records re-routing messages, as with other types of e-mail filtering methods. Changing MX records can be an operation with high risk, because if you get the settings wrong, the whole organisation can lose all their messages for a while, Mr Starr says.

### Hacking through the back door

When hackers want to attack a valuable target, like a defence company, they are increasingly starting small and working up, rather than trying to get straight into the target company. This could be considered a back door approach rather than a front door approach, Mr Starr says.

"The front door approach no longer works with organisations. You can spend a few hundred pounds on a firewall that does a pretty good approach of stopping people getting into your defences."

One way of starting small is by first trying to access people's personal e-mail accounts, perhaps by using "smishing" – phishing by text (SMS) message. Many people use the same password on their personal and corporate mail, Mr Starr says.

Further, many people's corporate e-mail accounts can be accessed just with a user name and password (multi-factor authentication can be rare).

These credentials can be bought on the "dark web". There are hackers whose business is to send out large volumes of phishing e-mails just to try to obtain usernames and passwords, which can then be sold on.

And when hackers gain access to a small supplier, they are keen to use this to find a way to get into their larger customer company. For example, a hacker seeking to access a major defence supplier may begin by trying to attack suppliers of simpler goods such as electronic components and metal.

"You compromise a suppliers' e-mail address, use that account to phish or compromise another account in their customers' [systems], who are infinitely more interesting."

While an average corporate user sends 20 messages a day, individual employees of



Pete Starr, Global Director of Sales Engineering at Cyren

small suppliers can be sending 200-400, with many short transactional messages. But that also means that much less attention is paid to each message, Mr Starr says.

Hackers sometimes send phishing messages just before lunch, or in the last 30 minutes of the day, "because they know people are in a hurry then."

Hackers can look up their targets on LinkedIn to see if they formerly have worked at companies which pose a more interesting target – and then see if the person's accounts with that company are still active, with the same password.

This was the way of working with the Colonial Pipeline attack, Mr Starr says. "Our understanding [is that] someone was phished, they got the credentials."

If there had been a multi-factor authentication (MFA), it would not have been possible for attackers to access the system with only the person's username and password, he said.

### Hackers and the pandemic

If you are a hacker, the pandemic has been good for you in a number of ways, Mr Starr says. With the rise of working from home, the use of Office 365 "has grown crazily," he says. There has been a big rise in corporate data stored in the cloud.

In the office people may ask colleagues for a second opinion about an e-mail before clicking on it, thinking it is a bit "phishy looking".

And people's home computer networks are likely to have less protection than corporate networks, with firewalls and their own Cybersecurity

e-mail gateways. "Once the users go out of the office and they are at home, some of the protection disappears," he says.

Meanwhile during the pandemic many organisations have been under resourced and have limited time for cyber training.

### **About Cyren**

Cyren describes itself as a "inbox security

company", developing tools to add security systems to messaging platforms run by other companies, including Office 365.

It provides antivirus software which is embedded into many other products rather than being sold under Cyren's brand, including antivirus scanning for Gmail, he says.

Cyren has headquarters in Virginia, USA;

sales and marketing offices in Berkshire (UK), California; and does research in Germany, Iceland and Israel.

The company offers an "Incident Response Service", with experts working 24 hours a day to monitor what is happening.



# Will Colonial Pipeline motivate hackers to keep trying?

Ransomware operators learn from experience, as they learned from a 2016 Los Angeles hospital attack that hospitals pay ransoms. Can energy companies expect the same pattern after last year's Colonial Pipeline attack? We spoke to expert Paul Prudhomme

"Healthcare organisations have been a preferred target [of hackers] because of a perception they are more vulnerable to extortion," says Paul Prudhomme, head of threat intelligence advisory with cybersecurity service company, owned by Rapid7.

"They don't have the luxury of waiting for files to be backed up, because they have patients on life support. Ransomware operators have seen this."

"Healthcare organisations didn't become a preferred target overnight. There's specific incidents which set a precedent, such as the attack on the Presbyterian Hospital in Los Angeles in Feb 2016."

This was "one of the milestone attacks," in demonstrating that some organisations would pay a ransom. The amount was "a relatively large ransom at the time (but pretty small by contemporary standards)," he says.

From a hacker's perspective, "that's 'proof of concept', you can make a lot of money by doing ransomware on a hospital."

"It demonstrates that healthcare is more vulnerable than other targets. This preference for healthcare didn't come out of nowhere - it came from a real-life experience."

"The question I have, will that prove to be the case for Colonial Pipeline. Will other ransomware operators see the value and try to follow in their footsteps?"

In the Colonial Pipeline hack, in May 2021, the government did manage to recover much of the ransom. "I don't know how they did that; they're probably not sharing that information for a reason."

"The idea is, 'OK, 'we can't arrest them or do anything else in real life, we can certainly try to improve our own defences.""

"At the end of the day, these people are in it for

the money, we deprive their motivation [if we] steal back the ransom."

But it may just push hackers to make more effort to ensure that their ransoms cannot be stolen back in future, he said.

Many oil and gas companies lack cybersecurity expertise. "They don't know how to take it seriously," he says. "They take it as some arcane subject.

Mr Prudhomme is head of threat intelligence advisory at IntSights, a company based in New York, which provides "strategic, geopolitical, and cultural context for the use of cyberspace by threat actors."

This includes analysing ransomware, banking Trojans, and other cybercriminal operations. IntSights also researches state-sponsored cyber espionage, and advanced persistent threats (APTs).

The company publishes reports, which it calls "threat landscape reports" for different industries, including energy, the technology industry, retail and hospitality, telecommunications, banking / financial services, automotive and healthcare. The energy report was published after the US Colonial Pipeline incident.

### State vs criminal threats

Mr Prudhomme says that while state sponsored cyber threats have been historically a more significant issue for oil and gas companies, now criminals are catching up."

Russia and Iran have been the most active in state sponsored attacks in the energy sector. "It is not a coincidence that Russia and Iran are major oil and gas producers. They have a dog in this fight," he said.

"I think with Russia we see a little bit more [focus on] utilities, not so much oil and gas [production]. Criminals can be easier to deal with than state attackers, "they tend to have fewer resources, they can be deterred more easily, they don't care who they steal from. So, if they find a hard target, they reach the conclusion that trying to compromise the target is not worth it."

"State sponsored actors cannot be deterred. They are looking for very specific types of information they can't get from somewhere else. If they want to get the oil and gas exploration data that BP has been collecting, they can't just go steal it from Shell. They are more likely to be more persistent in the face of failure."

A persistent [state] attacker may look hard to try to get the credentials of individuals with deep access to a system. For example, they may try to find the name of someone in a certain role on LinkedIn. "Reach out to that person through LinkedIn, that gives them a way around enterprise security defences."

Company staff directories are often available to buy on the 'dark web', he says.

Mr Prudhomme has seen hackers from Iran invest more in social engineering hacks, such as with fake personas on social media. These are "social engineering attacks that are harder for the security conscious user to detect."

"They don't just make up a fake email account, they'll have a fake Twitter account, a fake website, they will flesh it out in much more detail than you have seen in [other] social engineering attacks. This will satisfy a sceptic who is doing some due diligence."

In one case, Mr Prudhomme did research into the personal background of an Iranian hacker and found a professional LinkedIn profile saying they were a security researcher.

State hackers from Russia and China have been more interested in exploiting vulnerabilities in standard software which have not yet

### Smart Contracts



Paul Prudhomme, head of threat intelligence advisory with cybersecurity service company, owned by Rapid7

been hacked, which they can spend "six figure sums" on.

While criminal hackers in Russia have a main goal of making money there can be other elements. Some of them view attacks in the US as a patriotic way to make money. "Some of them do have a xenophobic attitude to English speakers," he said.

"The Russian government has made a decision they are not going to arrest or prosecute criminals in Russia that target foreigners. One could argue that the government is providing a safe haven for criminal activity. These criminals do bring money into the Russian economy."

"Those attacks are not state sponsored, but they are state tolerated. Benign neglect is the way to describe it." The Russian state has hired Russian criminals for specific attacks, where there is some national or economic objective.

For example, with the famous Not Petya attack in Ukraine, it was a state sponsored attack, but it used ransomware to make it look like a criminal attack.

"The idea of using ransom ware was to pose as criminals, giving the Russian government some plausible deniability," he says.

### Securing accounts

The Colonial Pipeline system was accessed through a virtual private network login which was no longer in use but had not been disabled. "This can be fixed simply by "turning off accounts you don't need any more," he said.

"With many people working remotely, maybe they were using VPNs to work at home to get access to company infrastructure."

The attackers probably found the password on the dark web. "One of these password dumps, where people put it, on the off chance someone uses it somewhere else."

This threat can also be mitigated by telling people not to re-use passwords or having two factor authentication.

Email is "probably the single most important and widespread attack vector," he says. "You tell people they shouldn't click on [suspicious messages], but they do anyway."

During the pandemic, "the actors have got a lot more creative with some of the content they've been using. Things like making an attack message look part of an existing conversation."

Remote working makes it harder to check someone actually sent the message.

#### Apps vs SMS codes

Mobile authenticator apps are more secure than text message codes, Mr Prudhomme says.

There have been attacks where someone working in a telecom company has re-assigned your phone number to a different SIM card, so the hacker receives text messages instead.

Mobile devices themselves can be compromised. "Android is quite a bit easier to compromise. With iPhone it can be done but that's quite a bit harder. You actually have to have malware that is capable of targeting the mobile apps."

There is a focus on trying to get people's online banking credentials this way.

Another way to bypass 2 factor authentication is to "social engineer" the user into providing their two-factor authentication code. Such as when you tell someone their account has been compromised and persuade them to provide a code. "Once they can get into the account, they can do whatever they need, from there."

cucrupy

# Why blockchain is good for smart contracts

Blockchain is not the only technology we can use to enable smart contracts but is generating momentum in getting smart contract systems implemented. And rew Bruce of Data Gumbo explains more

The logic of smart contracts is easy to understand - data automatically gets reported and people automatically get paid on the basis of data sources everybody can see, and which cannot be changed.

A question many people have is why blockchain is the most appropriate technology, when it is technically possible to do it with something much simpler, such as a simple program.

Andrew Bruce, Founder and CEO of Data Gumbo, agrees that it can be done in a simpler way – but people are not doing it in a simple way. Meanwhile, the blockchain based approach is proving to work.

Data Gumbo is a smart contract network company, which Mr Bruce founded in 2016. It was initially a data platform, which collected and standardised operational data. "We didn't start out using blockchain, we didn't want to use blockchain. I told a friend blockchain was a bunch of rubbish with no applicability for drilling," Mr Bruce explains. "But blockchain proved to be a tool for solving the problem."

Data Gumbo provides blockchain as a subscription service, rather than customers having to create and sustain a blockchain themselves.

#### **Drilling example**

To illustrate how it works, Mr Bruce tells the story of a large oil and gas company which realised that if its drillers could connect drill pipe together one minute faster each time, it would save \$250m a year. But the benefit would go to the oil company, not the drilling company, which is paid by the day.

So, it offered the drilling company a financial incentive -a bonus which would be paid if certain time savings were achieved.

For example, the algorithm could state, that a bonus is paid every time a drill pipe connection is made faster than the average of the last 6 months, thus providing an incentive to continuously improve.



Andrew Bruce, Founder and CEO of Data Gumbo

But the drilling company believed that the oil company would never pay the bonus even if the time savings were achieved. Like a parent who promises a child extra pocket money if the child does the washing up, but pretends to have forgotten about it on the next pocket money day.



In the oil and gas industry, it is known for people to play games when it comes to asking for payment, such as "which time zone are we talking about," Mr Bruce says.

With a blockchain based solution, there is an immutable record of how long the drill pipe connections took, which is made in real time. The pay-outs can be made automatically based on the data in the blockchain.

The blockchain ledger is independently hosted, and neither party can change it after the data has been entered. So, there cannot be any dispute about what the data was.

### How it can work

The same system could be used for any contract, such as for delivery of sand, so long as there's a means to measure electronically.

"You take all opportunity for manipulation out of the system," he says.

The same results could be achieved technically using a database which both parties can access, but there's still a question of who is in control of it, what happens if it gets corrupted, whether any changes can be made to data after it is entered, who controls the access to it, and how any disputes are resolved.

Blockchain uses secure encryption, which generates hashcodes which provide security, because if any of the data is changed, the code changes, and someone could detect it.

Although companies 'install' or purchase the use of a blockchain, they are not able to independently change data which is stored on it - if this was possible, then using the blockchain would not have a purpose.

Some people confuse blockchain with cryptocurrency. It is true that cryptocurrency uses blockchain, and cryptocurrency has done a lot to convince people that blockchain based solutions can be reliable and incorruptible.

But there are many elements of cryptocurrency other than blockchain which are not part of this. Such as the solving of puzzles to release new currency and motivate companies to host the servers.

For trust, it is important that the system uses data generated automatically using Industrial Internet of Things (IIoT)sensors, because if it is loaded manually or taken from software, there can be an opportunity for the data to be manipulated.

This can also drive an increase in focus on sensors, and ensuring that the relevant sensors are working properly, Mr Bruce says. "[People on] both sides of the transaction are commercially motivated to make sure the data is correct," he said.

To make smart contracts work, there also needs to be absolute clarity on what data will

trigger what payments, Mr Bruce says.

Real life business transactions can involve a lot which is not written down - or a lot which is written down but never read. "One of the contracts we did [turned into a smart contract] was 550 pages long," he said. "It contradicted itself in 35 places."

Making a 'smart' version involved going through it carefully and resolving all of these issues. You say what specific measures execute those terms.

Both parties probably need to test it, to make sure that the system gives them the results they expect.

"Smart contracts should also reduce the workload companies have to make in reconciling invoices – some large oil companies have enormous buildings full of people just doing that," he says.

"That's not the intent of how we do business. The intent is, 'I do business x and you pay y.""

Blockchain solutions could also be used for calculating carbon emissions.

For example, a fuel flow meter could provide data directly to a blockchain, so all parties can see directly how much fuel an engine has consumed.



### **Smart Contracts**

# Smart contracts tied to equipment operations

It is possible for oil and gas companies to have smart contracts which trigger automatically when certain equipment factors are met, using Kongsberg's Kognitwin integrated with Data Gumbo's Smart Networks

Imagine having digital systems which could automatically call out a contractor when a maintenance task needs doing and pay them once someone in your company has approved that the work is done. Or systems which automatically compile data about your emissions and send it to your customers or regulators as needed and is fully trusted.

Today, oil and gas companies spend a lot of money on administrative staff to do these things, including arranging contractors, checking their invoices, and compiling emission reports.

And the distrust in the process causes more work – suppliers distrust that they will be paid promised bonuses for meeting targets or improving performance, operators distrust that their invoices are correct, regulators and customers distrust emissions data they receive.

And when suppliers are being paid by invoice, the traditional method, it can be months between when the job is done and the payment is agreed, which means it is much easier for disagreements to surface about what exactly was done.

Oil and gas software company Kongsberg is developing a way to make this easier to do, through an integration with its "Kognitwin" cloud based digital twin system, and Data Gumbo's Smart Contracts system.

For example, Kognitwin includes a service called "Proactive Technical monitoring", which constantly monitors the condition of a piece of equipment, based on a range of data. A smart contract can be set up to trigger a work order request when the monitoring system identifies that a maintenance task is needed in the next few weeks. It can also send a request for the necessary spare parts.

The work order request is automatically sent to a pre-selected service provider, who can agree to do the work for a certain price, and a parts supplier for the spare parts.

When a company maintenance engineer has confirmed that the parts have been delivered or the work has been done, the payment can be automatically released.

For emissions data, Kognitwin can be used to gather and integrate the data, and Data Gumbo can be used for reporting it to authorities or customers.

The integration was developed in collabor-

ation with industry, although the relevant clients cannot be named at this stage. It will be put into live operation in the first quarter of 2022.

One operator said, "this is very exciting for us, we struggle with our supply chain," says Shane McArdle, SVP Digital Energy with Kongsberg Digital.

Both Kognitwin and Data Gumbo's smart contracts software are cloud based, Kognitwin uses Microsoft Azure.

### **Getting data**

While smart contracts have been talked about and tried out for a number of years now, one of the obstacles has been lack of availability of good quality data, Mr McArdle says. If money is going to be paid based on what the data says, it needs to be accurate.

"We had a discussion with Data Gumbo, they said, 'we always struggle with getting access with the right data to power or populate the ledger that we've set up'. We said, 'we have open APIs, we're already integrated with a lot of assets, we can push that information you need."

### **More on Kognitwin**

A typical Kognitwin customer is an oil and gas company which has a large digital 'estate' of computer systems put together over the years and is looking for a way to integrate them together, Mr McArdle says.

Kognitwin gathers and integrates a range of data from the facility, including IT and OT data. The data can be further integrated, contextualised, analysed and used in simulations.

It handles many different data types, including 3D models, transactional data, work orders and permits, piping and instrumentation diagrams, purchasing data.

Within Kognitwin, "all of that is ingested, verified and contextualised with each other," he said.

"If you have a 3D model you can zoom in and click on instruments or pieces of the system, pull up all relevant information associated with objects."

You can have a 'smart' piping and instrumentation diagram, where the diagram connects to time series data and work orders. "There's different ways you can interact and visualise the queries," he says.

The software also means that people do not need to login to so many different systems. There has been a big growth in the number of different software systems people need to work with over the past decades, Mr McArdle says.

"20 years ago, I would have had 30-40 different applications to log into, [such as] a control system, ERP for maintenance. Today we did an analysis, they have [typically] 150 to 250 applications that require a single login from a user."

"We're not trying to replace all of this but bring it into a single 'source of truth'. People working on maintenance, reliability, production, they all go to the same login area on the digital twin."

"They have role-based access, they find the information there, and they start doing the work. They say, 'I've been saving hours a day."

"One operator on a large gas plant says he spent 80 per cent of time on his walkie talkie, asking [questions like] "where is this pump, what am I looking for?"

"Now he types it in, he can find his way there, he can pull up maintenance history."

"There are lots of efficiency gains through having this digital integrator."





### Understanding better ways to work with technology to meet business goals

### **UPCOMING WEBINARS**

**Procurement emissions -** How do we make it easier to count and report them? Feb 11, 2022

**Advantaged gas** - Can we make gas projects 'sustainable' according to the EU taxonomy? 25 Feb 2022

See the latest at www.findingpetroleum.com / www.d-e-j.com

### **DOWNLOAD VIDEOS FROM OUR PAST WEBINARS**

# Geothermal energy - developments in the UK

Mine water heat, carboniferous limestone, research Jan 21 2022

### Super Basins 4: Guyana & Suriname case study

the latest 'Giant Fields' "Super basin" offers lessons as to how to find more of them! Nov 26 2021

# Lunch'n Think Webinar: The Key to reducing GHG Emissions? Actual Measurements!!

beginning with ground-based and worn(on PPE) sensors Oct 29 2021

Find out more and reserve your place at

www.d-e-j.com www.findingpetroleum.com