

Leveraging Integrated Operations to realize value Downstream

Point of View by Arnt Vegard Espeland



The upstream oil and gas business has over recent years reduced costs, and improved production rates and reservoir management. This is due to improved processes and technology driven by heavy investments in Integrated Operations (IO).

We observe that the downstream oil and gas business is still facing extensive use of manual processes, manual work and sometimes poor decision support. Despite the different business models of the upstream and downstream sectors, Capgemini believes that the downstream sector can benefit from applying an IO mindset and thus reduce cost and improve margins.

Industry experts estimate the potential profitability increase of an integrated downstream supply chain to be in the range of \$2.00/Bbl to \$4.00/Bbl based on \$100/Bbl cost according to the Capgemini paper “Creating the Integrated Value Chain for Downstream Oil.”

This document will discuss some of the challenges in the downstream oil and gas business and propose how to leverage knowledge gained through the adoption of the IO mindset in order to address them.

Challenge

The downstream oil and gas business is facing both classical challenges of doing business across unit, department and company boundaries, as well as some domain specific ones.

The downstream business is, in many ways, applying the same functional organizational structure as the upstream business. This structure has its strengths and weaknesses. One observed weakness and a classical challenge is that functional organization can easily lead to silos between the various functional units.

A key failing of silos is the sub-optimization of workflows across the business; for example, the functional area of one unit might be optimized whereas higher level processes may not be (and vice versa).

An example of a specific downstream domain challenge is the gap between physical hydrocarbons and deals represented by operations and trading. The reason for this gap is that trading can deal with many instruments and in many cases never become physical at all. In comparison, operations can move and store hydrocarbons without involving any financial transactions. As the goal of the Downstream is to maximize profit of the production by selling it at best price, the challenge then is to have these two worlds to meet and source a deal with the product and trace the hydrocarbons back to its origin.

In simplistic terms, maximizing profit ought to be relatively easy. However, this involves the complete supply chain and requires on time and accurate information from many

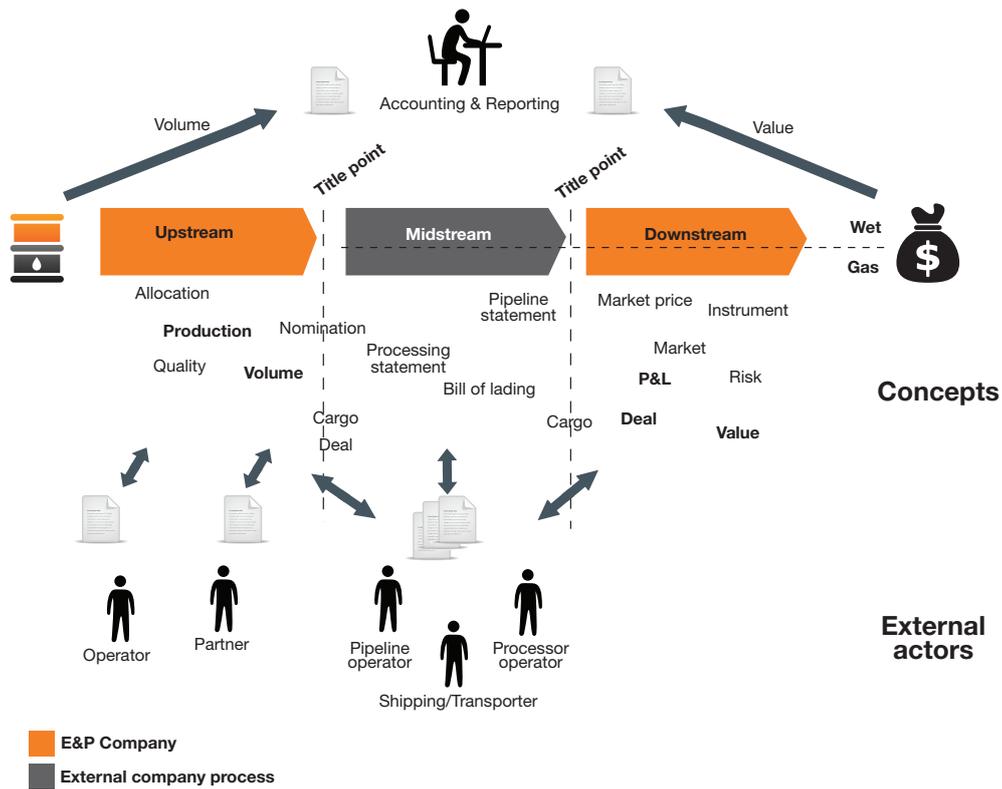
sources; traders need to know about forecasted production and availability in general, while schedulers need to know about supply and demand, transportation capacity and storage capacity. Figure 1 depicts the value chain at high level.

Along this chain there are many title points, which require proper handover (e.g. documentation). Major oil companies might have multiple title transfers within one domain making the picture even more complex. The figure also illustrates the dependency on external players like pipeline operators and Upstream.

Another domain specific challenge is the number of installations and the tailored workflows of each one. Each asset has its own unique infrastructure configuration and ecosystem of operator, partners and stakeholders. This has led to tailor-made workflows. Therefore, the complexity in creating automated workflows to reduce manual work and provide decision support to operators and traders grows by the number of assets.

Typically, IT systems can emphasize organizational silos through the implementation of monolithic standalone business applications that lack both the interfaces and integration across function areas. What Capgemini has observed is that the typical downstream application portfolio used within oil and gas companies often exhibits these undesirable characteristics of reinforcing the status quo. In addition, we also observe extensive use of highly privatized/personalized spreadsheets for data exchange and business execution that further reinforce the organizational silos. The

Figure 1: High level value chain



consequences are processes that become unscalable as they require heavy manual involvement. Other issues are that privatized spreadsheets force a lot of manual rework and the business becomes dependent on the spreadsheet owner.

Solution

The Upstream sector of the oil and gas business has faced many of the same challenges as the Downstream sector, i.e. functional and IT system silos sub-optimizing the business (for example, well placement and reservoir utilization are sub-optimized through reservoir expert and drillers are not collaborating).

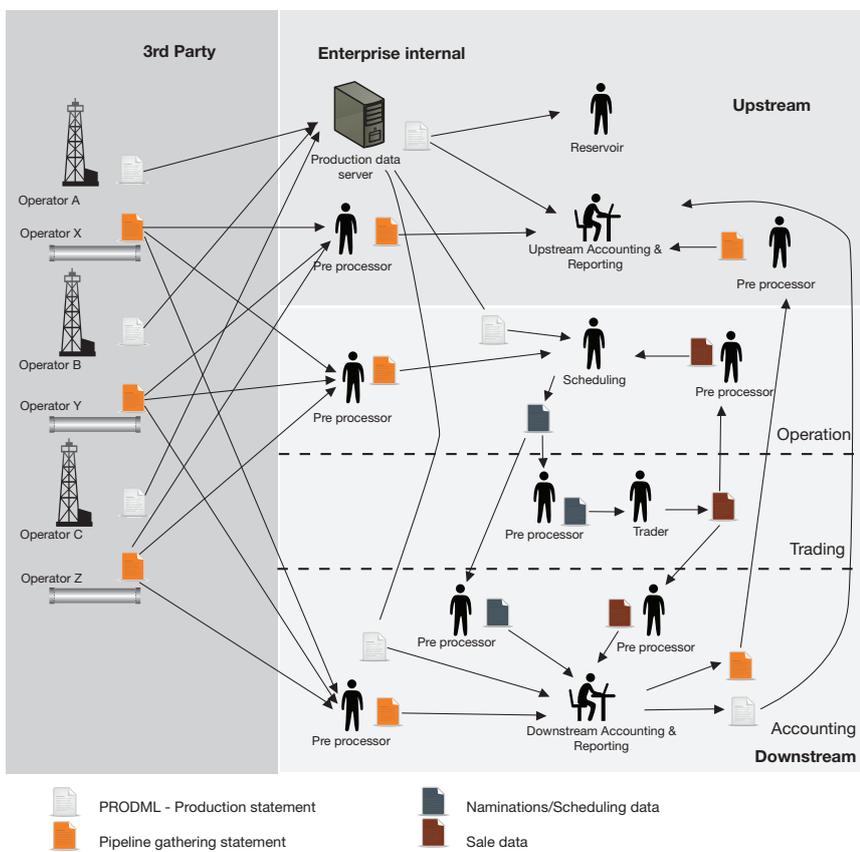
Upstream has for several years addressed these challenges through IO. The supervision of drilling, for example, can now be done completely remotely from the rig, and drilling data can be shared in real time between various domain experts. As a result, scarce experts can be better utilized and drilling operations can be more successful. Likewise, redesigned work processes and use of technology has resulted in increased production rates and improvements in reservoir management.

We believe that the Downstream sector could benefit from leveraging some of the Upstream IO work. Imagine schedulers being fed with real

time production figures, real time pipeline capacity and real time delivery obligations. Or, imagine traders having real time figures of P&L, storages, production, transport capacity, and refinery product mix.

Technology is a key enabler of IO. Improved hardware and network capabilities in combination with emerging industry data standards like WITSML and OPC UA have made it possible to share data in real time across functional units and companies. This has enabled companies to redesign processes and carry out remote drilling with support from drilling contractors, in-house reservoir experts and suppliers.

Figure 2: Illustration of as-is situation in the Downstream sector



The coloring of the documents indicate a file format and report layout. Typical file formats are pdf, excel and csv. Files having same format can have individual layout which requires interpretation.

Technology and data standards could be an enabler for Downstream too. Learning from industry initiatives like the OLF (Norwegian Oil Association) project Integrated Information Platform, the downstream industry could benefit by establishing semantics and data standards for domains spanning many stakeholders and roles. Examples of such domains are sale or deal, nomination, pipeline statement, processing plant statement and cargo statement.

Having had standards for these would enable the industry to make a big leap forward. First of all, data integration and data sharing would be improved. The industry could move away from the current situation illustrated in the Figure 2.

Note in Figure 2 how production statement, represented through PRODML, can seamlessly flow across companies and internal business units. In the Downstream domain, we can see that pipeline statements, nominations and deals have no standards and require manual interaction (pre-processing). This is the case even for collaboration between functional units like trading and operation. Take the Trader as an example. He/she is creating sales reports which are fed back to the Scheduler and Accountant. These three roles are in separate functional units and no industry data standard exists for deals. Hence, each receiver must transform (often manually by retyping the figures) the report into his/her format.

If industry standards existed, they would have been the foundation for easy integration and seamless data

flow (data sharing) across any border, as illustrated in Figure 3.

A closer look at the as-is situation and the potential to-be situation shows that manual work (intersections) can be avoided. Thus, data can be more real time, have one single source of truth, be available when required, and errors can be brought down as the chance for mistyping is reduced. This will reduce cost and improve decision support.

The list of benefits and business values does not stop here. First of all, traceability of hydrocarbons along the value chain would become easier. Today, each functional unit uses a standalone expert system to store and process information. Thus, tracing volumes is a tedious—and very often manual—job involving many systems and functional units. A set of data standards from production (like the PRODML) to end sale would enable system support for tracing.

Similar to traceability, reporting would become easier when a semantic is established and supported by data standards. Improved reporting, including Business Intelligence (BI), would enable optimization of transport capacity and storage facilities, and balancing of supply and demand.

Figure 3: To-be situation

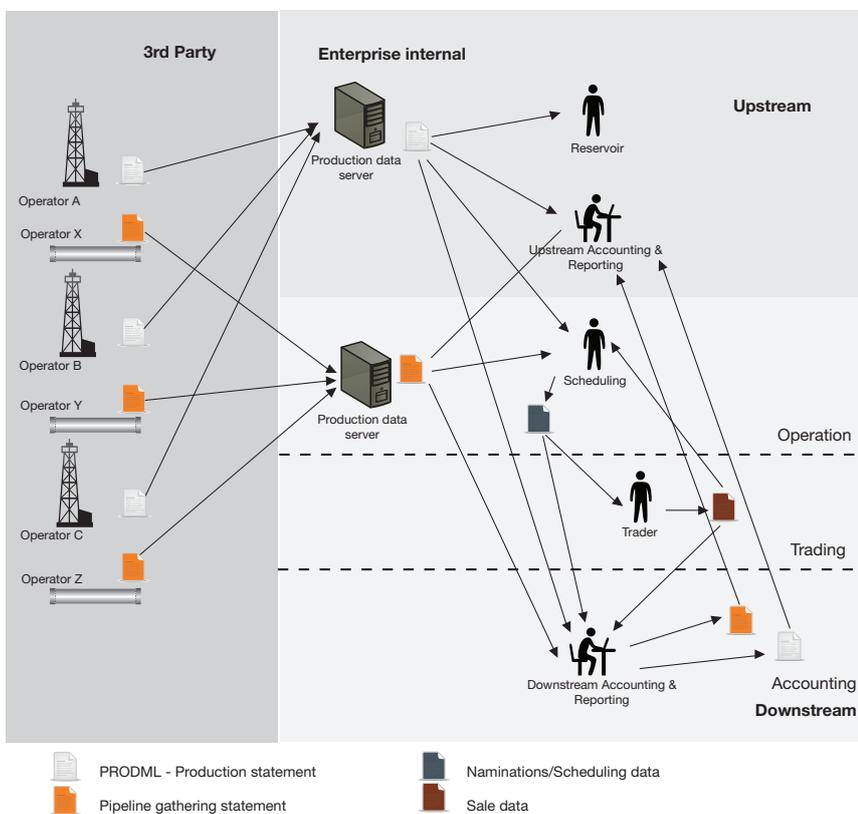
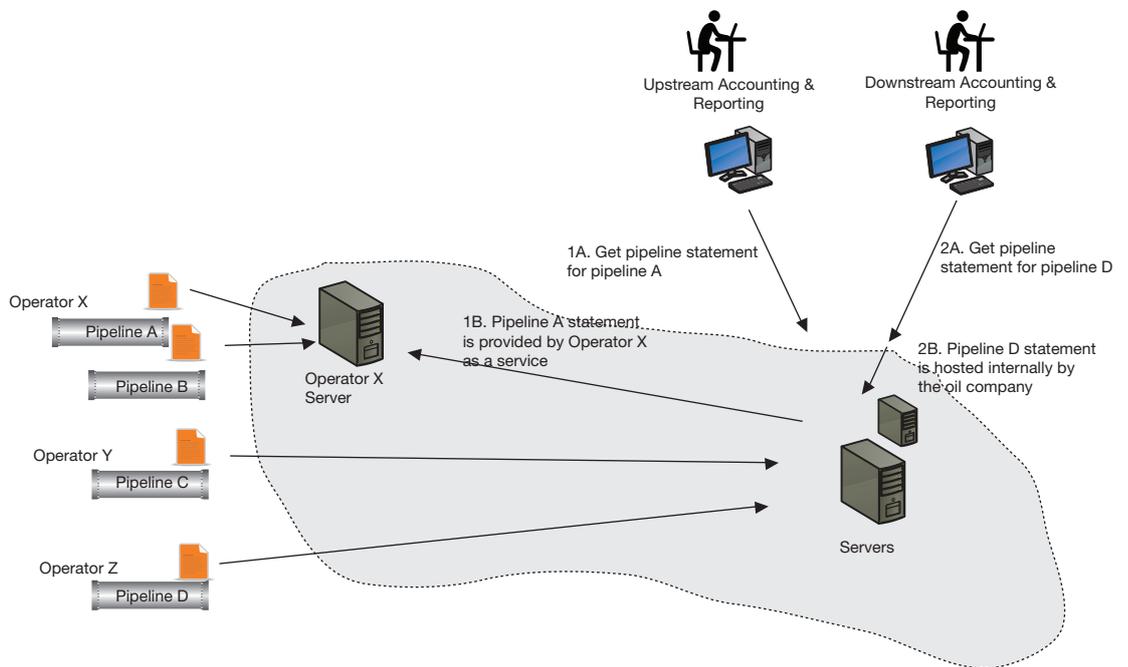


Figure 4: Software as service



The pipeline statements can be hosted by the oil company's application portfolio or it can be provided by the pipeline operator as a service. This is transparent to the end user but is very powerful in an IT context.

Industry semantic and data standards will close the gap between energy companies and service providers like plant operators, refineries and transport companies. It will enable seamless data flow between the players and can open new ways of working. Imagine if the service provider also provides business and system services like storage accounting and pipeline nominations. This would enable energy companies to outsource some of their functions to providers. The energy company

would make use of these software services for reporting and analytics. This case is illustrated in Figure 4.

Data standards when combined with software services could have a great affect on all sizes of companies—from small through to the supermajors. The larger companies will have the capabilities to build and implement the processes and provide the system support. For these companies, standards would ease the work. The smaller ones, not having the

same capabilities, could benefit from software services and “outsourcing” of some functions. However, whether large or small, all companies will benefit from utilization of the relevant standards.

Such standards would give many benefits:

- Reduce manual work
- Traceability of hydrocarbons along the value chain would become easier
- Software as a Service—outsourcing of key functions like storage accounting, etc.
- Reporting, including Business Intelligence (BI)
- Enable mash ups applications
- The standards can be used as contracts for defining services and are therefore a perfect match to Service Oriented Architecture.

These ideas are not futuristic. Capgemini is currently implementing some of these at a major oil and gas company by feeding production figures into scheduling and reporting systems. This is a good example of how a data standard can improve workflows, provide data for improved decision support, and facilitate the use of data across domains. Further, this is an excellent example of the value of semantic and data standards, and how these can be used outside their original context to provide innovative solutions.

Conclusion

The list of roles and stakeholders involved in doing downstream business is extensive and so is the information required. Lack of industry standards for describing the business and its data forces heavy use of manual processes and routines. Consequently, there is a loss of business opportunities like optimization, improved decision support, automated work processes and better tracking of volumes.

Capgemini believes that the downstream oil and gas business can take action on the above listed opportunities by leveraging an IO mindset and proven knowledge. Margins can be improved through cost reduction and improved decision support.

Redesigning processes and establishing standards would lay the foundations for the industry to take the first step to improve multi-disciplinary collaboration and realize the business opportunities.





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