SOFTWARE AND INNOVATION: REVOLUTIONISING THE LNG INDUSTRY

Girish Mandhania, Director, Services, Quorum Software, discovers what software and innovation will do for navigating the operational technology landscape for various LNG import and export operations.

Figure 1. LNG carrier.

As the information technology (IT) industry experiences a transition into more efficient, scalable, and innovative cloud and artificial intelligence (AI) technologies, the oil and gas industry in parallel embraces more sustainable practices and technologies. For oil and gas, this transition to a low-carbon future falls under the banner of the energy transition, with LNG playing a pivotal role as a bridge fuel due to its lower carbon footprint. This is why now more than ever, for the LNG industry to fully realise its potential and effectively contribute to the broader energy transition, it is crucial to harness each new innovative advancement in IT.

Whether it be the deployment of digital twins at LNG plants allowing for more precise monitoring, AI-driven

predictive maintenance, or Internet of Things (IoT) devices for supply chain optimisation – IT innovation allows the LNG industry to keep pace with an increasing demand. For example, per the U.S. Energy Information Administration, North America's LNG production and terminals will more than double within the span of 3 – 5 years.[1] Similarly, according to the Aggregated LNG System Inventory in Europe between 2021 – 2025, close to 20 FSRUs will be in operation.[2]

Examining the pace and expansion of the LNG industry, this article aims to explore what is working in the LNG industry in terms of best practices. It will also peer into the future through a lens of great potential, asking what can be accomplished with Software-as-a-Service (SaaS) and a commercial operations system, purpose-built for LNG.

SaaS

In terms of best practices, SaaS applications significantly benefit LNG companies with accessible, scalable, cost-effective, and secure solutions to various operational requirements. No longer a 'nice-to-have', rapid plant operations and systems readiness have become essential in maintaining energy security when facing the gas demands of the current geopolitical market. Furthermore, LNG operations can leverage the following benefits of implementing SaaS:

- Immediate access: With a SaaS solution hosted in the cloud, the need for bulky hardware and software installation processes is eliminated so LNG plants can quickly test software, develop proof-of-concepts, and move forward with systems. SaaS solutions often come pre-configured with industry-standard templates, reducing required time and effort in customising a system for business-specific needs.

Figure 2. LNG terminal.

Figure 3. LNG spherical storage tank.

- Scalability and resource elasticity: SaaS solutions can scale and add resources on demand as the LNG operation grows over the years.

- Cost efficiency: Adoption of a SaaS solution requires zero or minimal upfront CAPEX on infrastructure as compared to its on-premise alternative. SaaS providers handle all maintenance, updates, and security patches, reducing the need for building in-house expertise on various bespoke technologies used by different applications in the IT landscape. Hence it lessens the burden on the LNG plant's IT staff, enabling them to focus on more strategic initiatives.

- Security: Application security is typically of utmost importance to SaaS providers to offer robust protection for customers' critical data and operations in the cloud and over the internet. This is especially important for LNG companies that need to safeguard sensitive information against sophisticated cyber threats. A robust SaaS application goes through routine industry standard scans such as static application security testing (SAST), dynamic application security testing (DAST), and software composition analysis (SCA) uncovering any vulnerabilities in the tested version of the application. Encryption of data accessed over the internet is standard for a SaaS application.

Business process automation

Inherently, LNG business processes rely heavily upon interactions between different user groups: plant operations, commercial operations, terminal operations, marketing, accounting, trading, finance, and customers. Yet many of these interactions and processes have the potential to be fully or semi-automated, allowing users to interact only with the system during any exception. A system can automate tasks in a business process and create a to-do list of required manual interventions for the end user. For example, LNG contracts between buyers and sellers can have penalties tied to times or days for gas nominations as per the North American Energy Standards Board (NAESB) standard.[3] If the system is not automated to adhere to those times or days, then customers can incur fines. So, it is better to have an automated workflow. This process automation not only optimises end-users' interaction with applications but also makes the overall system more efficient and less penalty prone.

Integrations within building blocks

LNG operational technology is a landscape mired with applications: production and operations management, measurements, gas nominations, commercial operations, vessel vetting, risk management, trading, document

management, invoicing, and health, safety, and environment (HSE). Today, most of these functions are managed disparately, possibly provided by different vendors and sometimes homegrown by LNG companies themselves. LNG companies that leverage modern industry standard ways of integrations such as Representational State Transfer Application Programming Interfaces (REST APIs) and cloud middleware services realise seamless interconnectivity over those reliant on their own bespoke integrations.

REST APIs leverage hypertext transfer protocol secure (HTTPS) for encrypted communication over the web, ensuring data confidentiality and integrity during transit. REST APIs provide this common language for different systems to communicate with each other over the web. This allows disparate systems and applications to seamlessly exchange data and functionality, regardless of the technologies or platforms they are built on. To bridge any gaps, applications incapable of making REST calls can rely on cloud middleware services for integration flexibility.

By adopting a standard way of integrating with REST APIs and cloud middleware services, businesses can realise a wider range of benefits including enhanced interoperability, agility, cost efficiency, resilience, and security. Such modern integration approaches streamline operations, improve collaboration, and drive innovation in an increasingly interconnected digital ecosystem by enabling the following:

- End-to-end visibility: Integrated systems provide stakeholders with a comprehensive view of the entire value chain, from production to liquefaction, transportation, regasification, and distribution.
- Scenario modelling: Integrated systems support what-if scenario analysis and impact assessments to evaluate the potential effects of operational changes or market fluctuations on different parts of the LNG value chain. For example, analysing the impact of various maintenance schedules, changes requested from LNG buyers, and pricing trends on production capacity and cargo schedule, and then determining the most optimised scenario from contractual and profitability perspective will be feasible in an integrated digital landscape.
- Data centralisation: Modern integration approaches also enable seamless integration of data from various sources across the LNG value chain into centralised repositories and ensure that data is standardised, validated, and stored in a consistent format, facilitating reliable analytics, reporting, and decision-making.

Development methodologies

When LNG companies engage so many different user groups via many different applications, traditional methods of software development have the potential to become sub-optimal. Using only one or two applications to address a business problem may be too narrow, thus Scaled Agile development methodologies like Scaled Agile Framework (SAFe),[4] can provide significant value to LNG companies.

SAFe can empower LNG operations in the following ways:

- Ensure strategic alignment between all IT initiatives and business objectives.
- Promote cross-functional application development fostering collaboration and communication between teams consisting of members of various departments and responsible for commercial off-the-shelf (COTS), SaaS, and in-house systems.
- Encourage iterative and incremental development, adaptive to changing requirements and market conditions, allowing LNG companies to deliver value to users more frequently.
- Promote continuous integration and deployment (CI/CD) practices, automating integration, testing, and deployment of applications, reducing overall turnaround time and improving overall development efficiency.

Future: The art of possibility

If LNG companies have a SaaS mindset, combined with modern integrations, workflow automation, and scaled agile developments, then they are trending towards having a resilient digital foundation or 'digital core'. The key to innovation for LNG enterprises resides in existing systems within their digital core. By leveraging cloud technologies and fostering connected workflows, alongside maintaining high-quality datasets and standardised processes across their operations, LNG enterprises can proactively adapt to market changes, optimise resource allocation, and achieve sustainable growth in the dynamic global energy landscape. This strategic alignment enables them to capitalise on emerging technologies and trends, driving forward with agility and informed decision-making to stay ahead in the competitive marketplace.

What we know

As the LNG industry continues to scale, contributing towards a more sustainable future, software and innovation will play a stronger role in unlocking significant value for LNG companies. The next 3 – 5 years will be crucial as new LNG operations reach a final investment decision (FID), become commissioned, and finalise their digital strategy. If the LNG industry continues to invest in modern and standard software practices and applications, such as solutions like Energy Components by Quorum Software that operates via SaaS, wherever they may be sourced, not only will efficiencies eventually pay for themselves but the entire industry will operate as a well-oiled machine (pun intended) and deliver on promises of sustainable future. LNG

References

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