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Applying Thought

O&G's Operational Technology to Enter Digital Domain with Automated Systems, Robots

The Oil & Gas (O&G) industry prizes its physical infrastructure. It has been built over decades and spans vast geographies. As this infrastructure ages, managing it is becoming genuinely problematic. For example, massive storage facilities and immense lengths of pipelines have to be inspected periodically for leaks and vapor loss. When damage or wear and tear is identified, it must be documented and reported, spares and other repair material obtained, maintenance teams dispatched.

But autonomous, multi-tasking, software driven robots and drones with long-range battery life are changing Operational Technology in O&G. These self-directing robots inspect pipelines and other equipment tirelessly and are especially handy in hazardous environments. Automated systems work in tandem with these robots, triggering supplies, building spares and requisitioning the engineering teams based on their observations and analysis.

How will these digital technologies re-shape the O&G industry in the near future? The short answer is – dramatically. But not before we see a long phase where two different systems, the existing physical and the emerging cyber, will co-exist in an interesting mix.

Key technologies to track

Which are the key technologies that will force major shifts in the way the industry operates?

We believe seven key technologies will demand special attention. These are technologies with the ability to improve efficiencies in the downstream business, driving IT and OT convergence.

- **Industrial Internet of Things (IIoT):** This dense network of operational sensors will work in two ways by providing real-time data and using machine learning to quickly solve operational problems and at the same time support business intelligence.

- **Industrial Robotics:** These low-cost 24x7 physical and software bots will have the capabilities to monitor and run operations, manage maintenance, troubleshoot and improve safety.

- **Cloud Computing:** The technology will enable migration of data and applications to scalable platforms such as Private, Public and Hybrid Cloud, lowering the cost and improving the speed of provisioning and consuming IT.

- **Analytics:** Industry models and algorithms will surface co-relations between the vast amounts of data generated by sub-systems and partner ecosystems on a real-time basis, driving more accurate decision-making - and making the organization responsive to volatile market conditions.

- **Mobility/Wireless Industrial Communication:** With Cloud implementations, the entire organization can be mobile-enabled for anytime, anywhere access to data and applications over multiple devices. Wireless mesh networks will aid in remote sensing and monitoring of geological events and equipment, reducing costs and improving efficiency.

- **Open System Architecture:** Vendor-independent, non-proprietary, computer system or device design based on official and/or popular standards will enable integration between a vast variety of sensors and devices over disparate networks.

- **3D Printing:** The ability to print spares and other equipment on demand will reduce inventory lock-ins and substantially reduce transportation costs with on-site printing capabilities.

Everything on Cloud: The IT landscape redefined

The most immediate and visible effect will be that thousands of miles of cables that connect data sources (see Figure 1) to the Control Layer (PLC, SCADA, OPC) and to Manufacturing Execution Systems (MES) and Enterprise systems will vanish. Large racks and servers that are on-site as part of MES, ERP and BI will move to remote (and cost-effective) Cloud environments. Users and end-point devices will be able to connect to these systems, regardless of their geography over the Internet or mobile 4G/LTE networks. Every system will be integrated – from production to pipeline and from refinery to retail networks. Other than control systems that will continue to reside within refineries, everything else has the potential to get Cloudified.
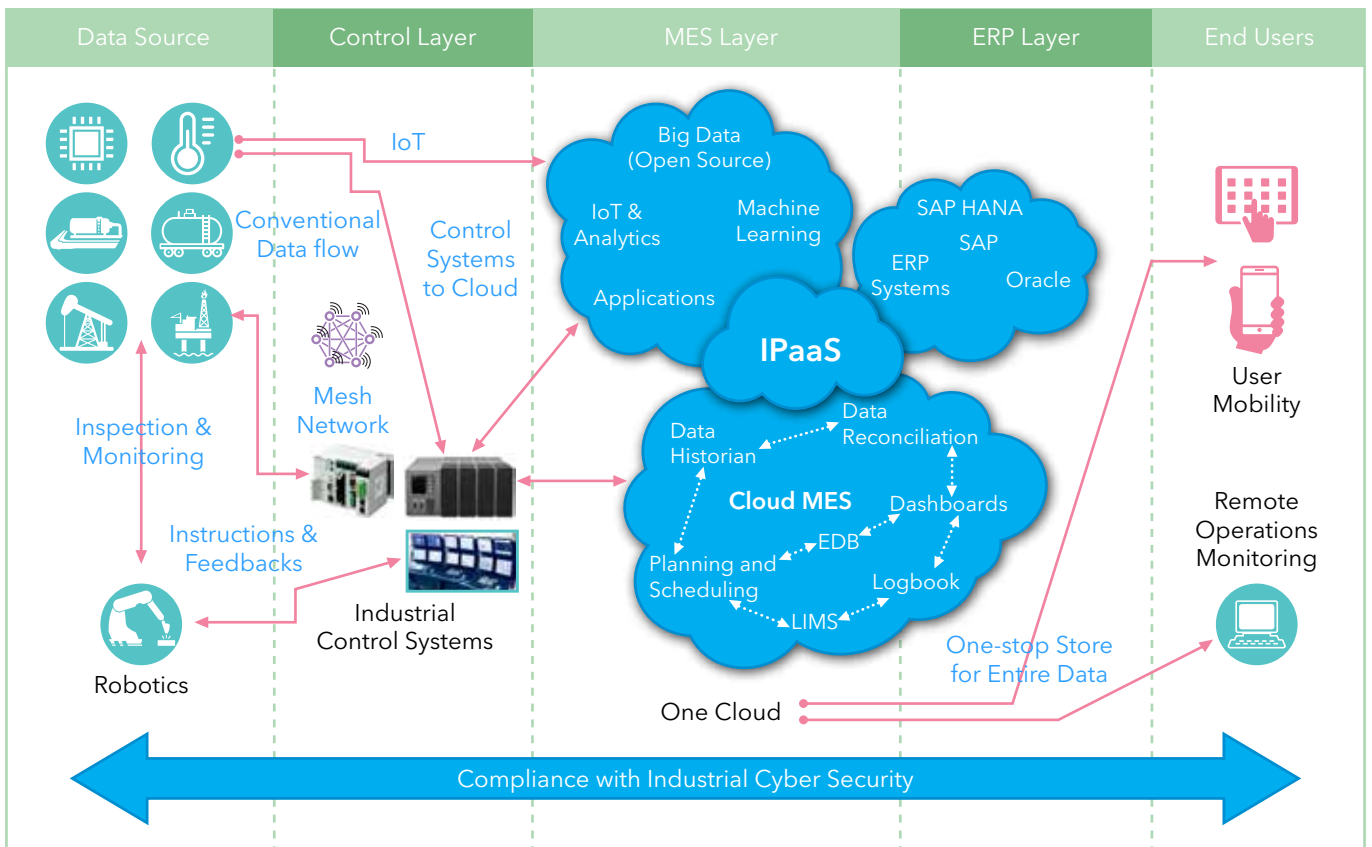

Figure 1: IT-driven Transformation in OT and the Enterprise

The end result: Rich, real-time data and actionable insights will become available to every function. The additional bonus will be in the form of lowered CAPEX through reduced IT maintenance costs, license costs and cost of upgrades.

The coming upside

Today, O&G systems reside in siloes (drill sites, refineries, MES, ERP, etc.). It is difficult and time consuming to acquire data from these applications. But with the integration made possible by open architectures and Cloud, not only will the data become consistent and reliable, but also its flow will become seamless.

Data and applications will be exposed to uses based on roles and business rules. Independent businesses will be able to afford and conduct their own R&D and simulations based on Big Data seamlessly integrated with SAP HANA, Hadoop, and other statistical and visualization analytical tools using PI integrators.

Regardless of the size of the enterprise, digital transformation must be broken up into two distinct phases. The first phase moves data, applications and systems to Cloud environments (Private, Public, Hybrid). And the second phase uses Integration Platform as a Service (iPaaS), a Cloud-based integration solution with a box of tools and technologies to support development and management of integrated applications, workflows, governance, provisioning, etc.

Using iPaaS, the O&G operations landscape can be completely transformed. With data and visualization techniques in Cloud systems, experts sitting in Houston can be leveraged to provide advisory based on events in remote terrains such as Kazakhstan or the Gulf of Mexico.

From our experience of working with a Finnish OEM who operates a plant in South Africa, we know that the focus of sensing, data usage/analytics and communications is about to be revolutionized. Vast distances, hazardous conditions and major cultural and skills gaps will be bridged as we see these digital technologies rapidly sweep across the industry.

About the authors

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