Empowering the Upstream Business in a Connected World

A MURA Framework White Paper

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MURA: Bridging Business Demands to Technology Innovation

No other industry can claim more demand from the world's population than oil and gas. According to the IEA World Energy Outlook 2012, global energy demand will grow by more than one-third through 2035 with China, India and the Middle East accounting for 60 percent of the increase. Over $37.9 trillion is needed in that period globally to meet demand. Operations continue to venture into deeper waters and more remote geographies, while sustainability initiatives focus on limiting impact to water resources and new energy sources from natural gas and renewables.

Challenging and costly operations as well as new drilling regulations have led to a strong focus on mitigating possible risk. Over 70 percent of respondents in a 2012 Microsoft and Accenture survey of upstream professionals reported that changing regulations have impacted their companies' focus on risk prevention. At the same time, upstream companies face a serious and growing risk from cyber-attacks, malicious software and other threats against their IT infrastructure and intellectual property, and via property employees bring into the workplace like smartphones and tablets. (For detailed guidance, please see '*Security in Upstream Oil & Gas*').

"The increasing level of complexity and difficulty in global upstream projects means that there is an increasing opportunity for operators to improve the performance of their E&P activity through the use of emerging technology capabilities and solutions," said Adam Hems, the Worldwide CTO for Oil & Gas and Mining at Microsoft Corp.

From smarter exploration processes to enhanced extraction techniques, the industry is primed for new innovations that add value to exploration and production operations.

Information technology has a role in facilitating more reliable and connected operations. "Upstream operators are demanding software solutions that enable them to work smarter and take advantage of new technologies including cloud services, apps, mobility, social computing, and platforms and tooling that unlock the potential of 'Big Data'," added Hems.

The Microsoft Upstream Reference Architecture (MURA) framework acts as a bridge between emerging business needs driven by the trends in the industry and modern technology in IT. MURA collateral from both Microsoft and the MURA participants provides guidance to customers on a broad range of available solutions from Microsoft and its partners in the industry, all underpinned by modern Microsoft technology. Also, a key goal of the MURA framework is to also provide guidance to what is achievable in the future for an upstream business with advanced Microsoft technology available today.

Consider the opportunities on the following page that advanced technology can enable in upstream operations.

1 **Big data**. Trillions of pieces of information are being collected, stored, and analyzed almost daily in an oilfield with increasing speed. Drilling rigs can relay data on current production, depths, temperatures and pressures, while every pump, fitting, valve and other component have sensors that monitor drilling status. The variety of information includes unstructured data sources from emails, text, blogs, videos, photos, names, seismic, purchase history inventory and more. It is estimated that within a decade, more than 50 billion everyday objects could be collecting data and creating new business opportunities. [Big Data](#) addresses one of the most critical issues facing business today: how to gain value from the growing reams of high-velocity, high-volume complex data. (For more detail, please see '*[Big Data in Oil & Gas](#)*').

2 **Cloud**. Cloud services is a platform that can be used to greatly simplify deployment and management of software used in complex upstream operations, enabling workloads that involve huge volumes of data, which require a combination of strict security and easy sharing with appropriate partners. Solutions delivered via a cloud infrastructure allow businesses to rent only the functionality they need, when they need it and on a per-user basis. Whether it is a team on a platform in the ocean, at the shale and oil sand sites, or in the corporate office, Cloud infrastructure allows for huge amounts of data to be collected and sent to the right person to do the right job.

3 **Mobility**. Despite the global nature of the industry, creating seamless and connected experiences has never been easier. Large amounts of bandwidth are available even for the most remote offshore and onshore regions – consider that 5-GB fiber is now available in the Gulf of Mexico that can be used to connect the assets deployed there to one another and to the shore. Businesses are taking advantage of new devices, especially tablets and smart phones, providing new, much more mobile experiences and higher flexibility for end users. These devices can run apps that connect to services and solutions that run in the public cloud as described above. Hardware manufacturers are enabling these capabilities in the field of oil and gas by providing touch-tablet solutions in 'ruggedized', and for some even 'intrinsically safe', tablet form factors running Windows 8 to support long-term survival in the harsh operating environments on the pad or rig, for example.

Real-time communications solutions from industry software vendors such as [Twisted Pair](#) provide reliable mobile solutions between onshore operations centers and offshore rigs.

4 **Social**. Finally, social media technologies such as status updates, messages, blogs, shared files and wikis can foster cross-discipline collaboration and better management of the upstream business environment. Adoption of these social functions will be a faster and smoother transition with the influx of a younger generation of professionals into the workforce (the 'Great Crew Change'), who are natural users of social in their personal lives and from an earlier age than their older colleagues. Collaborative technologies will also bridge the knowledge gap between these generations through people and expertise search, podcasts and social networks.

The Business Case for an Upstream Reference Architecture

As a framework for the oil and gas industry, MURA is informed by the macroeconomic trends and business issues of primary concern to enterprises in the upstream oil and gas industry. It is a framework intended specifically to aid in bridging the gap at oil and gas companies between the petro-technical professional in the business, and the technology professionals in IT.

"Microsoft has taken this approach as a balance between industry-specific needs for greater relevance and as a generic business solution, and technology guidance for broader applicability across the business-process spectrum," said Ali Ferling, managing director, Worldwide Oil & Gas and Mining Industries for Microsoft Corp.
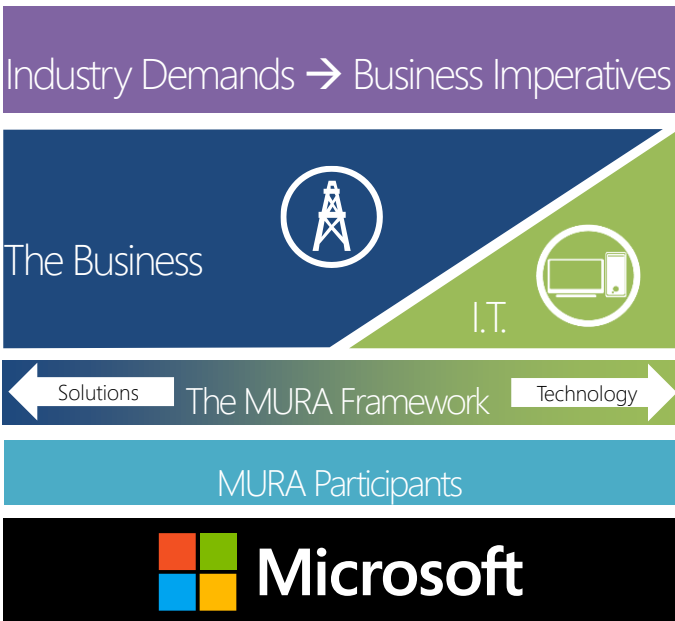
The following examples present just a few real-world scenarios and related technology solutions enabled by Microsoft its partners that address them.

- **Scenario**: Increasing the reliability of Electrical Submersible Pumps (ESPs)
  Solution: Capture trending & exception reporting of historic and real-time ESP data on SharePoint via OSISoft PI, monitored with StreamInsight
- **Scenario**: Integrating applications between multiple systems
  Solution: OSIsoft and Esri Web Parts, Web Part connections and a declarative integration technique to quickly and easily create composite solutions
- **Scenario**: Facilitating knowledge management
  Solution: Office 365 to simplify and reduce the cost of creating a temporary workspace for employees of different companies to securely collaborate
- **Scenario**: Ensure the proper running and maintenance of mobile field assets like cement pump trucks
  Solution: Use on-board Windows Embedded systems to send telemetry captured from key aspects of such assets (engine run time, fluid levels, GPS location, key temperatures and pressures, etc.) via 3G data connection to an Azure-hosted portal for continuous remote monitoring from anywhere in the world.

Like any enterprise architecture framework, the MURA framework is a guide. Any framework will need to be adapted to the needs of an individual organization based on its business objectives, current business structure and IT landscape, and a definition of the desired business state. CIOs and enterprise architects need to accommodate the broader enterprise context and business environment when applying a framework and developing an implementation blueprint.

MURA Guiding Principles

The Guiding Principles reflect the trends and challenges affecting the global upstream oil and gas industry today and, thereby, address the business needs of organizations in this industry. They are used to define qualities that solutions built upon the MURA framework should encompass (usually in part, not in whole). Microsoft partners are required to indicate the Guiding Principles that their solutions apply in order to ensure the solutions address the high-level trends in the industry.

"Oil and gas organizations can derive great value through the adoption of the MURA framework using existing investments, transform their business – and benefit over time from Microsoft technology advancements and industry partner expertise," said Hems.

The twenty-seven Guiding Principles also act as a pivot to guide Microsoft technology choice for business solutions that align with these Principles. By using the latest Microsoft technologies in their solutions, partners can enable customers to leverage or enhance existing technology investments. For example, several oil and gas companies have already invested in Microsoft Lync and SharePoint Server through Office 365. They can thereby save unnecessary costs by deploying upstream solutions built from these technologies. Also, Active Directory provides single-sign-on (SSO) capability and System Center can be used to manage these investments – both of which are typically installed within these enterprises.
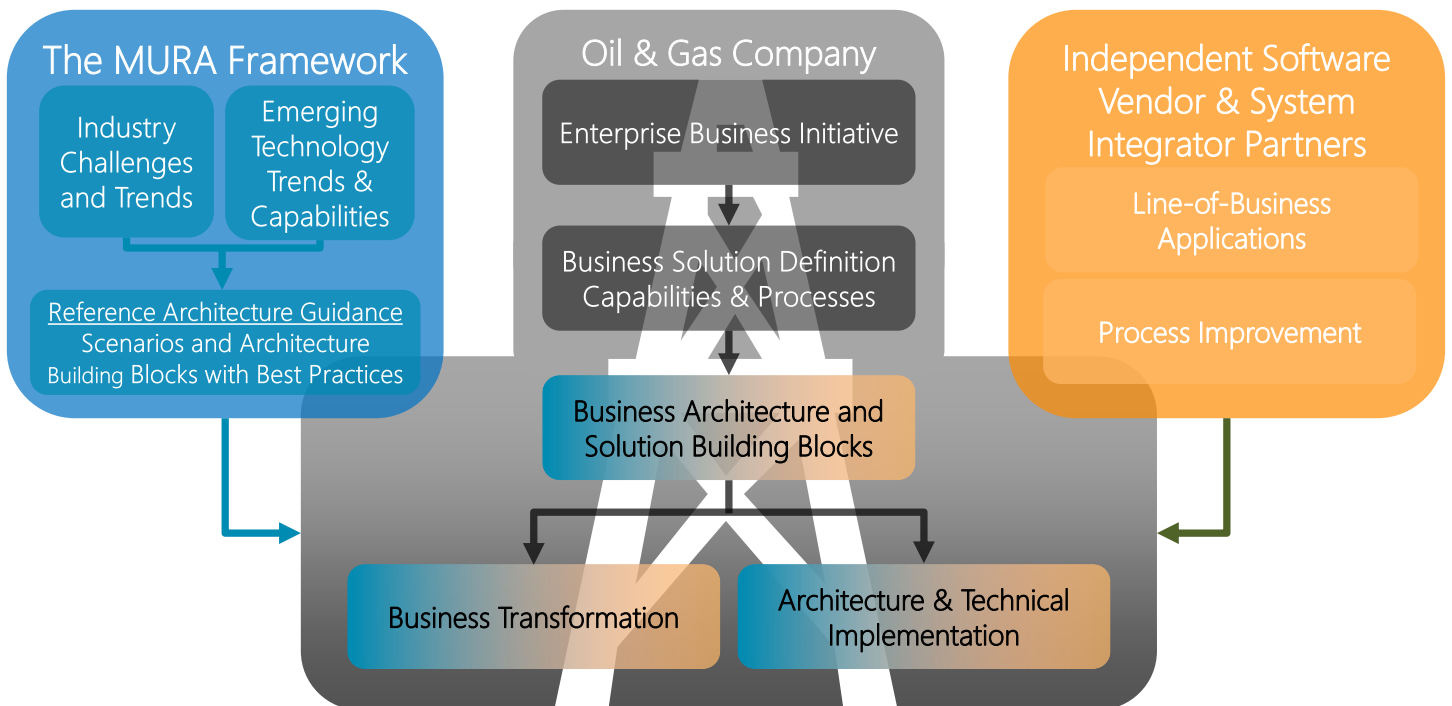
1 – How the MURA Framework informs Enterprise Business Initiatives

Role-Based Productivity & Insights. Through role-based productivity & insights, upstream operators can gain new insights from the vast, and increasing, amount of business-related data and maximize the productivity of individual workers, allowing them to do more with less. Capabilities include real-time analytics, which offers rich statistical and analysis packages for data mining, discovery, and reporting for diverse information consumers, and complex event processing, via new capabilities of SQL Server or Windows Azure Business Analytics and using Complex Event Processing technology like StreamInsight to monitor tens of thousands of points of data per second for particular patterns in real-time during drilling or production, for example.

Natural User Experiences. New technologies take advantage of rich user experiences, intuitiveness and ease-of-use across a multitude of devices – from smart phones and tablets to PCs and expansive operations command centers. The latest related technologies such as the Windows 8 Modern UI, Windows Presentation Foundation, Direct3D, RemoteFX and the Kinect are opening new possibilities for applications in the business domains that run on many form factors.

Social Enterprise. Communications technology is keeping pace with today's global and on-demand collaboration – including real-time communication networks, mobility, Web conference, voice over IP (VoIP), and of course, social media. Collaboration services and the Microsoft technologies that support them can include Lync, SharePoint, Yammer and Office 365, key capabilities for companies in oil and gas who wrestle with the effects of the 'Great Crew Change', where the majority of senior expertise in the industry is retiring in one great wave, leaving mostly younger, inexperienced workers to take their place.

> Oil and gas organizations can derive great value through the adoption of the MURA framework using existing technology investments.

Connected Business. For the MURA framework to successfully deliver cost-effective, integrative benefits, it must enable comprehensive interoperability – both on premise and in the cloud. As a result, MURA solutions should use industry standards like the Professional Petroleum Data Model (PPDM) on SQL Server and the standards stewarded by Energistics. Published interfaces and information models are of critical importance to maximize interoperability. Connected, agile businesses require solutions that integrate the workflows of the business workers and the systems they use, their process and procedures, and the information those workers create and manage as part of their work day across all the upstream systems they interact with.

Secure, Scalable, High-Performance Infrastructure. The MURA Guiding Principles capture the need of an underlying technical infrastructure that at the foundational level enables many business processes. Principles of this infrastructure include scalable support for more users, larger models and increased transaction volumes; securely deployed components, functionality, and information protected from unauthorized access or malicious attacks; and services that are location agnostic for anywhere deployment and that can be accessed on any device. Microsoft technologies supporting these principles include Windows Server, Active Directory, Windows Azure and System Center.

The MURA Story Told through Our Partners

The MURA framework aims to better meet customer needs by sharing Microsoft's strategies and broad technology solutions with its partner network that delivers specialized oil and gas industry know-how and line-of-business solutions. The framework offers guidance on the value proposition of Microsoft's technologies and how they align with industry trends and challenges without constraining the ways in which these technologies can be integrated into innovative partner products and solutions.

"We rely on MURA as guidance for collaboration between Microsoft and our partner networks, so the final solutions deliver the highest value and performance to customers with the minimum of effort and cost," said Hems. "The framework also is intended to serve as an 'idea beacon' to broadly facilitate innovation within the network, thereby continually reinforcing mutual learning about the needs of tomorrow's markets, and to respond rapidly and flexibly to market and customer pull."

Solution Sheets
Many examples of innovative partner solutions that apply the MURA Guiding Principles are available on the MURA website in the form of brief, two-sided 'solution sheets', demonstrating the valuable industry solutions that have already been created, or which could be created, using the MURA framework. The solution sheets span four areas of upstream operations: 1) Drilling & Completion, 2) Geology & Geophysics, 3) Production Operations, 4) Back Office, as well as solutions pertaining to Integration & Information Management.

"The solution sheets are the concrete realizations of the MURA framework, comprising the solutions customers can have today. All of this is enabled by the domain expertise of our partners and the technology underpinned by Microsoft," added Hems.

MURA's Supporting Technology: Many Products Combined for Power

The MURA framework is guidance for the capabilities upstream operators may need to put in place to get to the next level of performance. As such, it is not a single product, nor a rigid set of infrastructure technologies that must all be used at once. It is a framework to enhance upstream performance backed by technology components that can be mapped into any enterprise environment.

The MURA Guiding Principles serve to help select which of the many Microsoft products and technologies might be best suited to any given business need. Each Principle maps back to particular technology from Microsoft.

There are numerous Microsoft technologies that are important to each element of MURA, including:

- **Windows Azure and Cloud Computing**. Windows Azure and SQL Azure provide public cloud computing capabilities through Microsoft data centers around the globe. Look for the Azure platform to increasingly be tapped by operators in remote oilfields to enable remote management solutions and services through cloud deployments. It will also be used in high-performance computing environments for added flexibility – some users can get their work done on a project-by-project basis, while others could choose to transition all of their data off site to the cloud solution.

Ubiseis™ from Ubiterra Corporation is a cloud-based Internet service that runs on Windows Azure for archiving, collaborating and marketing seismic data assets. (Solution Sheet). Additionally, Halliburton's FieldPlan® solution is a software-as-a-service (Saas) solution delivered up upon Windows Azure to generate technically viable field models that integrate the key components of field development, from the wells through the subsea architecture, production facilities and export options, and an estimate of the associated costs.

- **Microsoft BizTalk Server**. BizTalk Server 2013 is Microsoft's integration and connectivity server solution. Including more than 25 adapters and a messaging infrastructure, BizTalk Server provides connectivity between core systems both inside and outside an organization.

  For example, BizTalk Server acts as the connector for Invensys Operations Management's ArchestrA Workflow, an advanced workflow management solution. (Solution Sheet)

- **Microsoft Lync Server and Unified Communications**. Lync Server 2013 is the latest generation of the Microsoft Office Communications platform. It includes support for instant messaging, audio, web, and video conferencing, and application sharing—for both scheduled and impromptu meetings. Lync Server, along with Exchange Server, are vital to Microsoft's Unified Communications strategy enabling capabilities for smart, connected devices, the timely delivery of insights and the connections between value chain partners.

  Twisted Pair's WAVE® enterprise applications integrate tightly with Microsoft Lync, allowing people to connect in an operations or emergency response. (Solution Sheet)

- **Microsoft Office 365**. Microsoft offers businesses the power of the latest Office suite plus a wide range of productivity services coupled with rich compliance features and full management capabilities for IT, hosted in the cloud and for rent on a per-user basis. The latest Office applications also include advanced enterprise-grade communication capabilities and compliance features that enable IT to be more agile. It also contains a large suite of business intelligence (BI) capabilities, supporting browser-based self-service BI for business users across the enterprise.

- **Microsoft SharePoint Server**. Microsoft's portal platform is used by software partners in oil and gas as the basis of collaborative solutions in areas such as production portals or drilling portals, where the respective teams can collaborate and see real-time information as part of their dashboard. SharePoint provides partners and users with functionality such as search, content management, workflow and alerts. SharePoint's latest edition—SharePoint Server 2013—also incorporates social media tools such as blogs and wikis and works with Microsoft's BI tools including Excel Services and SQL Server Analysis Services.

  Microsoft SharePoint Server enables the collaboration capabilities in Schlumberger's Petrel Studio that make it possible for asset team members to collaborate in the context of their Petrel project and data. Also, the full range of iStore PetroTrek data access and visualization components are available as a suite of Web Parts and services for Microsoft SharePoint.

- **Microsoft SQL Server and Microsoft SQL Server StreamInsight**. SQL Server is the database management platform for many partner solutions in oil and gas. Additionally, many partners and users leverage the platform's BI capabilities—SQL Server Reporting Services and SQL Server Analysis Services. One of the latest enhancements to the

platform is StreamInsight, a complex event processing engine that allows partner solutions to rapidly comb through plant-level data to spot significant events and correlate them with data from other systems, such as order or schedule data.

EUPHORIA is a solution from L&T Infotech that provides a PPDM-compliant central data repository, dimensional data mart with drilling facts and dimensions, and a scalable framework to manage KPIs and metrics – all based on Microsoft SQL Server. (Solution Sheet).

Accenture's Integrated Oilfield Solutions Platform (IOS) separates the source data stores and technical tools from the digital oilfield solution to solve the problems of deployment to heterogeneous asset application portfolios using Microsoft SQL Server.

CGI's Accelerators for StreamInsight enable rapid development and deployment of new applications built on Microsoft StreamInsight, cutting development time by three to six months. (Solution Sheet)

- **Web Parts**. This is a specification that enables prepackaged functions for SharePoint-based solutions or other ASP.NET web user interfaces. The beauty of Web Parts is that they allow specific functions to be encapsulated in a widget that can be easily configured to build role-based functionality by end users.

  The use of Web Parts, Web Part connections and a declarative integration technique from SharePoint Server and Microsoft partners like OSIsoft and Esri make it possible to quickly and easily create composite solutions. (Solution Sheet)

- **Windows 8**. The latest operating system from Microsoft offers a modern user interface well suited to touch and a wide range of applications from the Windows Store, including a growing number of industry-specific apps for oil and gas. Windows 8 features the new fast and fluid Start screen that gives people one-click access to the apps and content most relevant to their role. It also features an entirely new Internet Explorer 10 that is perfect for touch, and built-in cloud capabilities with SkyDrive.

For More Information

To learn more about how MURA Guiding Principles can be applied to your business, please contact **Ali Ferling**, Worldwide Director for Oil & Gas and Mining, at alferlin@microsoft.com, and **Ariane Jayr**, Industry Solution Manager for Oil & Gas and Mining, at arianec@microsoft.com.

You can also find more information, white papers, solution sheets and other resources from Microsoft and its partners at www.microsoft.com/mura.