Building the Future Smart Utility through IT OT integration -Leveraging an Asset Information Management Framework

The conventional value chain that has underpinned utilities for so long is today undergoing disruptive changes. One way flows of energy and digital information are evolving into multi-directional flows of real time data spanning various aspects of operations. A major driver of this dramatic shift is the increasing penetration of consumer centric technologies, such as distributed generation and storage, electric vehicles, and growing end use efficiency. Rising regulatory pressures for enhanced safety and the need to adopt sustainable practices that foster environmental protection are compelling utilities to revamp their business processes.

Moreover, power, gas, and water companies are facing intense competition with the need to reduce operational costs through improvements in quality and asset utilization. Assets and customers continue to remain the key focus points for utilities companies. In order to successfully navigate this changing business and technology landscape, and differentiate themselves in a cutthroat marketplace, utilities must aim for effective asset and enterprise asset information management. They need to institutionalize a data driven value chain that enables them to integrate their information technology (IT) and operational technology (OT) systems, and convert real time data into actionable intelligence. This, in turn, will help companies bolster operational efficiency, slash costs, and develop long lasting relationships with customers.

Introduction

Utilities have historically developed and managed IT and OT as two different domains, maintaining segregated technology stacks, protocols, standards, governance models, and organizational divisions. However, in the last few years, a host of business factors and technological advancements have strengthened the case for the integration of IT and OT systems.

According to a poll of 68 senior decision makers at 39 North American utilities conducted in 2011 by McDonnell Group, on behalf of Ventyx, the majority of respondents cited IT OT integration as an area of higher priority than planning for future smart utility initiatives.¹ This, the survey noted, reflected the respondents' belief that IT OT integration initiatives are a necessary precondition for building the future smart utility. Nevertheless, only 50 percent of utility companies have formulated plans for such convergence till now.

Why IT OT integration is essential

Till date, IT has largely been associated with back-office information systems relating to costs and accounting, billing and revenue, workforce records and time-keeping, customer records, and other transactions. Usually, these functions entail manual data entry, and the computing resources tend to be deployed in offices, server rooms, and corporate data centers.

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On the other hand, OT typically refers to field-based devices connected to the plant systems, and the infrastructure for monitoring and controlling those devices, such as Supervisory Control and Data Acquisition (SCADA) and Distribution Management Systems. Most OT systems involve device-to-device, or device-to-computer communications, with relatively little human interaction.

Historically, OT and IT for distribution operations have been developed, maintained, and used in silos in a utility organization. While technical and organizational challenges prevail for those looking to cross IT-OT boundaries, there are compelling business imperatives and strong technology drivers for increased IT-OT integration.

**Business drivers for integration**

The emergence of disruptive technologies and evolved business processes in recent years have strengthened the case for integration of operational technologies with IT systems. As utilities incorporate more smart devices into their operational environment on a continuous basis, the need to deal with the massive amount of data generated by such instruments arises. Emerging digital transformation technologies such as social media, mobility, Big Data and analytics, and cloud computing can be leveraged in this regard for data acquisition and management.

OT systems that now embrace smart devices are also driving requirements in the context of field maintenance and work activities that span IT-OT, including significant increases in device configuration and communications management.

Moreover, the underlying technology of OT systems, spanning platforms, software, security, and communications is increasingly beginning to resemble IT systems, validating the case for IT to contribute to operational technology software management. Shared standards and platforms across IT and OT can enable utilities to reduce costs across the software management landscape, including enterprise architecture, support and security models, software configuration practices, and information and process integration. This can be a significant driver in helping utilities cut operational expenses by improving their asset management capabilities.

**Unsynchronized asset data**

Even as the volume of data generated across multiple OT and IT applications in the asset life cycle keeps increasing, many utilities continue to deploy disparate IT and OT systems to manage various business processes. Different streams of information are stored in silos, leading to inaccuracies in asset status data and a lack of a synchronized view of asset information across enterprise and operational systems. This renders effective management of assets and business processes challenging, as it prevents data sharing that can enhance system performance, reduce overheads, and improve customer service. Consequently, utilities have to grapple with service deterioration, regulatory fines, and poor system performance, among other adverse outcomes.

**Other factors**

It is increasingly imperative for utilities to leverage software to interpret the numerous streams of data flowing in from the array of sensors in their infrastructure networks. The need for IT-OT integration is all the more important considering that most technology vendors continue to offer separate solutions for these two domains, resulting in duplication of systems and processes. Another consequence of such an arrangement is that split responsibilities between IT and OT for organizational security lead to higher risks.

**Recommended Solution - An Asset Information Management Framework**

Frameworks for IT-OT integration offered by most technology vendors currently tend to be based on their proprietary products and solutions. Moreover, a significant proportion of these architectures deploy a point-to-point transactional Enterprise Application Integration (EAI) approach that lets asset data reside in multiple points across IT and OT systems.

In our view, the most effective way to integrate IT and OT is to implement a platform-, product- and technology-agnostic asset information management (AIM) framework that entails no change to utilities’ existing IT and OT systems. Such a framework should be based on the Service-oriented Architecture (SOA), and leverage asset data models and associated business processes specific to the utilities industry.

At a larger level, utilities should keep the following three aspects in mind while implementing an architecture for IT-OT integration:

- **Asset meta model**: The framework should be underpinned by a utilities-relevant asset data model that attaches ‘meta tags’ to assets. This ensures that any given asset can be correlated across the organization’s operational systems for different requirements.

- **Business process modeling**: The architecture should facilitate the customization of business processes involving utilities’ operational and enterprise applications, such as procurement, finance, quality, customer information system, and so on. The framework should offer a synchronized view of assets from SCADA, asset management, geo-spatial technology, ERP and other systems; this will drive better asset- and system-centric collaboration.
Process monitoring and visualization: An optimal framework for IT-OT integration should provide key stakeholders with easy–and quick–access to asset information. Top decision makers need not log into multiple systems; rather, they should be empowered with rich dashboards containing inbuilt industry-specific functionalities, key performance indicators (KPIs) and reports.

Benefits
Major investment choices for Utilities have always considered Return on investment (ROI) and total cost of ownership (TCO) as key factors for investments. An AIM framework can help companies achieve optimal balance between operational performance, financial results and risk management. Utilities can better forecast and manage outages by gaining improved visibility into critical asset attributes such as run hours, energy and residual value. Companies can enhance the accuracy and timeliness of asset information, and allocate resources in a more informed manner, thereby improving asset utilization levels. This, in turn, keeps downtime to the minimum, thus resulting in higher returns on assets. Utilities will also be better positioned to reduce maintenance, construction and renewal costs by automating business processes, and undertaking preventative maintenance and renewals more effectively. Overall, enterprises will be able to maximize the value of assets across the asset lifecycle, and offer better customer services.

Conclusion
The extent of interoperability between enterprise information and operational systems will have a major bearing on the future agility and performance of utilities. Companies, in order to be able to match up to growing consumer expectations, need to generate actionable insights from the ever-growing volume of data captured by their various IT and OT systems. And integrating these two hitherto separate realms represents a tangible way for utilities to reorient themselves in the 'Digital Consumer Economy'.
About the Authors

Ravi Karnad

Ravi Karnad heads the Engineering and Industrial Services (EIS) business at Tata Consultancy Services (TCS) for the UK and Europe markets for the Pharmaceutical Manufacturing, Utilities, Energy and Resources, Telecom, CPG, and Food and Beverages industries.

With over 30 years of experience working with the Tata Group, 19 of which were with TCS, Ravi has led various complex engineering assignments. By combining engineering excellence and operational efficiency with superior technologies, processes, and competencies, Ravi helps clients reduce both cost and time to market.

Ravi is a mechanical engineer and a post graduate in Data Networks from the Brunel University, UK. He has also participated in the Advanced Management Program for senior executives at St. Catharine’s college, Cambridge University, as well as the Tata Group executive seminar at the Ross Business School, Michigan, USA.

Murali Chandrahasan

Murali Chandrahasan is the Practice Head, Plant Solution Frameworks, at TCS. Murali’s 23 years of experience in plant solutions across multiple process industry verticals spans control systems, asset management, operations management, plant to enterprise integration, manufacturing intelligence, industrial business process management, mobility, and cloud solutions.

Over the years, he has provided business and technology oriented, strategic, and customer centric solution frameworks to global process manufacturing and utilities clients. In his current role, Murali drives sharp focus on IT OT integration and business process orchestration. He has published point of view articles, and is a speaker and panelist at various industry conferences on plant solutions, asset management, and manufacturing intelligence.

Murali holds a Bachelors degree in Electronics and Communication from the University of Madras, India.
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Contact
For more information about TCS’ Engineering and Industrial Services Unit, visit:
www.tcs.com/eis  Email: eis.marketing@tcs.com

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