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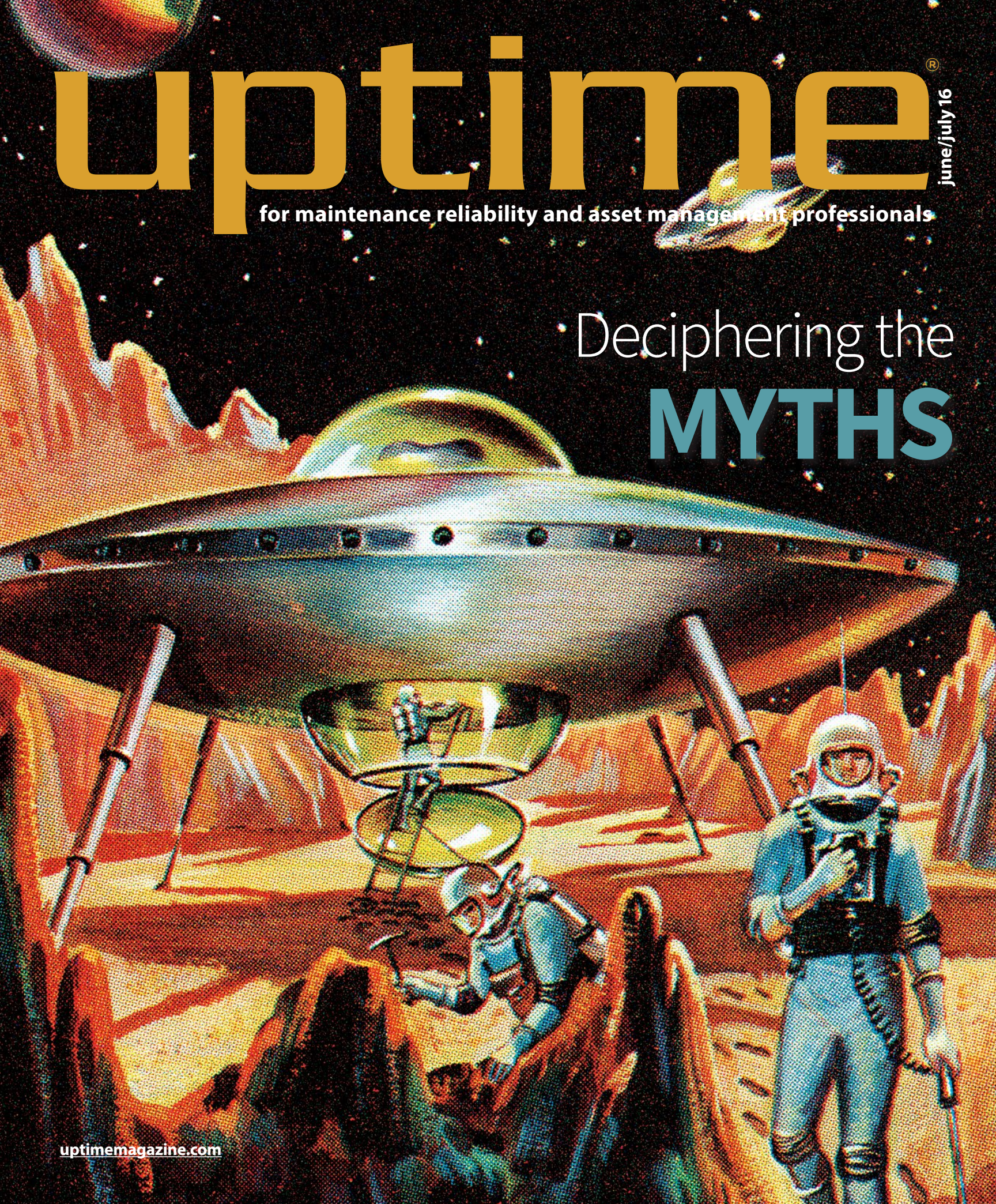

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Standards' Interoperability Breaks Silos in Operating Facilities

by Gary Mintchell

Problems for maintenance reliability professionals in asset-intensive industries begin long before the plant is running. The root of a problem typically begins in the engineering and design phase, well before construction begins.

Name one of your biggest headaches when something goes down at 2 a.m. More than likely it entails having ready access to engineering details of the unit, component, or asset you're working on. Documents in PDF format exist from engineering, procurement, construction (EPC), but what confidence does anyone have that the data is accurate as to what was built? Further, what is the confidence level that any engineering changes during the time in operation were fed back through a revision management system into the document you now have while trying to fix the problem?

The problem in operating facilities no longer lies in getting data. Nor is there a problem of not enough IT and data standards. The problem is that so much data resides in silos of applications and databases. These may all comply with one data standard or another, but those standards often actually conflict with each other.

> *"Name one of your biggest headaches when something goes down at 2 a.m."*

Data residing in the engineering silo may or may not match the data in the operations and maintenance systems. Furthermore, various engineering, operations and maintenance reliability systems may not be properly connected to each other or the sensors providing them with real-time data.

The Internet of Things (IoT) and more powerful databases may provide floods of additional data, yet managers are still searching for information that will aid decision-making and improve performance.

In a nutshell, the problem is a lack of interoperability in both IT systems and operations and maintenance systems. John Palfrey and Urs Gasser, writing in *Interop: The Promise and Perils of Highly Interconnected Systems*, said, "Higher levels of interoperability can lead to systemic efficiencies. The greatest beneficiaries of interoperability are often business operations that use it to streamline their processes and manage costs."

Silos

Owners/operators recognize that they are in a bind. Custom integration of data horizontally across the horizontal plant lifecycle does not work in the long run, not to mention its expense. Instead, owners/operators have turned to technology suppliers, but the solution requires a larger industry effort.

A plant information system consists of many sub-systems. Data should flow seamlessly from system to system. But there are roadblocks in the sys-

tem. The problem is both IT interoperability (i.e., getting the data to flow) and system-to-system interoperability (i.e., getting the entire facility operations to work together).

The formation of the OpenO&M Initiative was driven by this need to achieve interoperability among open standards that, at the same time, allows for use of commercial off-the-shelf software and solutions from the various technology suppliers. Founding members included the International Society of Automation (ISA, 88 and 95 committees), the Manufacturing Enterprise Solutions Association (MESA) International, MIMOSA and the OPC Foundation. Other organizations that joined in the work include Fiatech, POSC Caesar Association and the Professional Petroleum Data Management Association.

OIIE to the Rescue

The work has culminated in the open industrial interoperability ecosystem (OIIE). This ecosystem explains how the various standards are used together to support systems, communications and applications interoperability employing a system of systems approach. It builds upon existing standards and describes how to make them work together.

The OIIE is well-documented and available for use by technology providers, suppliers and owners/operators.

The OIIE simplified systems architecture represents the framework for developing an enterprise architecture that employs a system of systems interoperability. The foundation of an interoperability architecture is standards and the OIIE uses a portfolio approach in leveraging both international and industry standards. The selection of standards is based on their capability to meet the industry specified requirements, as well as levels of industry adoption and community engagement.

The OIIE prescribes the use of standards for several important components, including:

- An information message bus to provide middleware-based data transport/conveyance;
- Information and message models for representation of messages and service inputs/outputs;
- Reference data for consensual interpretation of information;
- A service directory to register ecosystem applications, manage service of record and exchange service endpoint and transport configuration;
- An asset interoperability register that includes the system of record for systems of records, datasheet definitions management and mapping, and the asset management of change log;
- An object registry that maintains identifier mappings between internal application identifiers and canonical identifiers used as part of standard information models.

Standardization of these components allows industries to collectively reduce capital, operating costs and risks because the software required to support the OIIE (e.g., software adapters) can be written and, more importantly, maintained by software suppliers rather than owners/operators.

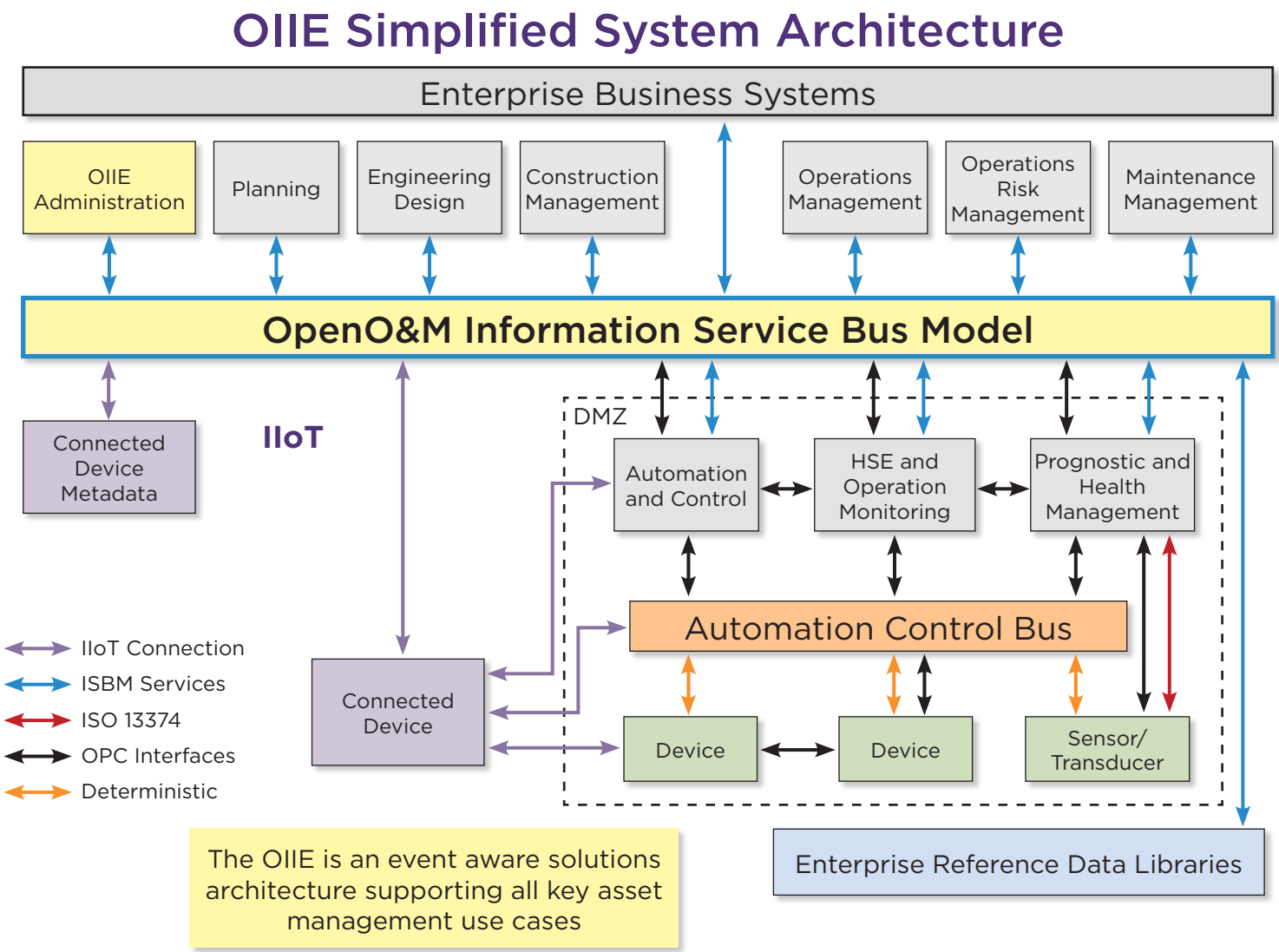

Figure 1: OIIE simplified systems architecture

Reduce Capital and Operating Costs

The centerpiece of the OIIE systems architecture is the OpenO&M web services information service bus model (ws-ISBM), also described in ISA95, Enterprise-Control System Integration standard. The ws-ISBM specification can handle the arbitration for Level 3 related activities, and is, in fact, a series of open application programming interfaces (APIs). Equally important are the OIIE administration tool specifications, which provide the basis for application and supplier neutral ecosystem administration, which is critical to establishing and maintaining an interoperability ecosystem. The OIIE administration tool specifications include the MIMOSA service directory and structured digital asset interoperability register (SDAIR), in addition to the OpenO&M common interoperability register (CIR).

Notably, the business process itself is not standardized by the OIIE. No attempt is made to require either proprietary application software or a plant's business process to conform to a standard.

OGI Pilot Demonstrates Success

So, does this actually work?

Twelve technology suppliers, universities, standards organizations and owners/operators worked together to construct a pilot of a debutanizer project. The oil and gas interoperability (OGI) pilot, an example of the OIIE, demonstrated the feasibility in action of a continuous hand over from design to operations and maintenance (O&M) of a debutanizer.

Eleven use cases were developed and five actively demonstrated:

- Capital project hand overs to O&M;
- Recurring engineering updates to O&M;
- Field changes to plant/facility engineering;
- Enterprise product data library management;
- Asset installation/removal updates;
- Preventive maintenance triggering;
- Condition-based maintenance triggering;
- Early warning notifications;
- Incident management/accountability;
- Automated provisioning of O&M systems;
- Enterprise reference data library (RDL) management.

Many individuals and organizations have contributed to the development and trial implementation of the OIIE. This model does not destroy any existing standards or even individual suppliers' products. By using the ws-ISBM for arbitration and the OIIE administration, organizations move many steps forward to the dream of interoperability through rules for both information management and O&M management.

The dream of live, accurate data for the engineers and technicians who keep the plant running at 2 a.m. is much closer.

Gary Mintchell, *founder of The Manufacturing Connection, followed up a 25-year manufacturing/IT career with a second career in media, becoming the voice of automation. He is now an independent writer, analyst and consultant in manufacturing/production technologies and strategies.*
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