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Second-Stage Challenge for the PRODML Standard: Adaptive Production Optimization

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Abstract

PRODuction xML (PRODML™) was started jointly by BP, Chevron, ExxonMobil, Shell, and Statoil in early 2005 as a data exchange mechanism to support production optimization within a 'digital oil field' context. These companies have been joined by Aspentech, ConocoPhillips, Euriware, Halliburton, InfoSys, Invensys, Kongsberg Intellifield, Matrikon, OSISoft, P2ES, Pioneer, Petroleum Experts, Schlumberger, TietoEnator, and Weatherford. Energistics® has stewardship of PRODML and fosters further development.

There is significant industry interest in implementing digital oil field strategies. Corporate and government initiatives anticipate significant, sustained improvements in recovery and operating efficiencies while maintaining safe operations. This will require robust, trustworthy, implementation of measurement, optimization and automation technologies.

Version 1.0 of the PRODML standard, released in 2006, enables a range of production optimization use cases to handle an information hierarchy which includes time series data. This lays a foundation for adaptive optimization involving interaction between applications and data stores from multiple vendors. Such optimization is important both for situations with low-frequency changes, such as waterfloods, and for those requiring agility, such as compliance with pipeline, liquefied natural gas, and power-generation customer-export schedules that may cycle within a day.

PRODML V1.0 provides a means of transferring data between applications incorporated in simple, common use cases. However, it did not address the task of accommodating changes to the physical configuration of the network, such as the addition of a well or a sensor, without having to manually reconfigure applications. Such changes are commonplace.

In 2007, the PRODML work group focused on managing changes in production network configuration and in the capabilities of system components. The result enables optimization and reporting architectures and data management processes to adapt to changes faster with less effort and fewer errors. PRODML has therefore become a tool which can be used in implementing robust, trustworthy optimization and automation processes.

Several example use-cases are included to illustrate how PRODML can be applied.

Introduction

The production system of an oil field changes during its life. Wells are added and removed, and gathering and injection systems and other facilities are modified and often expanded. The capability of equipment also changes over time. The changes may be gradual, such as a change in compressor efficiency or the performance of a well zone, or it may be a step change after equipment is overhauled or modified during maintenance.

Measurements and reference parameters abound and vary over time for a given production installation. The sensors might include downhole pressure and temperature gauges, distributed temperature systems, and other equipment instrumentation throughout the production facilities. Flowmeters may use different reference temperatures, and a single optimization system incorporating information from several sources must deal with this variation.

Managing this environment therefore involves accounting for changes in the physical asset, represented by the information hierarchy, and in the data available for the asset. In production optimization, a single architecture must often support a diverse set of use cases. For example, one process might require information for only the higher levels of the hierarchy while another might require the most detailed information available at the lowest levels of the hierarchy.

Potential Benefits

The PRODML team envisions the following future benefits for operating companies and solution providers who adopt the enhanced standard:

- Improved operational efficiency. Production optimization systems are more reliable and accurate with a lower total