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Revolutionizing Energy Data Management: OSDU® and Next-Gen Innovations for Geophysical Workflows

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Abstract Summary

The OSDU® is revolutionizing how the energy industry manages and utilizes energy data. Established in 2018 by a consortium of major energy and technology companies, OSDU® provides a cloud-native, open-source, and vendor-neutral platform that standardizes the ingestion, indexing, and access of key data types, including well logs, seismic volumes, and interpretation datasets. This abstract explores OSDU®'s conceptual architecture and data standards, particularly for seismic workflows, and demonstrates how the adoption of ingestion applications simplifies data integration through automation, validation, and metadata management. These tools enable scalable, repeatable workflows while reducing manual effort, fostering collaboration, and accelerating digital innovation. Despite ongoing challenges, such as cultural resistance, evolving standards, and technical integration, OSDU® is rapidly emerging as the foundation for a new era of interoperable, data-driven geoscience.

Introduction

The OSDU® represents a significant shift in how the energy industry handles energy data. Established in 2018, the OSDU® Forum emerged from a collaboration of major energy and technology companies, including Shell, BP, Equinor, Microsoft, Schlumberger, and others. Its goal is to eliminate data silos and foster innovation by standardizing the way data is stored, accessed, and consumed across platforms.

At its core, OSDU® provides a cloud-native, open-source, vendor-neutral data platform (The Open Group and EPAM, 2021). It currently supports standardized ingestion and access for numerous data types such as well logs (LAS, DLIS), seismic data (SEG-Y, VDS), reservoir models (RESQML), and interpretation datasets (The Open Group, 2025). Ongoing forum discussions aim to establish standards for more complex data, including real-time drilling operations, fiber-optic measurements, and production performance monitoring, ensuring continued relevance and scalability of the platform.

Theory

The OSDU® platform architecture delivers a modular ecosystem with unified APIs enabling professionals to ingest, discover, and consume energy data effortlessly. Key components include ingestion pipelines, metadata indexing, elastic search, and consumption layers for visualization and Analytics. Its primary objective is to decouple data from proprietary applications, enabling organizations to concentrate on generating business value and driving innovation, rather than grappling with the lack of data interoperability and foundational data management issues (Sharma and Gubanov, 2023). Figure 1 illustrates the conceptual architecture of the OSDU® implementation hosted on AWS.

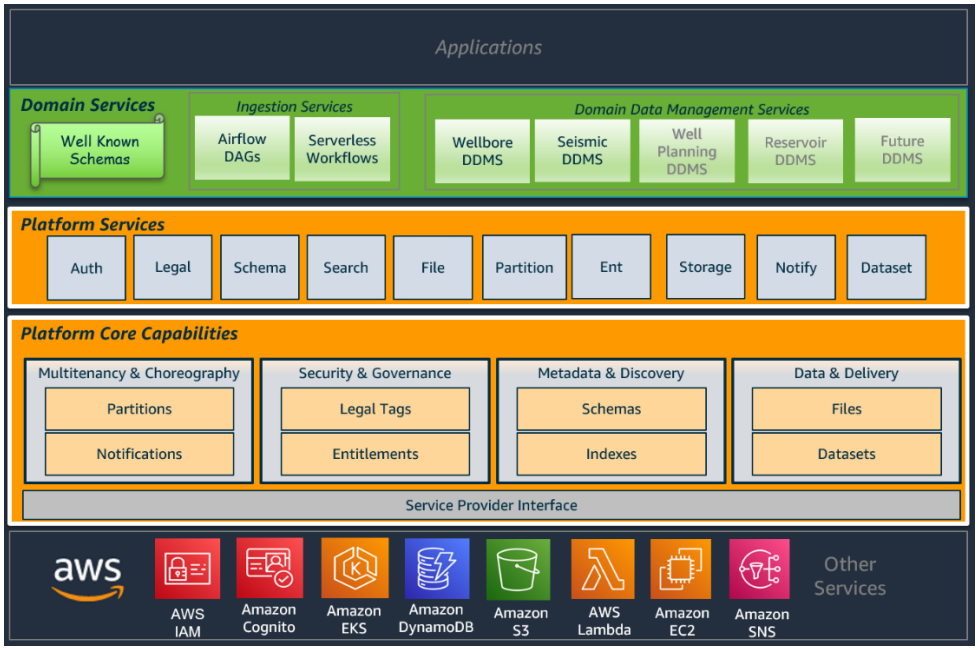

Figure 1 - Conceptual architecture of the OSDU® Data Platform, AWS-based (Sharma and Gubanov, 2023).

OSDU® natively supports seismic data formats such as SEGY and Bluware VDS, both of which are widely used for storing 2D/3D seismic traces and volumes. The platform's ingestion workflow ensures that seismic data is securely transferred, validated, and indexed with rich metadata, facilitating rapid search and on-demand access by users and applications (The Open Group, 2022). In Figure 2, it is possible to see an OSDU Seismic Model.

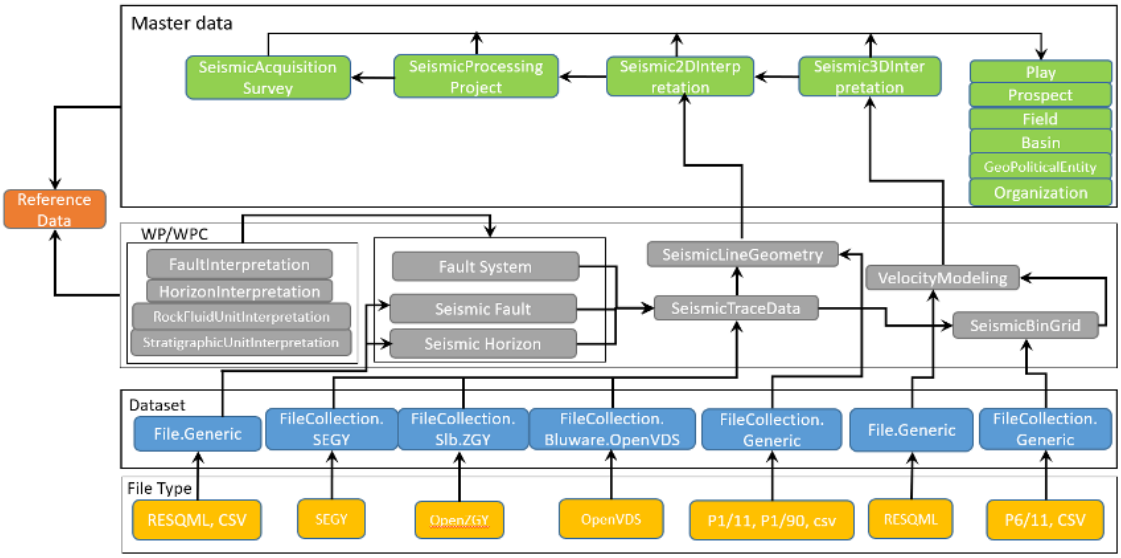

Figure 2 - OSDU® Seismic Model: not all WP/WPC and file types are displayed (Prabaharan et al., 2022).

Seismic surveys are typically conducted using grids of source and receiver points, and OSDU® represents these through the SeismicAcquisitionSurvey master data type. Processed data, grouped into bin grids, is managed under SeismicProcessingProject, while interpreted features like faults and horizons are captured using Seismic2DInterpretation and Seismic3DInterpretation (Prabaharan et al., 2022).

These master data types can be linked to business context, such as field, basin, or operator. Metadata is ingested using standardized OSDU® schemas involving Master Data, Work Products (WP), Work Product Components (WPC), and Files. While the diagram, figure 2, simplifies this structure for readability, OSDU® typically manages a more detailed seismic data model.

Results

Using a data ingestion application integrated with the OSDU® Data Platform significantly simplifies the workflow of registering and managing subsurface datasets, particularly seismic data. These applications are designed to automate much of the traditional manual work, such as:

- Validating seismic formats (e.g., SEG-Y, VDS)
- Mapping metadata to OSDU schemas
- Linking master data (e.g., survey names, fields, basins)
- Automatically creating work product (WP) and file relationships
- Storing and indexing data for search and API access

By guiding users through these steps with intuitive interfaces and predefined ingestion templates, such tools reduce human error, eliminate redundant scripting, and shorten the time from data discovery to decision-making.

The advantages of using a data ingestion application are speed, standardization, accessibility, scalability and traceability.

These applications are critical enablers in operationalizing OSDU, turning what was once a slow and inconsistent process into a repeatable, governed workflow that benefits both technical and business stakeholders.

Conclusions

The OSDU® Data Platform is reshaping how geoscientists access, manage, and analyze energy data. By decoupling data from proprietary tools and organizing it into an open, standardized ecosystem, OSDU® empowers professionals to spend less time wrangling data and more time extracting value from it. This shift enables faster collaboration, better decision-making, and easier integration of advanced technologies like machine learning, real-time analytics, and automated interpretation workflows.

With the widespread adoption of data ingestion applications, the benefits of OSDU® become even more tangible. These tools serve as bridges between legacy data sources and modern cloud-native environments, simplifying and accelerating the ingestion process for all users, from data managers to geoscientists and reservoir engineers.
However, despite the momentum, the OSDU® Forum still faces important challenges:

- Cultural Resistance: Many organizations are still tied to legacy workflows and vendor-locked solutions.
- Standard Maturity: Certain data domains (e.g., real-time operations, production data) are still under discussion or in a state of evolution.
- Adoption Complexity: Full-scale adoption often requires significant cloud infrastructure and change management.
- Interoperability Testing: Ensuring cross-vendor compatibility across OSDU® implementations remains a continuous effort.

Even so, as more companies contribute to the Forum and adopt OSDU® standards, the community-driven model ensures constant improvement and growing interoperability. Over time, OSDU® is poised to become the backbone of energy data management, fueling the next generation of digital exploration, collaboration, and innovation in geosciences.

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