

LTM

WHITEPAPER

ENERGY & UTILITIES INDUSTRY

Outcreating Traditional Digital Oilfield Constraints with Digital Oil Field as a Service (DOFaaS)

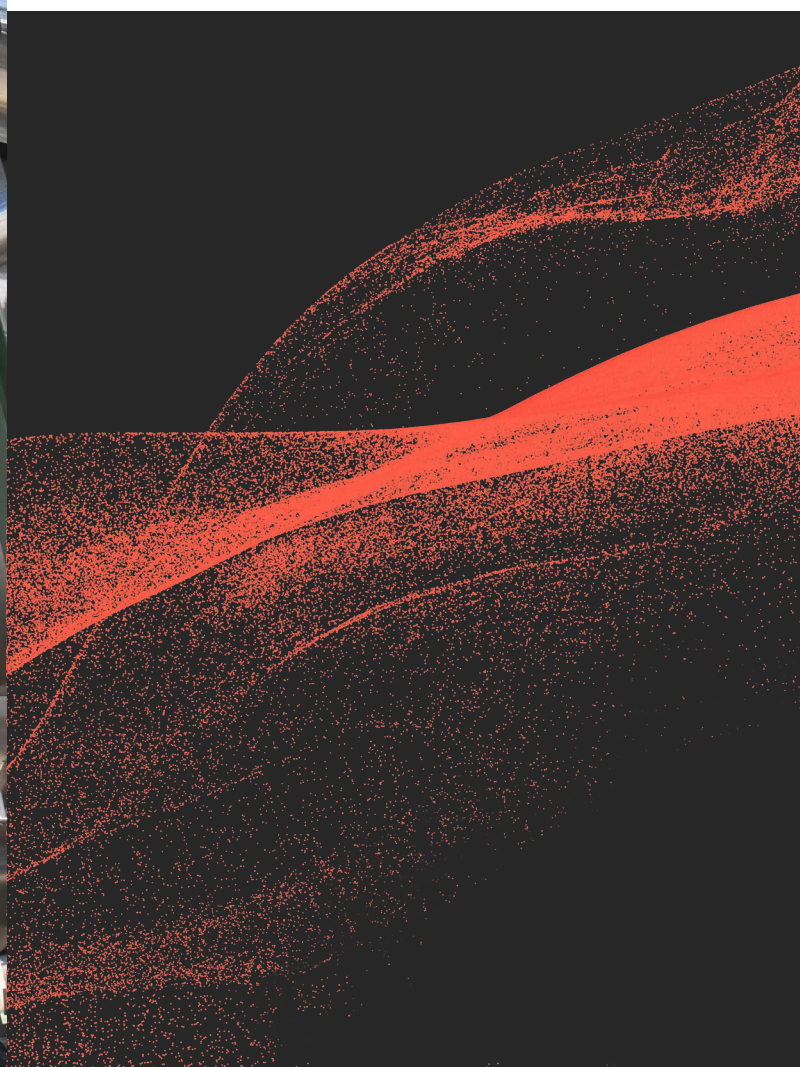


Table of Contents

Abstract 3

Executive Summary 3

Introduction 4

Definitions 4

- Digital Oil Field (DOF) 4
- Managed Digital Oil Field Services (DOFaaS) 4

Industry Pain Points & Drivers for DOFaaS 5

What is Digital Oil Field as a Service? 5

Business Benefits 6

Reference Architecture for DOFaaS 7

- Overview of the High Level Architecture 7
- Data as a Service (DaaS) 8
- Modeling as a Service (MaaS) 8
- Workflow as a Service (WaaS) 9
- DOF AI as a Service (AIaaS) 9
- Visualization and Multi-Layer Insights 10
- Role-Based Access and User Segmentation 10

Service Delivery & Operating Model 11

Use Cases 11

Roadmap for Implementation 12

Risks, Challenges & Mitigation 12

Future Outlook: Autonomous Digital Fields 12

Conclusion 13

About the Author 13

References 14

Abstract

The oil and gas industry faces increasing operational complexity, workforce constraints, sustainability pressures, and growing demand for real-time decision intelligence. Traditional Digital Oil Field (DOF) programs have delivered value, they often involve high capital costs, fragmented architectures, vendor lock-in, and slow deployment and decision cycles.

Digital Oil Field as a Service (DOFaaS) addresses these challenges through a fully managed, vendor-neutral, cloud-native service model. It enables operators to retain ownership and control of their data while consuming digital capabilities through a scalable, subscription-based framework.

This whitepaper introduces the DOFaaS architecture and its modular service stack. The model is designed to deliver continuous digital improvement, operational agility, and outcome-driven value realization.

Executive Summary

Since its emergence in the 1970s, the Digital Oil Field (DOF) has evolved from basic data acquisition and remote monitoring to cloud-native, AI-enabled digital operations. These capabilities improve efficiency, reduce risk, and support real-time decision-making.

Digital Oil Field as a Service (DOFaaS) builds on this evolution through a fully managed, vendor-neutral service model. Operators retain ownership of their data while consuming digital capabilities through a scalable, cloud-based platform.

DOFaaS is delivered through a progressively dependent service stack comprising Data as a Service (DaaS), Modeling as a Service (MaaS), Workflow as a Service (WaaS), and DOF AI as a Service (AIaaS). This architecture enables operators to adopt capabilities incrementally. It also provides standardized data, automated workflows, vendor-neutral model execution, AI-driven insights, and continuous platform improvements.

As the industry moves toward autonomous and intelligent operations, DOFaaS provides a secure, scalable, and future-ready foundation. It accelerates digital transformation, improves operational efficiency, and enables data-driven optimization across the oilfield.

Introduction

The oil and gas industry is undergoing rapid digital transformation. Market volatility, rising costs, sustainability pressures, and advances in cloud, IoT, and AI technologies are driving this change.

To improve efficiency, safety, resilience, and environmental performance, operators are increasingly adopting data-driven and automated operations. These trends have created the foundation for Digital Oil Field as a Service (DOFaaS).

DOFaaS improves data accessibility, accelerates analytics, and shortens the path from data to insight, decision, and value realization. As AI-driven predictive and autonomous capabilities mature, DOFaaS enables organizations to operate more intelligently, efficiently, and sustainably. It also maintains real-time visibility across wells, facilities, and field operations.

This shift creates an opportunity to move beyond conventional digital oilfield models. By bringing data, models, workflows, and intelligent systems together within a managed operating model, DOFaaS supports a more integrated approach to digital operations. In this sense, it creates room to improve traditional operating constraints while bringing Business Creativity into the way digital capabilities are designed and consumed.

Definitions

Digital Oil Field (DOF)

A Digital Oil Field is an integrated framework that enables organizations to conduct real time surveillance, analysis, and optimization of their assets. It combines live operational data, physics based models, and engineering workflows to generate actionable insights, identify production opportunities, and improve overall field performance.

DOF systems help operators transition from reactive decision making to proactive, model driven optimization

Managed Digital Oil Field Services (DOFaaS)

Digital Oil Field as a Service (DOFaaS) is a fully managed, cloud-hosted delivery model. It provides DOF capabilities through subscription-based or pay-as-you-go services.

The model is vendor-agnostic and delivered through a modular, four-layer service stack:

- **Data as a Service (DaaS):** Reliable, scalable data acquisition and real-time ingestion
- **Modeling as a Service (MaaS):** Cloud-hosted, continuously updated reservoir, well, and network models
- **Workflow as a Service (WaaS):** Event-triggered or on-demand engineering workflows
- **DOF AI as a Service (AIaaS):** Advanced analytics, predictive insights, and agentic AI capabilities

This stacked architecture follows a cumulative dependency model in which each higher layer requires the capabilities of the layers beneath it.

Operators can enter at the Data as a Service layer and progressively adopt higher service tiers. When an operator adopts a higher tier, the required lower-layer capabilities are included in that tier or must already be operational.

Industry Pain Points & Drivers for DOFaaS



Operational Challenges

Oil and gas operators face fragmented data, legacy systems, vendor lock-in, inconsistent asset maturity, and complex model and workflow maintenance requirements.

These challenges reduce data trust, limit interoperability, slow decision-making, and increase reliance on manual processes. DOFaaS addresses these issues through standardized data management, vendor-neutral integration, automated model lifecycle management, and scalable workflow automation.



Economic Drivers

Market volatility, capital constraints, rising technology costs, and pressure for predictable spending are driving demand for more flexible digital operating models.

DOFaaS shifts digital capabilities from CAPEX-intensive ownership to a consumption-based OPEX model. This reduces technology overhead, improves cost predictability, and enables operators to focus capital on core production activities.



Technology Drivers

Advances in cloud computing, API-driven interoperability, real-time analytics, AI, and digital twins have created the foundation for a new generation of digital oilfield solutions.

DOFaaS leverages these technologies to provide scalable infrastructure, interoperable systems, advanced analytics, and AI-driven intelligence. Operators can access these capabilities without building and maintaining complex digital platforms.

What is Digital Oil Field as a Service?

Digital Oil Field as a Service (DOFaaS) is a fully managed, vendor-neutral, cloud-native service model. It delivers data, modeling, workflow, and AI capabilities through a subscription- or consumption-based model.

Operators retain ownership of their cloud environment, data, models, and outputs. The service provider manages the platform, operations, security, monitoring, and ongoing enhancements.

Built on a progressively dependent architecture, DOFaaS comprises Data as a Service (DaaS), Modeling as a Service (MaaS), Workflow as a Service (WaaS), and DOF AI as a Service (AIaaS).

Together, these layers provide standardized data, vendor-neutral model execution, workflow automation, and AI-driven insights. By combining operator-controlled data with managed cloud services, DOFaaS reduces CAPEX, minimizes operational complexity, eliminates vendor lock-in, and accelerates digital transformation.

It also supports security, governance, and measurable business outcomes.

Business Benefits

- DOFaaS reduces technology costs and operational complexity by replacing selected proprietary tools with integrated, vendor-neutral services for data, modeling, workflows, and AI.
- Preliminary assessments indicate a potential annual licensing opportunity of USD 1 million to USD 2 million. This opportunity comes from consolidating or retiring overlapping visualization, workflow, and model-management platforms.
- DOFaaS also improves cloud economics by shifting from continuously provisioned infrastructure to an elastic, consumption-based model. Compute resources can scale with actual demand. This aligns cloud spending more closely with usage while reducing the burden of maintaining underutilized capacity.
- Engineering productivity improves through managed, evergreen model and workflow lifecycle services. Engineers can spend less time on maintenance and more time on optimization, analysis, and decision support.
- Reusable workflows further reduce duplicated development, testing, and asset-specific rework.
- DOFaaS can also simplify mergers and acquisitions by standardizing data interfaces and enabling vendor-neutral model execution. Reusable workflows within an operator-controlled environment can further support this process. This can accelerate asset onboarding, reduce integration effort, improve governance consistency, and speed value realization.

All benefits should be validated through pilot and MVP programs. These procedures should establish measurable baselines for licensing costs, cloud spend, engineering effort, implementation costs, and realized business outcomes.

Organizations should track realized savings, cost avoidance, productivity gains, and strategic benefits to establish a fact-based business case.



Reference Architecture for DOFaaS

Overview of the High Level Architecture

The DOFaaS runtime operates within an operator-controlled cloud environment. This ensures that the operator retains ownership of all data, models, workflows, and outputs. The service provider manages the platform through delegated, least-privilege access. This access operates under the operator's security and governance policies.

The architecture consists of four modular and interoperable service layers:

- Data as a Service (DaaS)
- Modeling as a Service (MaaS)
- Workflow as a Service (WaaS)
- DOF AI as a Service (AIaaS)

Each layer provides APIs, visualization capabilities, and stateless processing. These layers interact with operator-managed storage, identity, networking, and governance services. Production data and complete engineering models remain under operator control, with only approved metadata, audit logs, and observability data retained.

The service layers follow a cumulative dependency model. DaaS forms the mandatory foundation, MaaS depends on DaaS, WaaS depends on DaaS and MaaS. AIaaS builds on all lower layers to deliver progressively advanced digital capabilities.

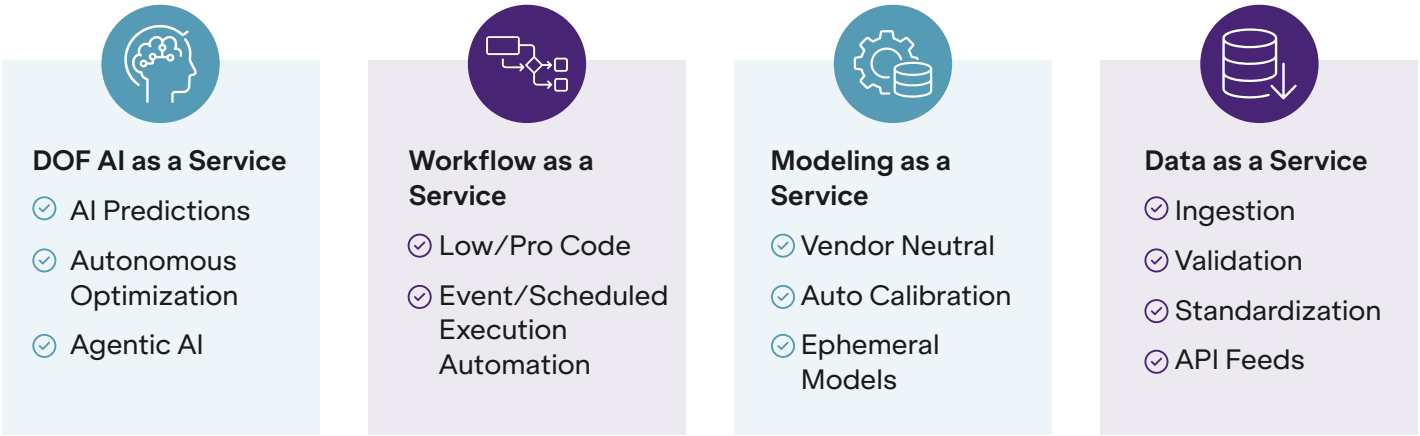


Fig 1. Core Service Layers of DOFaaS

Data as a Service (DaaS)

The Data layer ingests data from operator systems and applies automated validation, enrichment, harmonization, and standardization. It transforms data into optimized, storage-efficient formats. Curated datasets are written back to the operator's environment. This provides a trusted, high-quality data foundation for modeling, workflow automation, analytics, and AI while minimizing storage overhead.

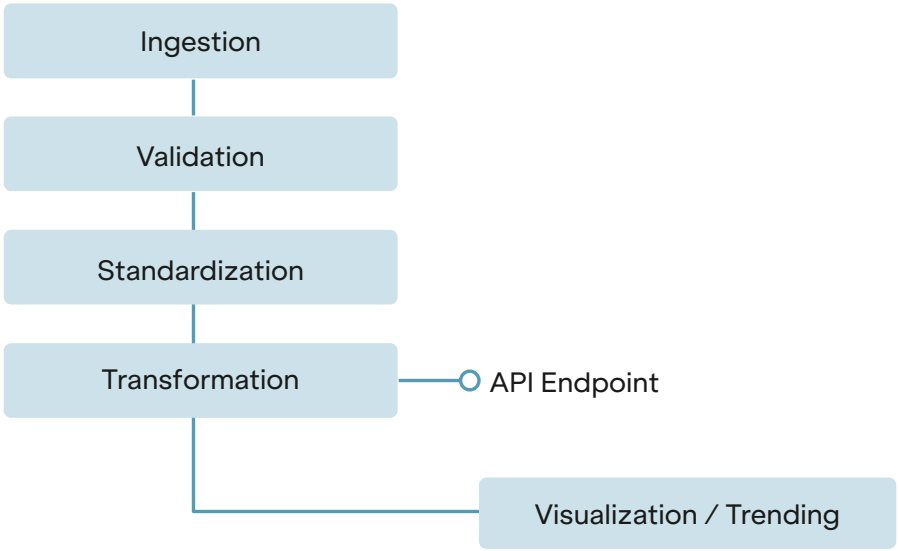


Fig 2. Data as a Service (DaaS)

Modeling as a Service (MaaS)

The Modeling layer provides a vendor-neutral environment for executing reservoir, well, and network models. These models use standardized data from DaaS.

Models are automatically validated and calibrated to meet defined accuracy and performance requirements. To improve efficiency and governance, models are executed ephemerally and converted into lightweight, rehydratable representations. Only essential outputs and metadata are retained in the operator's cloud environment. This enables traceability, version control, efficient storage, and rapid model reconstruction during workflow execution.

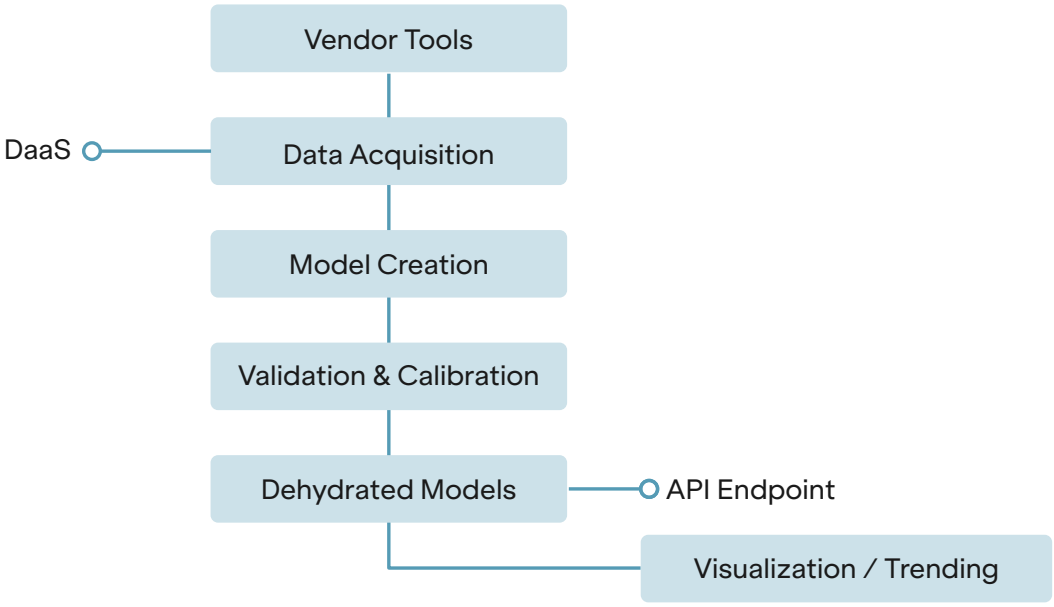


Fig 3. Modeling as a Service (MaaS)

Workflow as a Service (WaaS)

The Workflow layer combines validated data from DaaS with rehydrated models from MaaS. It enables low-code and pro-code workflow development for on-demand, scheduled, and event-driven execution. Through standardized API-based integrations, it supports multi-vendor model orchestration and automation.

Workflow logic and results are stored in lightweight formats. It allows workflows to be dynamically reconstructed and executed without relying on large, static workflow packages.

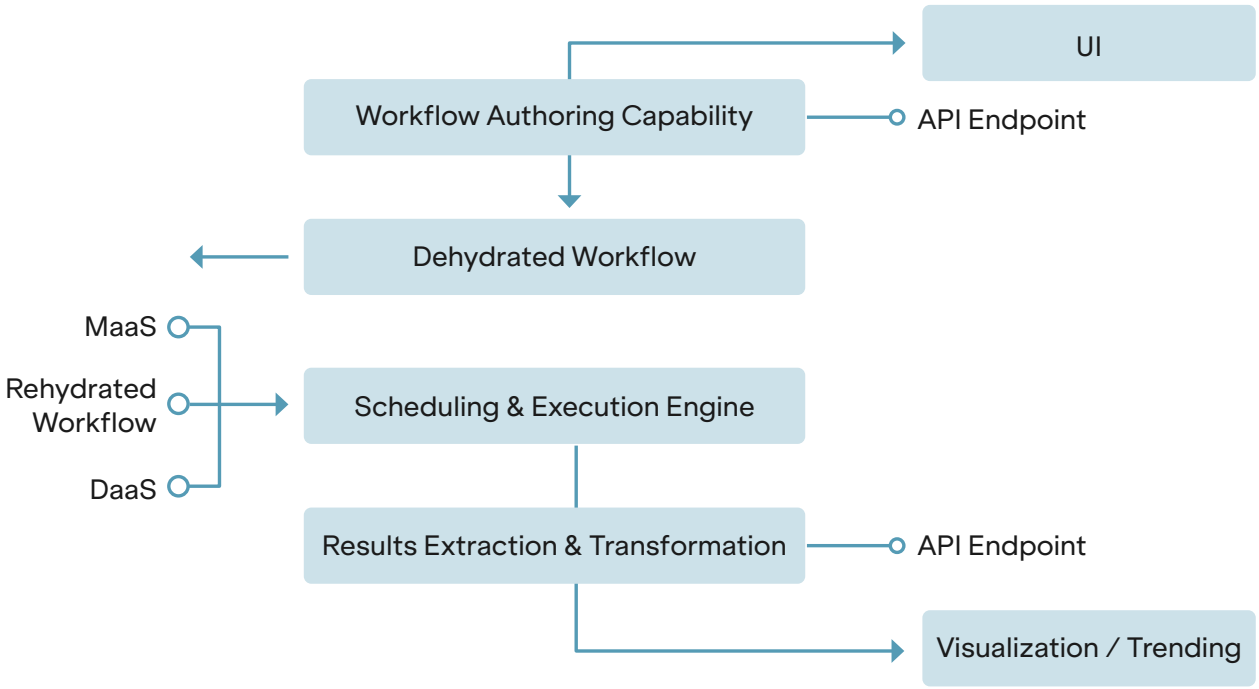


Fig 4. Workflow as a Service (WaaS)

DOF AI as a Service (AIaaS)

The AI layer hosts RAG-based systems, intelligent agents, and AI reasoning engines. These capabilities transform trusted operational data into contextual insights, recommendations, anomaly detection, and decision support. All AI-generated recommendations and automated actions operate within operator-approved constraints, safety policies, authorization controls, and human oversight. The operator retains the final decision authority.

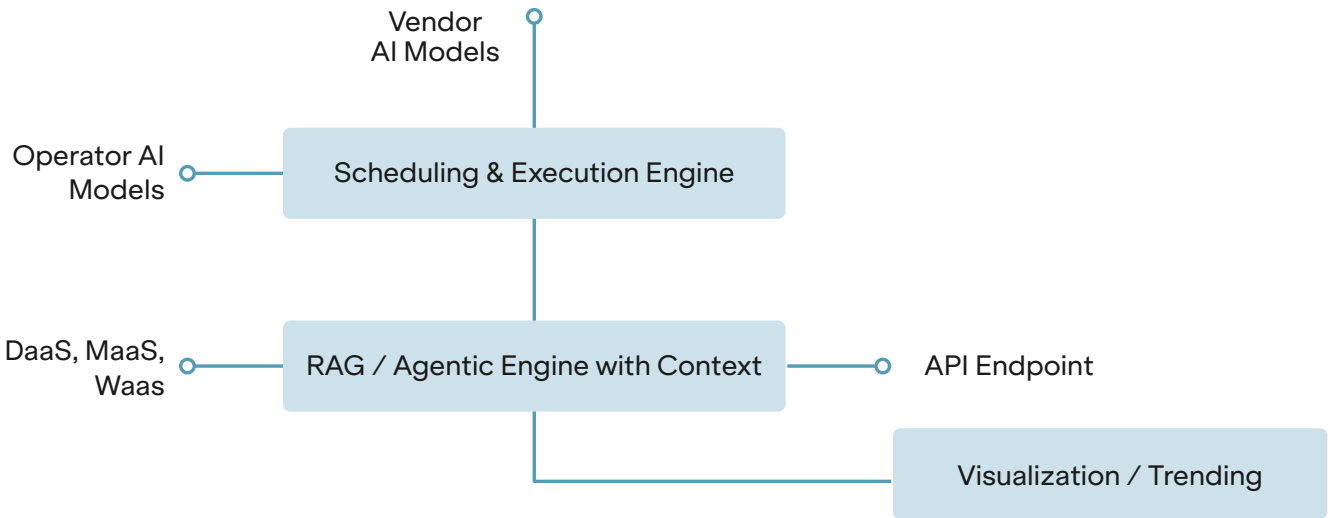


Fig 5. DOF AI as a Service (AIaaS)

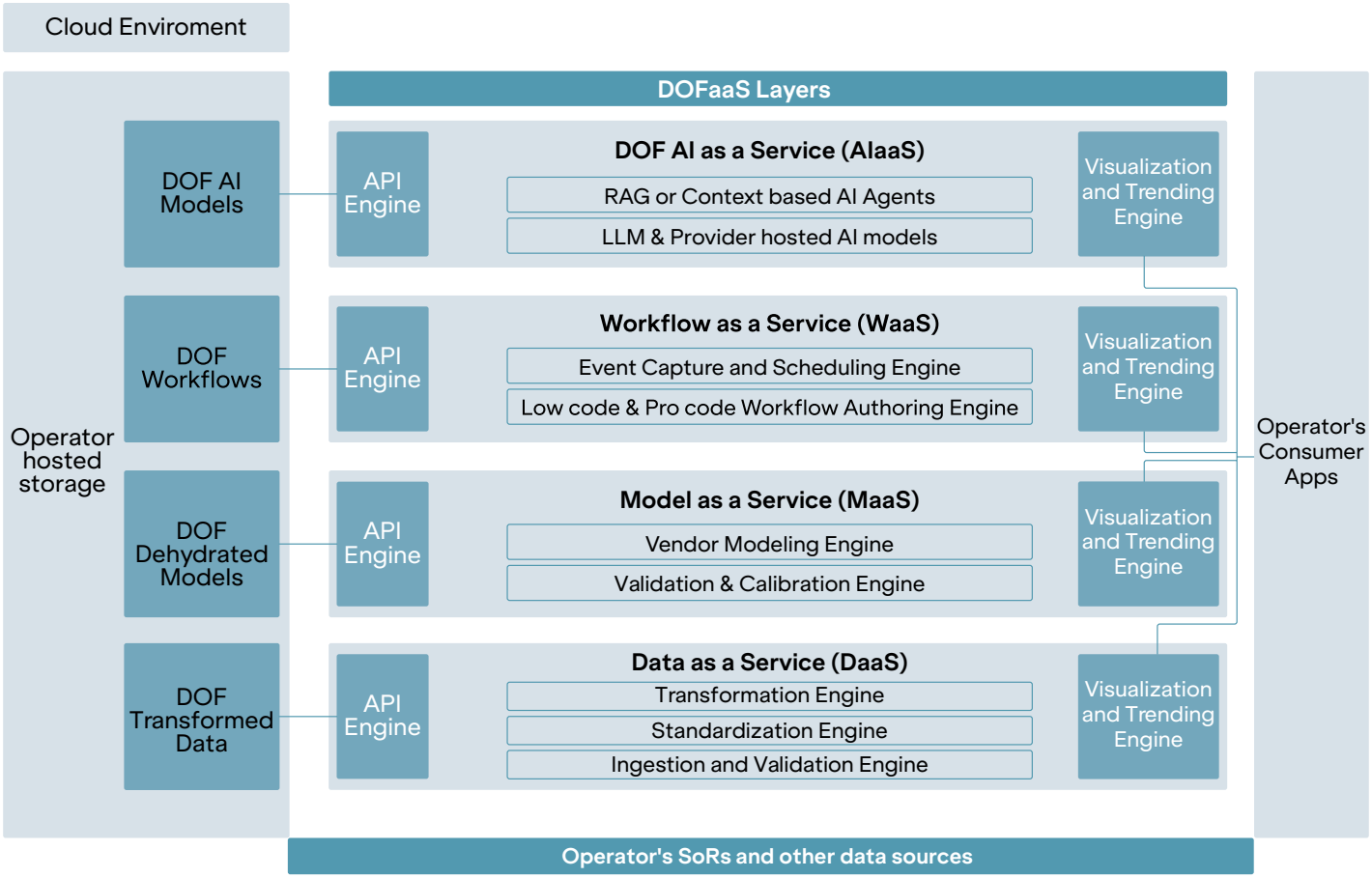


Fig 6. High-level Architecture Diagram

Visualization and Multi-Layer Insights

Each DOFaaS service layer provides dedicated dashboards, diagnostics, and analytics tailored to its outputs. In addition, cross-layer visualization enables operators to combine data, model results, workflow outputs, and AI insights into a unified view. This provides end-to-end surveillance, analysis, and decision support across the digital oilfield.

Role-Based Access and User Segmentation

Integration with the operator's RBAC framework provides secure, role-based access to visualizations and services. It delivers customized views and permissions aligned with each user's operational responsibilities.



Service Delivery & Operating Model

DOFaaS combines continuous innovation with governed, high-reliability operations. It does so through evergreen updates, managed AI lifecycle processes, and SLA-driven service delivery. Performance is measured through defined SLIs, SLOs, and contractual SLAs. These cover availability, data quality, workflow execution, AI performance, and incident response.

Business outcomes are tracked separately through shared KPIs. The platform provides 24/7 monitoring and multi-tier support, including self-service tools, technical support, domain experts, and vendor assistance.

Structured incident management, automated alerting, performance reporting, and controlled release processes ensure operational reliability and continuous improvement. They also minimize disruption.

A formal RACI governance model defines clear responsibilities across the Operator, Service Provider, and Vendors. The Operator retains ownership of data, policies, workflows, and operational decisions. The Service Provider manages the DOFaaS platform, security, data processing, models, workflows, and AI services under agreed SLAs.

Vendors remain responsible for their proprietary tools, updates, support, and compatibility.

Together, these roles provide a secure, compliant, and continuously improving foundation for scalable digital oilfield operations.

Use Cases

Data as a Service (DaaS) provides a trusted, centralized data foundation. It enables real-time visibility, cross-asset surveillance, advanced analytics, and AI-driven insights.

Modeling as a Service (MaaS) delivers browser-based, vendor-neutral access to cloud-hosted models. This enables broader use of modeling capabilities, scenario analysis, and innovation without specialized infrastructure.

Workflow as a Service (WaaS) enables low-code and pro-code workflow automation. It supports model-driven optimization, management by exception, and controlled execution of operational recommendations.

DOF AI as a Service (AIaaS) leverages trusted data, models, and workflow outputs to provide contextual insights, anomaly detection, predictive maintenance, failure forecasting, and explainable recommendations.

Together, these capabilities enable scalable AI-driven decision support across assets.

Roadmap for Implementation

DOFaaS adoption follows a phased roadmap. It progresses from digital readiness and connectivity to data platform deployment, vendor enablement, visualization, AI adoption, and workflow automation. The approach establishes a trusted data foundation and enables cloud-native operations. It then progressively advances toward autonomous, AI-driven optimization.

Implementation follows a pilot-to-scale model. It begins with Proofs of Concept (POCs) to validate key capabilities. Minimum Viable Products (MVPs) then measure performance and user adoption. The process culminates in enterprise-scale deployment governed by SLAs, change management, and operational standards. However, successful adoption requires strong change management. This includes role-based training, user enablement, continuous feedback, and executive sponsorship. Early value delivery, cross-functional champions, and alignment between business and engineering teams help embed DOFaaS into everyday decision-making and operations.

Risks, Challenges & Mitigation

DOFaaS addresses key risks through secure architecture, governance, and operational controls. Cybersecurity is enforced through Zero Trust principles, encryption, secure execution environments, and strict access controls. Data sovereignty is maintained through operator-controlled storage, with production data and engineering models remaining under operator ownership and only approved metadata and audit records retained.

Vendor-neutral, API-first architecture reduces vendor lock-in and simplifies integration across multi-vendor and legacy environments through standardized interfaces and modular services. Successful adoption is supported through strong change management, including leadership sponsorship, training, communication, and early value demonstrations that encourage confidence in data-driven and automated operations.

Future Outlook: Autonomous Digital Fields

The long-term vision for DOFaaS extends beyond automation and optimization toward intelligent, increasingly autonomous field operations. AI copilots will interpret real-time conditions, diagnose issues, generate recommendations, and assist engineers and operators with planning and field execution. The integration of real-time data, dynamic models, and AI-driven reasoning will support automated well control, production optimization, and equipment management.

Predictive maintenance insights will connect with supply-chain systems to optimize inventory, reduce lead times, and improve reliability. Enterprise planning and real-time field execution will also become more closely integrated to enable synchronized optimization from the reservoir to the boardroom.

Self-healing systems will detect anomalies, initiate corrective workflows, recalibrate models, and perform self-validation to reduce downtime and improve resilience. VR/XR capabilities will further provide immersive asset visualization and may enable authorized remote interaction with field systems, including controlled adjustments to operating parameters. However, operator accountability remains unchanged.

All AI recommendations, automated actions, and VR/XR-enabled controls must remain within operator-approved operating envelopes, authorization policies, cybersecurity controls, process-safety systems, validated interfaces, role-based permissions, and human-oversight requirements.



Conclusion

Digital Oil Field as a Service (DOFaaS) provides a scalable, secure, vendor-neutral, and operator-controlled framework for delivering data, modeling, workflow, and AI capabilities through a managed-service model. By bringing these capabilities together within a structured operating model, DOFaaS enables operators to accelerate digital transformation and improve operational efficiency. It also establishes a foundation for continuous optimization and operator-governed autonomous operations.

More broadly, DOFaaS creates an opportunity to move beyond conventional digital oilfield models. It brings human expertise, engineering judgment, data, and intelligent systems together within a more flexible operating model.

This is where Business Creativity becomes relevant to the evolution of the digital oilfield: not simply adding more technology but rethinking how digital capabilities come together to create new ways of operating. DOFaaS provides the foundation to Outcreate traditional digital oilfield constraints, replacing fragmented, technology-led operating models with a more connected, intelligent, and operator-controlled approach.

References

1. *Building the Digital Oilfield Vision,* Michael Maltsev, Energy Workforce & Technology Council, 23 July 2025, https://energyworkforce.org/building-the-digital-oilfield-vision/#:~:text=The%20digital%20oilfield%20concept%20has,facets%20of%20onshore%20operations1

2. *The Rise of Service-Based Business Models,* NTT DATA Group, 29 March 2023, https://www.nttdata.com/global/en/insights/focus/2023/the-rise-of-service-based-business-models

3. *Modernizing Oil & Gas Pipeline SCADA Systems with Cloud and AI,* AppsTek Corp, https://appstekcorp.com/white-papers/modernizing-oil-gas-pipeline-scada-systems-with-cloud-and-ai/

4. *Upstream Oil and Gas Investment Outlook,* International Energy Forum and S&P Global Commodity Insights, June 2024, https://www.ief.org/_resources/files/reports/upstream-oil-gas-investment-outlook-2024.pdf

5. *Oil and Gas Industry Shows Discipline on Capex, but Risks Remain,* Sung Je Byun, Federal Reserve Bank of Dallas, 31 March 2025, https://www.dallasfed.org/banking/pubs/dfb/2025/2501#:~:text=Capital%20expenditure%20(capex)%20is%20a,capital%20discipline%20and%20maintenance%20capex.

About the Author



Vishnu Subash

Associate Principal, Package Implementation, LTM

Vishnu Subash is a Digital Oilfield Technical Lead with around 15 years of experience in software engineering, cloud technologies, data analytics, and digital oilfield solutions. He specializes in cloud - native digital transformations, workflow automation, AI - enabled optimization, and scalable Digital Oilfield architectures. He is passionate about advancing intelligent, autonomous, and data-driven energy operations.

LTM — a Larsen & Toubro Group Company — is an AI-centric global technology services company and the Business Creativity partner to the world's largest enterprises.

We bring human insights and intelligent systems together to help clients create greater value at the intersection of technology and domain expertise. Our capabilities span integrated operations, transformation, and business AI — enabling new ways of working, new productivity paradigms, and new roads to value. Together with over 87,000 employees across 40 countries and our global network of partners, LTM owns outcomes for our clients, helping them not just outperform the market, but Outcreate it.

© LTM