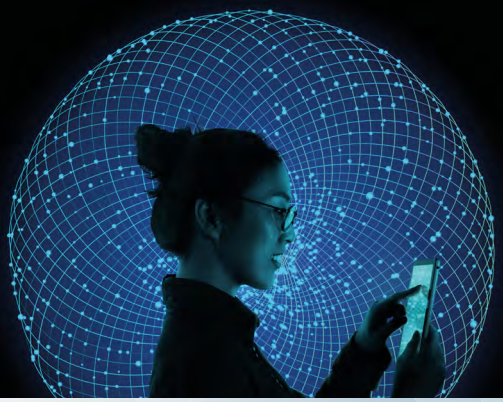
Deloitte.



Driving Competitive Advantage through Oracle Cloud, Edge Computing and AI

Powered by Intel® & Deloitte

Leveraging Cloud, Edge Compute and Human-Centric AI to Accelerate Your Business Goals

Organizations looking to transform their business with data are spending millions on automation capabilities, instrumentation, and digitization. These capabilities are being procured and deployed to make organizations more efficient by providing more insight into operations. This data-driven approach to operations can promote faster revenue growth, lower cost of goods sold, better margins, reduced risk, and improved competitive advantage. These organizations are involved in highly complex operations that generate large volumes of data representing the state of a physical system or a process at any given time. For instance, a typical offshore oilfield generates about 100 million time-series records per day; or an integrated steel plant generates data from all the sensors and instrumentation to the tune of about 5 million measurements per second1. These large volumes of high-speed data elements are used for actionable insights that drive business decisions.

A well-defined Information Technology – Operations Technology (IT/OT) architecture, consistency in technology capability in the data center and the edge, integration, data migration, data movement, and ease of use, become critical enablers for success. Furthermore, many organizations face skill gaps with their current employees and a shortage of available workers in the market today. Transforming the workforce and investing in highly specialized staff that understand complex IT, including cloud and edge computing technology, artificial intelligence, data science, digital twins, and individuals with the industry expertise to interpret the engineering and science behind the produced data, is a challenge.

To meet this challenge, organizations should consider the following:

1. Leveraging cloud and edge computing that offers consistency in engineering and performance for growth and scalability. Use of **Intel®** technology at the Oracle cloud core and the edge can ensure that.

2. Building systems designed to leverage all data produced at high-speed.

3. Leverage advances in technology around digital twins to accelerate problem resolution in various applications such as manufacturing, energy production, defense operations, and building and infrastructure management.

4. Implementing human-centric technologies that automate analysis of data and provide easy-to-understand, reliable, actionable insights.

5. Designing systems that accelerate learning, enable virtual problem solving, and enhance future system design and engineering.

6. Onboarding a System Integrator (SI) partner with a depth and breadth of technology and industry capabilities to lead through the transformation journey. Deloitte has built solutions involving Oracle Cloud Infrastructure (OCI) and Oracle Roving Edge (RED) device with **Intel® Xeon®** technology, to solve complex problems.

Deloitte has the experience to build better solutions using the Oracle and **Intel®** technology stack across the IT and OT silos of the customer enterprises. **Intel®** has developed a digital twin AI reference kit, which can speed up training and inference of digital twin behavior both at the cloud core and the edge. These solutions are crafted for higher performance and delivering business outcomes, in a rapid fashion. The ability to unleash the maximum potential of this technology stack, like a driver of top-of-the-line racecar, comes with years of experience, on working on challenging real-world problems. Deloitte brings virtually unparalleled knowledge in major industry domains, to accomplish this, alongside the technology provided by **Intel®** and Oracle.

Figure 1: Oracle and **Intel®** technology stack for AI

Deloitte's alliance relationships with **Intel®** and Oracle reduces the time to value for the enterprise customers. Such an approach for enterprise-grade AI and edge applications for complex problems, often works better than home-cooked solutions. Deloitte professionals can explain such recipes for success with customer success stories.

Visit this link to watch a short video on how we help customers drive competitive advantage through Oracle Cloud, edge computing, and AI.

Growth and scalability that cloud and edge offer

By now, most organizations are familiar with the benefits that are derived from moving their technology systems to public cloud. The cloud allows organizations to grow and scale their operations as needed and with greater velocity than making on-premises IT purchases and building in-house complex technology systems. Cloud enables greater access to resources, improved disaster recovery and business continuity, and increased collaboration. Many cloud platforms provide Internet of Things (IoT) platforms or applications and digital twin solutions. Digital twins can simulate the behavior of a product, process, or system and monitor it in real-time; this can aid in understanding the root cause of problems and finding optimal solutions.

However, a new frontier for many organizations is edge cloud services. Edge cloud services can bring your enterprise applications closer to the data sources, allowing for faster insights, better response times, and lower latency. A common theme among edge workloads is the need for Artificial Intelligence and Machine Learning (AI/ML) driven data analysis and local-access databases integrated into application tiers that need to run in the field. Cloud Services Providers, such as Oracle, are beginning to offer purpose-built edge devices designed to run in remote, semi-disconnected, or disconnected environments. When Oracle's RED is combined with AI/ML applications like Falkonry's Time Series AI Suite with Falkonry Insight, operations teams gain capabilities that were nearly impossible to achieve and analyze in near real-time due to latency and bandwidth constraints. By leveraging **Intel®** to process terabytes of data at plant scale, Falkonry can surface machine and process anomalies without needing manual intervention. Operations teams can virtually inspect every electrical and mechanical data point to automatically detect new and emerging hotspots of anomalous activity in their production data.

Falkonry Insight organizes detected anomalies by the plant's affected components, the anomaly's severity, and the main contributing factors. It also provides a collaborative reporting environment where operations and maintenance teams can confirm and catalog the behaviors by using rich time series visualization capabilities.

Deloitte and Oracle are collaborating Intel®. Intel® has AI selected AI reference kits for their impact on the problems they solve across various industries. Each kit includes an AI model developed to deliver higher accuracy, better performance in training and inference, and lower overall total cost of ownership.

Edge cloud services also enable federated learning by allowing your models to be trained on data stored and processed at the edge of a network rather than in a centralized location such as a data center. Federated learning is practical, where a large amount of data is generated by devices at the edge of the network, such as IoT devices. It would not be feasible or very expensive, to send all that data to a centralized location for processing.

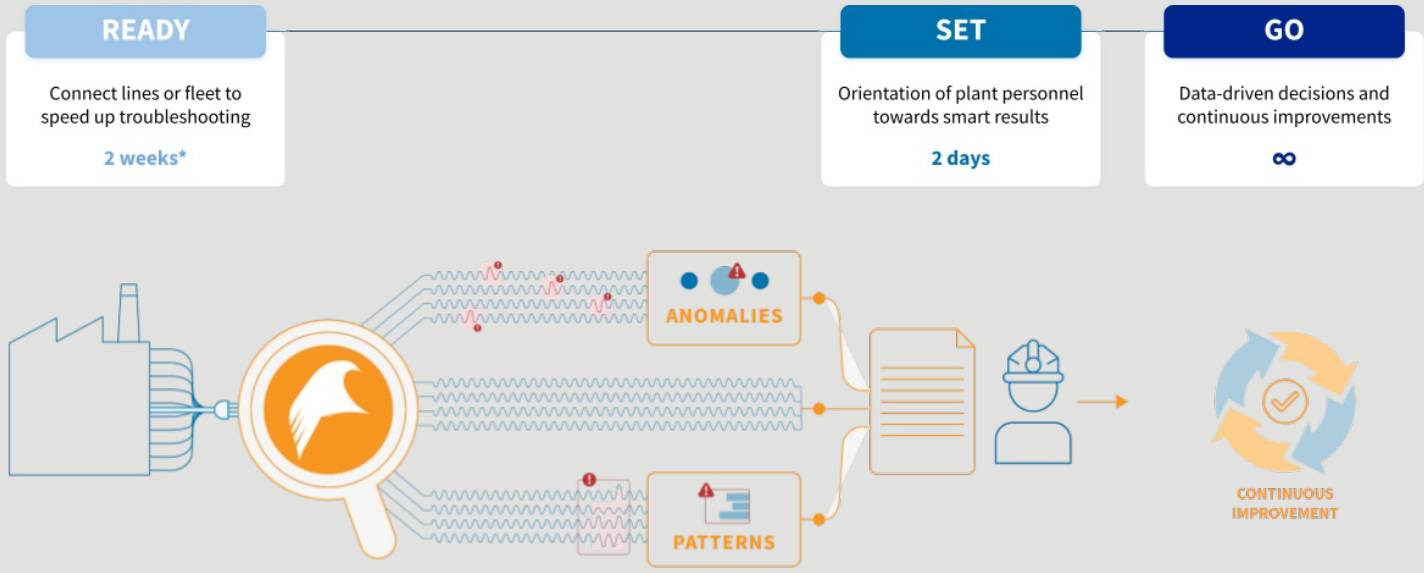


Figure 2: Anomalies Detection Framework

Source: https://falkonry.com/archives/author/ram-ballampallifalkonry-com/

In federated learning, a central server coordinates the training of a model across multiple devices or "edge nodes" that each has their data. Each edge node trains the model locally on its data and then sends its updated model parameters back to the central server. The central server then averages the updates from all the edge nodes to create a new global model, which is then sent back to the edge nodes for further training.

By processing the data at the edge, federated learning reduces the amount of data that needs to be transmitted over the network, which can reduce costs and improve the privacy and security of the data. It also allows for models to be trained on data that may be difficult or impossible to collect in a centralized location.

Overall, Federated Learning combined with Edge Computing allows more complex and more extensive models to be trained while keeping data in the local environment. It can also reduce the data transmission amount, thus limiting the latency and improving privacy or data residency needs.

Digital twins can often solve predictive maintenance issues with complex assets like power generators or aircraft engines. Digital twins can be used to simulate and analyze the behavior of physical systems, such as machinery and equipment. These digital twins are deployed at the edge to provide insights near the origin of the vast amounts of data. By monitoring the digital twin in real time, engineers can detect and predict issues before they occur, allowing them to schedule maintenance and repairs proactively, which can reduce downtime and improve equipment reliability. Further, digital twins can be used for remote monitoring and control of physical systems, such as industrial equipment or infrastructure, making diagnosing and fixing problems in the field easier.

Edge cloud services can benefit companies in several ways:

Lower Latency: Edge cloud services bring cloud computing closer to the source of data by hosting servers and other resources in more locations closer to the user. Edge computing can significantly reduce latency and improve the speed and performance of applications and services.

Cost savings: By reducing the distance data travels, edge cloud services can reduce the costs associated with data transfer and storage.

Improved reliability: Edge cloud services can improve the reliability of applications and services by providing multiple points of presence, reducing the risk of downtime.

Better data security: By processing and storing data closer to the source, edge cloud services can improve data security by reducing the risk of data breaches and other cyber-attacks.

Real-time processing: Edge clouds are particularly well suited for real-time data processing, like IoT devices. This ability can enable new use cases like predictive maintenance and machine learning on the edge.

Autonomous capabilities: Edge clouds enable companies to take advantage of the low latency and offline capabilities of edge computing to enable autonomous capabilities like robotics, drones, and self-driving vehicles.

Support for remote and disconnected areas: Edge clouds can support remote and disconnected areas where the data can be analyzed and processed locally before it's sent to a central location, making it feasible to have cloud services in these areas that were previously impractical.

Doing more with less: Human-centric technology makes the existing workforce more efficient.

As organizations become more data-driven, new technologies are introduced to generate and capture data at an increasing volume and velocity. At the same time, organizations face shrinking workforces and a need for more skilled talent to design, implement and adopt these new technologies. This "digital dexterity gap" caused by organizations introducing and depending on new technology faster than the current workforce's ability to adopt and use the technologies effectively leads to organizations deriving little value from investments in these systems. **Intel®** has developed a digital twin AI reference kit, which can assist applications to speed up training and inference of digital twin behavior modeling.

To help reduce the digital dexterity gap, organizations should turn to human-centric technology designed to work in harmony with human capabilities and limitations. A properly developed application can help meet the needs of the workforce and the organization. The workforce is provided autonomy, career development, and advancement opportunities and can more quickly integrate into the workforce. Organizations benefit because they can meet their goals of achieving continuous innovations, easier change management, and increased contributions from the workforce.

Digital twin technology can simulate real-life scenarios to train the workforce, enabling the employees to get hands-on experience before working on the physical systems. Digital twins can communicate complex information about physical systems to different stakeholders clearly and interactively. This can help everyone, from the engineer to the end user, understand the details of a system or process. Digital twin technology is an effective tool to address workforce productivity and accelerate problem resolution by providing more insight and control over physical systems, allowing engineers and operators to be more proactive, accurate, and efficient in troubleshooting, problem-solving, and optimization.

The foundation of any technology system is the underlying capabilities of the hardware your applications run on. As organizations build these human-centric applications, they should pay attention to the power of building out capabilities on a platform that offers consistency in engineering from the data center to the edge. Intel® has spent years solving the complexities of IT and operational divides, fine-tuning and validating edge software, and working with partners to bring hundreds of market-ready packages to customers. It's all backed by a trusted, mature development ecosystem, so you know it will be there when it counts. Working with Deloitte professionals can help ensure such solutions are properly implemented.

Oracle's OCI Cloud, combined with the Oracle RED, is an excellent example of how human-centric design begins with a consistent foundation. Oracle's cloud and RED offer organizations the ability to build, test and deploy their applications on the same reliable, performant **Intel®** platforms no matter where they're deployed. Additionally, the cloud administration and software functionality are identical, so cloud engineers only need to learn how to manage Oracle Cloud once and can deploy anywhere.

Figure 3: Oracle Roving Edge Device with **Intel® Xeon®** Technology

Source: https://www.datacenterknowledge.com/edge-computing/oracle-cloud-launches-oracle-red-portable-server-edge-computing

This consistently engineered cloud and edge computing environment combined with a purpose-built AI are the next generation of making more human-centric applications to increase the productivity of our workforce. When well-designed and implemented, Edge-driven AI can lead to faster, better, more informed decision-making by locating anomalies and contextualizing them from existing data sources.

Instead of manual data analysis by operators trying to use intuition to determine why an event is occurring, an automated AI system learns from millions of event data points. It can provide timely, actionable insights to staff in seconds, not hours or days, that it might take for an operator to sift through data. Empowering staff access to the correct information, at the right time, in an actionable way can lead to better outcomes for employees and organizations, such as:

1. **Increased productivity:** Human-centric technology can be designed to make tasks easier, quicker, and more intuitive to complete, leading to increased productivity and performance.

2. **Better decision-making:** Human-centric technology can provide people with the correct information at the right time and in the proper format, improving decision-making and leading to better outcomes.

3. **Greater engagement:** Human-centric technology can be designed to be more engaging, which can lead to increased motivation and job satisfaction, making employees more productive and efficient.

4. **Automation of repetitive tasks:** Human-centric technology can automate repetitive and monotonous tasks, freeing employees to focus on higher value-added tasks.

5. **Empowerment and autonomy:** By design, Human-centric technology can empower and enable people to take more control over their work; this can increase ownership and engagement with the process, leading to higher productivity and better outcome.

6. **Real-time feedback:** Monitoring tools can give real-time feedback to the workers about the operational performance, which can help them to adjust the processes, improve productivity, and reduce errors.

Overall, human-centric AI can improve the workforce's efficiency by making tasks easier, quicker, and more intuitive to complete, reducing fatigue and injuries, improving decision-making and engagement, and empowering people to take more control over their work.

Accelerate ramp up through virtual problem-solving and digital knowledge capture.

To truly understand a situation, one needs to observe it and where it happens. This key manufacturing principle is known as Genchi Genbutsu (or the 'Gemba attitude' as it is popularly called). The underlying premise here is that you only understand what you experience with your senses; therefore, you must be out where the action (and problems) happens. This boots-on-the-ground approach has been used for decades, but how many places can we be at once? Do we have the people required to achieve it faithfully? A possible way to overcome this challenge is to do some of it virtually and help operations teams prioritize their physical interventions.

Combining data from the edge and an AI system that is continuously learning creates a powerful capability for learning and virtual problem-solving. Digital twins create an opportunity to train your operations team before they set foot in a factory or onboard a ship. Digital twins are digital representations of physical systems or processes that can be used to simulate and analyze their behavior. Monitoring real-world conditions remotely and solving physical problems as they arise is key for the future workforce. This approach also helps capture the tacit knowledge of subject matter experts into the digital record system for enhanced and collaborative problem-solving.

Use Case

These real-world use cases demonstrate how organizations leading the digital pursuit leverage cloud-edge computing and advanced analytics capabilities to unlock new realms of operational excellence.

Department of Defense (DoD) Implementation

The DoD aims to improve operational readiness and performance in its modern vessel classes. Digital modernization programs have resulted in vessels outfitted with thousands of sensors, each sampling at a rate of 1 Hz to 10kHz. Falkonry enables the DoD to exploit vast volumes of time series automation data from complex systems-of-systems to enhance mission readiness. Falkonry applications are used directly by the DoD crew and design teams. The solution encompasses on-shore instances for use by design engineers and in-service engineering agents (ISEAs) across a class of ships and self-contained, detached on-ship instances for real-time analysis during deployments.

This first-of-its-kind AI deployment is carried out with a Falkonry-designed reference architecture using Oracle Cloud Infrastructure's (OCI's) distributed cloud. It enables better performance and reliability awareness using ultra-high-speed electrical and mechanical time series data from thousands of sensors. Falkonry's insights are then surfaced through its browser-based UI and integration with Beast Code's 3D digital twin of each vessel. This integration provides the world's first live smart digital twin, which provides real-time analysis of a ship's operations within the context of an interactive digital replica of the vessel.

North American Stainless (NAS) Digital Factory

A typical integrated steel plant is heavily instrumented and could have up to 30,000 signals captured from various equipment and sensors. Yet, only a few hundred are utilized for live monitoring of the operations. North American Stainless (NAS), one such leading steelmaker, embarked on a digital transformation journey to efficiently use all available data to improve its steel mills' process, quality, and productivity. NAS leveraged Falkonry's unique no-setup AI to automatically analyze high-speed time series data and gain a better understanding of its operations. One use case involved a Hot Run Table (HRT), which consists of a series of table rollers that transport the steel strip between the finishing mill and the coiler, cooling the strip to the desired temperature before coiling. This HRT consists of 188 rollers, each powered by an electric motor. Each motor is equipped with a sensor that measures the current powering the roller. The motors must operate at precise current levels at all times to maintain the highest quality of the passing steel strip, specifically when the steel strip is moving through the hot run table. Any inconsistencies during operation would result in scratches or other defects on the steel strip leading to the entire sheet being scrapped. Therefore, it is imperative to have a live monitoring system that automatically surfaces any anomalous behavior as it happens and enables the engineers to perform rapid root cause analysis to prevent any detrimental impact on the production and product quality.

With Falkonry's cloud-based AI system, NAS turned time series data into insights consumable by the end-users responsible for ensuring the highest productivity and quality. Falkonry eliminates manual data analysis and provides the operations staff with actionable insights on the excursions that need their attention. Thanks to access to a secure and scalable computing infrastructure, the AI is readily scalable for plant-wide monitoring of production operations.

Please reach out to the Deloitte/Intel® team to find out more about turning your information into timely and actionable insights.

Jake Hall
Senior Manager
Deloitte Consulting LLP
Tel/Direct: +1 703.687.7918

Mark Saltzman
Specialist Leader
Deloitte Consulting LLP
Tel/Direct:+1 305-808-2392

Shyam V Nath
Specialist Leader
Deloitte Consulting LLP
Tel/Direct:+1 925-549-7135

Deloitte.

intel. ORACLE Cloud Infrastructure

Designed by CoRe Creative Services RITM1335554