

Data generated at the edge is a critical input for AI to ensure that models remain accurate and effective, especially as AI interacts in real-world environments. Accurate, trustworthy AI requires infrastructure platforms that meet the unique demands of distributed computing.

Edge AI: Why Platform Anatomy Matters

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Introduction

Edge AI platforms underpin more advanced, intuitive, and proactive operations and processes. By gathering, analyzing, and acting upon real-time data at the edge, industries are completely reshaping outcomes for the better. Examples include:

- » Driverless vehicles can "see" a cyclist behind a building before they reach an intersection, preventing a potential crash.
- » Industrial manufacturers deploy AI-driven predictive and proactive maintenance on machinery, improving uptime and eliminating the cost associated with time-based maintenance.
- » Healthcare providers use AI-augmented imaging diagnostics to improve accuracy; surgeons leverage AI-powered surgical robots to speed procedures and reduce errors.

As AI advances, the goal is to reduce or completely prevent the occurrence of problems, whether this means avoiding an automotive accident, fixing problems in the manufacturing line before they occur, or improving patient health.

Each industry and use case is very different, but what is common across all industries is the need for a platform that supports a cycle of continuous learning and development. The traditional cycle of train once and run forever is obsolete. Emerging workloads are incredibly dynamic, sensing and reacting to real-world situations and data in real time. These workloads need a platform that spans the entire data ecosystem, from creation to analysis to action. Data generated at the edge is a critical input for AI to ensure that models remain accurate and effective, especially as AI interacts with real-world environments. Continuous learning and feedback with edge data improves performance and reduces model degradation. Leveraging AI requires infrastructure platforms that enable data from many sources and locations to be gathered, analyzed, protected, and acted upon. The new IT landscape needs to address the myriad of data-gathering and data-generating sources at the edge and merge them with cloud and core datacenter resources.

AT A GLANCE

WHAT'S IMPORTANT

- » Edge AI needs a continuous cycle of learning to be trustworthy and effective.

KEY TAKEAWAYS

- » Edge AI platforms must be resilient and operate autonomously with limited human intervention.
- » Modern platforms are evolving to support a myriad of edge devices and IoT sensors that dynamically share data.

Platform anatomy matters for edge AI

At the edge, compute, and connectivity infrastructure are the brain and central nervous system for AI. The anatomy of an edge AI platform matters. These platforms must be resilient and operate autonomously, with limited human intervention. Many edge use cases require mission-critical IT services. Without dependable connectivity, even the most powerful processors and analytics engines will have limited usefulness. AI systems at the edge are only as strong as the network that connects the devices — devices that gather data, compute that analyzes data, and storage that secures and retrieves the data.

Today, connectivity needs to be much more dynamic than the traditional two-way edge-to-cloud and cloud-to-edge architectures. Modern platforms are evolving to support a myriad of edge devices and IoT sensors that dynamically share data. This evolution dramatically alters dataflows. Devices share data with other devices, and cloud and core systems share data with distributed platforms. The connectivity infrastructure becomes extremely complex and intertwined, placing more pressure on IT organizations to modernize their data management and security processes. The shift to highly distributed infrastructure and applications impacts more than location — it is a fundamental change in IT strategy. A "distributed by design" platform enables, connects, and secures a diverse set of resources and data.

Benefits of modern edge AI platforms

Platforms designed for the unique challenges of edge AI deliver the following benefits:

- » **Improved decision-making and predictive capabilities:** Real-time data processing and decision-making drive faster and more optimized operations. Decisions can be made more quickly without the latency of moving data from the edge location to the cloud platform hosting AI. With edge AI, organizations can more rapidly respond to changing demands and conditions.
- » **Increased accuracy and precision:** By learning patterns from large volumes of data, reducing human variability, and adapting decisions in real time, edge AI systems in industrial manufacturing, robotics, and healthcare can perform tasks more accurately and precisely.
- » **Reduced safety risks:** Tasks that are tedious, demanding, and repetitive and that present physical risk to humans can be shifted to AI-enabled robots powered by edge compute.

IDC's research shows that organizations that have invested in edge computing platforms recognize a number of measurable benefits (see Figure 1).

FIGURE 1: *Benefits of edge investments*

Q *What did your organization gain from edge investment?*



n = 800

Source: IDC's Edge View Survey, January 2025

Trends in edge AI

The trends discussed in the sections that follow bear watching by IT organizations.

Uptick in digitally enhanced operations

The transition to digital operations is well underway. IDC research showed a sharp uptick in edge investment for digitally enhanced business and field operations in 2025, signaling that edge projects are maturing and providing value, according to IDC's January 2025 *Edge View Survey*. Much of the early investment addresses proof-of-concept projects. As projects advance past the proof-of-concept stage, organizations find it challenging to grow and scale to new locations. Getting from an innovation idea pipeline to a full-scale deployment is a major step, hindered by affordability and complexity.

Integration challenges

IDC's research found that 83% of organizations report that they look for edge providers and partners that have the ability to integrate with their existing core and cloud datacenter deployments and that 81% look for providers that can guarantee the compatibility of all components. Edge AI is a complex set of hybrid resources that need to work together in synchronization. One of the biggest challenges organizations face is integrating data and applications from diverse sources. Each industry and use case will require at least 20% of time and cost investment dedicated to the unique needs of the process. By starting with a purpose-built platform for edge AI, the IT organization can reduce the amount of time it

spends on connecting resources and instead focus on innovating with technology to overcome unique business and operational challenges. A modern platform that supports heterogeneous, hybrid resources can make it exponentially easier to deploy applications and use cases across edge, core, and cloud data and applications.

Increased focus on life-cycle management

As IT environments become increasingly distributed, ensuring consistent data security grows more complex, particularly as edge AI deployments generate a continuous flow of data, models, and application updates across distributed locations. In highly regulated industries, security concerns extend across the full life cycle, not just data at rest or in transit. Data is generated and processed at the edge, securely aggregated into a centralized cloud environment where AI models are retrained and applications refined, then redeployed back to edge devices. This closed-loop cycle repeats continuously, increasing both the operational complexity and the importance of enforcing consistent security, compliance, and governance at every stage.

To scale edge AI effectively, organizations must shift beyond point solution approaches and establish a life-cycle management strategy that governs how data, models, and applications traverse the edge-to-cloud continuum and back. Achieving this requires a unified approach across heterogeneous environments, encompassing edge execution, secure data aggregation, model iteration, and controlled redeployment. Organizations that standardize processes across distributed locations will be best positioned to scale edge AI without compromising security or compliance.

Considering Wind River

Wind River aims to provide organizations with the infrastructure and tooling to support edge AI innovation. With more than four decades of experience supporting customers in manufacturing, telecom, and automotive industries, the company has a deep understanding of mission-critical environments. Its parent company, Aptiv, is a major player in the automotive industry, providing platforms for driverless vehicles.

Wind River approaches edge AI as an enabler of a continuous, closed-loop life cycle, sensing, thinking, acting, and optimizing, in which data is generated and processed at the edge, securely aggregated into a cloud environment, used to retrain models and refine applications, and then redeployed back to edge devices. Rather than addressing edge execution or cloud orchestration in isolation, Wind River's broad platform of infrastructure, management software, and analytics capabilities spans the full continuum from deeply embedded systems to enterprise infrastructure, allowing organizations to enforce consistent security, compliance, and governance at every stage while freeing customers to focus on innovative AI models and custom use cases. Wind River's edge AI platforms and tools span the embedded-to-enterprise continuum:

- » Unified infrastructure management across datacenter and edge locations (Wind River Cloud Platform)
- » Commercial Linux for edge systems (eLxR Pro)
- » Embedded Linux for edge platforms (Wind River Linux)
- » Certified real-time operating system (RTOS) for deterministic, mission-critical operations (VxWorks)
- » Type 1 hypervisor for security, safety, and hardware scalability (Helix)
- » Scalable analytics and orchestration tools (Wind River Analytics, Wind River Conductor)

Challenges

When technology begins to influence and interact with real-world physical systems, the stakes are extremely high. Unlike a controlled laboratory setting, the real world presents a constant stream of novel situations, unexpected obstacles, and varying conditions, and critically, these systems interact directly with people. Medical devices monitoring patient vitals, autonomous vehicles navigating public roads, aircraft flight management systems, and emergency 911 services running over 5G networks are all examples where edge AI is no longer an IT concern alone: failure is not an option. The potential for danger is great, and IT organizations will be under tremendous pressure to establish protocols that reduce risk, as missteps in these environments can have life-critical consequences. To address these risks, IT organizations must adopt rigorous testing, validation, and certification procedures long established in mission-critical OT environments, disciplines where determinism, reliability, and safety are nonnegotiable by design. For many IT organizations, this will be new territory, requiring meaningful adaptation and investment in expertise. The process from concept to project rollout may take longer than anticipated. Integration issues and the technical complexity of projects require expertise and time. To ensure progress, it is paramount that a solid business case for continued investment is communicated. There is great potential to radically transform processes with technology. However, it is critical to educate business leaders and decision-makers on the importance of high-quality data and platforms that support data analysis and action from core to cloud to edge.

Gaining market share in new industries and use cases will require a concerted effort, as it would for any platform provider entering an organization for the first time. The nature of edge AI projects requires deep connection between multiple organizational processes to yield full value. Growing the customer base will require the ability to prove that it has a superior platform. IT organizations do not make these shifts easily, and building trust takes time. Wind River's decision to support heterogeneous platforms as well as offering its own solutions bodes well for gradual growth and adoption. Customers will appreciate the ability to integrate Wind River solutions as they see fit, without being required to make a wholesale platform change. Through its association with parent company Aptiv, Wind River is well positioned to confirm the reliability of its platform. Wind River has a deep understanding of the need for highly resilient infrastructure to support mission-critical edge operations.

Conclusion

Edge AI platforms are transforming industries and outcomes by enabling real-time data collection, analysis, and action where the data is created — at the edge. The anatomy of edge AI platforms is a critical factor in ensuring trustworthy, reliable AI. The evolution toward "distributed by design" IT strategies is reshaping how data is managed and leveraged. IT organizations are adopting new approaches to integration, security, and life-cycle management. To succeed with edge AI, organizations must prioritize platforms that are resilient, secure, and capable of supporting distributed, hybrid environments.

Edge AI platforms are transforming how industries sense, think, and act in the real, physical world.

About the analyst



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Olga Yashkova is a research manager within IDC's Worldwide Telecommunications research organization, where she leads coverage of edge platform trends and strategies and the infrastructure ecosystems that support them. Her research examines the interplay of physical infrastructure, software, and services that enable secure, resilient operations at the edge, with a growing focus on how organizations across industries are designing and executing edge AI strategies to drive operational intelligence at scale.

MESSAGE FROM THE SPONSOR

Wind River provides software platforms that enable deployment and lifecycle management of edge AI workloads in mission-critical industrial and enterprise environments, including manufacturing, energy, transportation, and retail. Its portfolio spans real-time operating systems like VxWorks, Linux distributions such as eLxR Pro, and cloud-native orchestration tools that support containerized AI applications at the intelligent edge. These technologies are designed to deliver deterministic performance, high reliability, and efficient use of compute and power resources where latency-sensitive inference is required. Wind River also collaborates with ecosystem partners, including silicon and AI software providers, to build integrated solutions for running optimized models close to data sources. To learn more about Wind River edge AI use cases and platforms, visit: [https://www.windriver.com/solutions/learning/intelligent-edge?utm_source=content&utm_medium=referral&utm_campaign=edge ai overview](https://www.windriver.com/solutions/learning/intelligent-edge?utm_source=content&utm_medium=referral&utm_campaign=edge%20ai%20overview).



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