

# Simplifying and **accelerating AI-driven** change in manufacturing





**Artificial Intelligence (AI) promises to revolutionize manufacturing with highly automated and intelligent factories populated by robots and digital technology. The future looks bright, but the “here and now” can feel like setting off on a long journey without directions, during rush hour.**

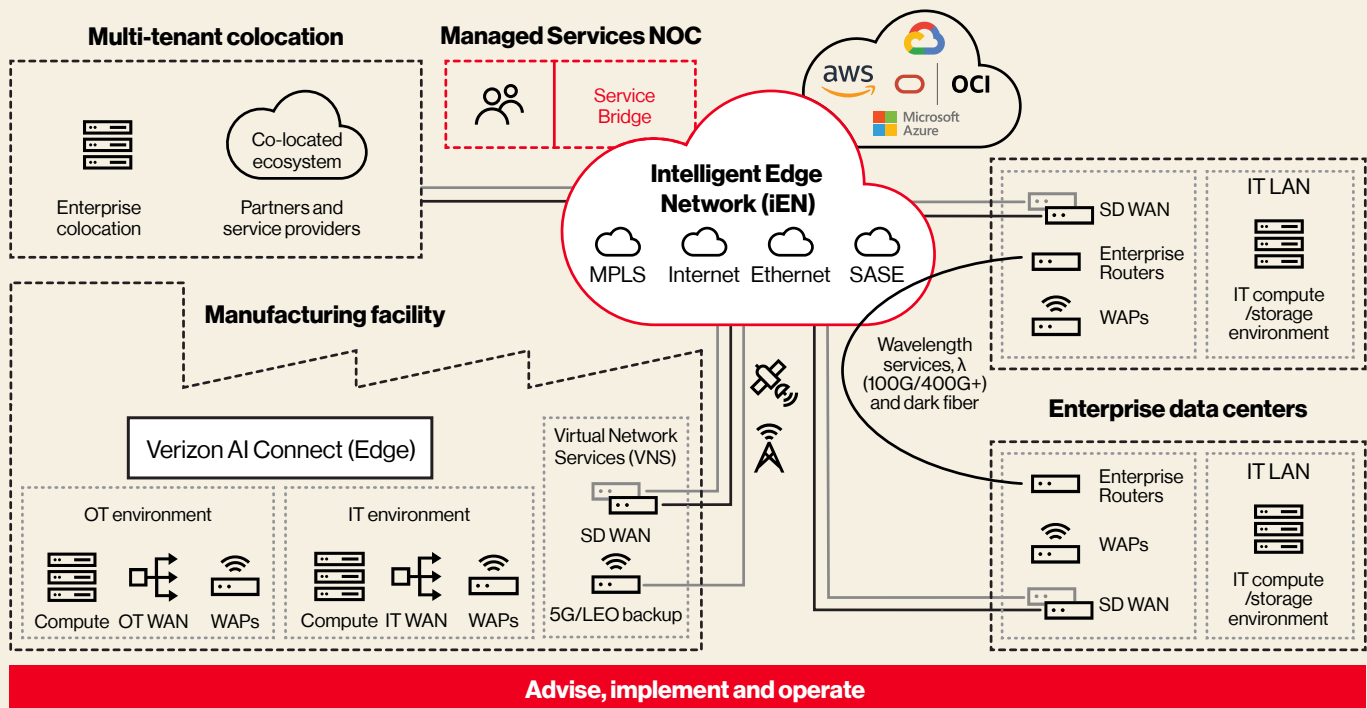
The paper looks at the core challenges: massive data volumes trapped in quasi-air-gapped, bandwidth-constrained sites, fragmented third-party vendor connectivity and AI models whose real-world accuracy and scalability are limited by latency and infrastructure gaps. We will explain, illustrated by key manufacturing use cases, how Verizon AI Connect can help manufacturers operationalize AI by unifying connectivity, compute, storage and security across IT and OT environments.

Verizon AI Connect leverages Verizon's extensive network and edge assets to create an exclusive “private highway” that enables fast, secure movement of data between factory floors, near-edge facilities and centralized GPU-as-a-Service (GPUaaS) environments. This can help accelerate training and inference to simplify and de-risk the creation, deployment and operation of scalable and responsive AI-based applications.

This portfolio simplifies the adoption of AI by replacing the complexity of multi-vendor solutions with a tried-and-tested integrated ecosystem. Combined with its predictable monthly costs this can help de-risk AI initiatives, give companies greater confidence to innovate and help achieve better results, sooner.

**The manufacturing industry is in the midst of a profound transformation, driven by Industry 4.0 technologies and a surge in data creation on the factory floor.**

# Verizon AI Connect in a nutshell



The Verizon AI Connect portfolio includes GPU/compute (purchased separately), storage, networking and management to help simplify the journey to AI. It integrates seamlessly with on-premises solutions and enables secure access to all data from the safety of the enterprise.

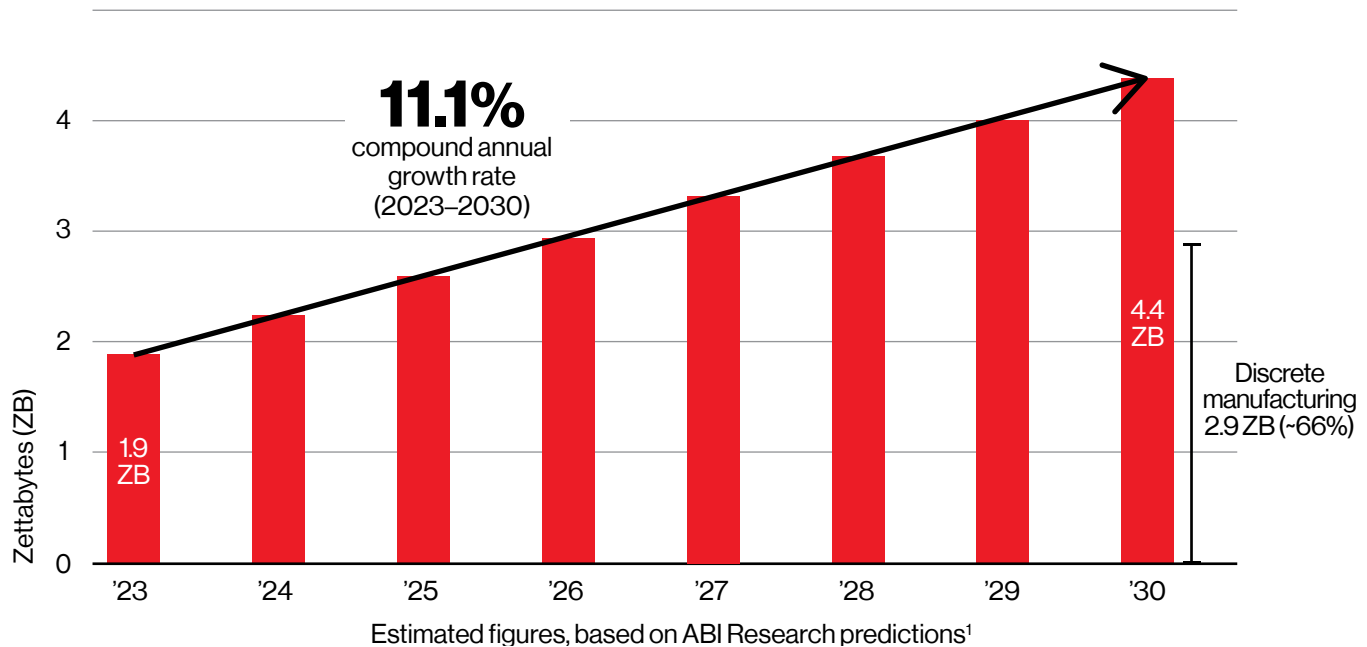
The Verizon AI Connect architecture covers all modern connectivity options, both wired and wireless. It's made up of three main components:

- **Intelligent Edge Network (iEN) (see page 10):** The foundational network strategy for scalable programmable connectivity—including dark fiber and high-speed wavelength service capabilities.
- **AI Pods and AI Edge (see page 10):** Pre-validated infrastructure designs that combine compute, storage, networking and orchestration so enterprises can deploy AI stacks more quickly.
- **Advisory and managed services (see page 11):** The operational layer that supports implementation, and ongoing management.

Customers can deploy GPU, compute and storage resources needed to host their AI applications on-site or in a multi-tenant colocation facility, leveraging Verizon's Intelligent Edge Network to deliver the performance needed to support latency-sensitive use cases.

# The manufacturing landscape

Volume of data captured by industrial manufacturers each year (Zettabytes)



**Manufacturers aren't short of data. And with the growth of technologies like Industrial Internet of Things (IIoT), the volume created continues to grow exponentially. ABI Research has forecast that it will reach 4.4 Zettabytes (4,400,000,000,000 GB) per year by 2030.<sup>1</sup>**

## Bridging IT/OT for success

While Information Technology (IT) governs the enterprise-level systems and data infrastructure, Operational Technology (OT) manages the critical physical processes on the factory floor, including machinery and control systems. Historically, these domains have functioned in isolation, each with distinct priorities and infrastructures.

A significant hurdle to bringing these environments together is the “quasi-air gap” nature of most factory data circuits. These often have limited bandwidth and restricted external access, creating substantial bottlenecks for data flow. The burgeoning demand for data will only exacerbate this challenge. Verizon AI Connect directly addresses this by dynamically expanding the capacity of data pipelines, flexing bandwidth to accommodate diverse use cases. Leveraging the Verizon Intelligent Edge Network dramatically reduces data round-trip times, enabling companies to deploy compute resources in multi-tenant colocation facilities, while providing the performance required to support latency-sensitive use cases.

Modern factories often host a multitude of vendors and partners, each with their own “as a service” (XaaS) processes that require data to be sent back to their respective clouds/data centers to enable maintenance, tracking and performance monitoring. Providing secure remote access for these third-party systems is a common headache on the modern shop floor. The problem is exacerbated by poor cellular coverage in the remote locations where many factories are sited and by signal distortion caused by factory walls and heavy machinery. This often leaves manufacturers with complex and problematic wide area network (WAN) environments to be that rely on fragmented virtual private networks (VPNs) and other connections that may not be secure.

The Verizon AI Connect portfolio integrates seamlessly with on-premises solutions and brings the programmable and scalable compute, storage, network and management required to make dedicated and secure network connections across facilities, to the cloud, and to service providers, to give the enterprise the performance and security that it needs. It enables communication with on-premises robots and machines, enabling a single pane of glass for improved ease-of-use, management and performance.

Verizon AI Connect provides unified and secure connectivity which can help to consolidate disparate solutions/systems. This not only simplifies the enterprise's network environment but also addresses a critical problem with a clear ROI. Instead of each vendor struggling to establish its own, often unreliable, connection back to its cloud for tracking and performance information. Think of the various stations in an almond mill — drying, roasting, cleaning — each may require separate secure communication with a different third party, Verizon can simplify this into a single, robust platform.

Verizon empowers manufacturers to overcome this complexity. This goes beyond simply running traffic through a dedicated router; it optimizes the entire management of third-party resources, helping to ensure seamless and secure data flow for critical maintenance and operational insights.

The Verizon AI Connect portfolio:

- Simplifies and consolidates complex IT/OT environments.
- Encompasses critical access capabilities.
- Enables fast and efficient expansion of network capacity.
- Enables seamless AI workload integration.
- Provides a unified platform to manage diverse systems and drive operational efficiency.

## The challenges of AI accuracy and scalability

Like other industries, manufacturing AI models are initially developed and tested in controlled cloud environments. But manufacturers face distinctive challenges deploying models to production — often within warehouses and remote facilities.

**“Our ML model was 95% accurate in training; 60% in production.”<sup>2</sup>**

Research shows that AI models that deliver impressive scores on synthetic benchmarks (84–89%) can see their effective accuracy more than halved (25–34%) when evaluated on messy, real-world tasks.<sup>3</sup> Such a precipitous drop in model accuracy can create substantial problems for global operations.

Autonomous agentic AI models are deployed in a hybrid edge-cloud ecosystem where inferencing is performed on the factory floor (the edge) and the intensive process of fine-tuning and retraining requires massive compute power, typically hosted in centralized, high-density GPU-as-a-Service (GPUaaS) environments (the cloud). This means that a vast amount of new production data — from video feeds for motion analytics and IoT sensors — must be constantly and securely transmitted for ingestion by these powerful off-site environments. In cases like this, slow or unreliable transfer of data, latency, becomes a critical factor.

To support these demands, enterprises typically face the need for substantial technology upgrades, including investments in edge servers, power and connectivity at numerous distributed locations. These extensive upgrades can be financially prohibitive, logistically complex.

By contrast, Verizon AI Connect provides a fast, scalable and secure data pipeline to move raw data from the edge to the dedicated AI compute environment where the data can be processed to develop insight. The agility it offers can help accelerate model development and enable the organization to seize more of the opportunities that AI offers.

# AI use cases in manufacturing

## Driving value beyond the shopfloor

For some, the mention of AI in manufacturing conjures up images of autonomous robots and fully automated production lines. Indeed, the ultimate extension of these concepts is “autonomous manufacturing loops,” closed-loop control systems where the AI:

- Detects deviations or opportunities via IIoT sensors and production data.
- Applies rules/models to decide the best response (e.g., new set points, different routing).
- Pushes those changes directly into equipment, robots or work orders.

However, the most impactful and achievable AI applications often reside “off the shopfloor.” There are significant opportunities to leverage AI in more passive, yet highly valuable, ways that directly enhance operational efficiency and workforce effectiveness providing support across the value chain. AI is already transforming areas such as sourcing, procurement and planning.

AI is also fundamental to advanced automation on the factory and warehouse floor. This includes core use cases like:

- Predictive maintenance: Forecasting equipment failure before it happens.
- Robotic guidance: Use of computer vision to dynamically adjust robot paths.
- Inventory optimization: analysis of spatial and movement data to maximize warehouse density.

These foundational applications rely heavily on the real-time data connectivity. However, the applications that are easiest to deploy and which offer the most immediate impact often involve leveraging existing data streams for high-value insights, focusing on augmenting human capabilities and quality control.

We'll cover some of the most promising use cases in manufacturing over the next few pages.

## Workforce empowerment



### Just-in-time (JIT) learning/ staff retention

**Solution:** AI can visualize standard operating procedures, enabling employees to pull up relevant video clips for JIT learning. Instead of relying on a radio call or a manager's immediate availability, an employee facing a complex challenge can rapidly get tailored instruction in an engaging and rich format.

**Benefits:** As well as the immediate improvement in productivity, this directly addresses the needs of digital natives and can significantly improve the retention employees by providing rich training resources on the spot.

Productivity

Retention

Agility

### Multi-modal, conversational legacy system engagement

**Solution:** AI is used to provide maintenance operatives with detailed, step-by-step guidance on fixes. Operators can ask questions hands-free in natural language using AI-enabled voice recognition. The system then analyzes context—including location data, camera footage, sensor data, maintenance logs and procedure manuals—to provide detailed guidance on a fix, including safety notes.

**Benefits:** Less time is spent searching for information. Safety is maintained as employees can get information without losing focus or removing safety gear—e.g., taking off a safety glove to operate a device.

Productivity

Safety

## Operational efficiency



### Predictive maintenance

**Solution:** AI is used to analyze real-time data from machine sensors (e.g., vibration, temperature, pressure) to predict equipment failures before they happen.

**Benefits:** This approach can improve the scheduling of maintenance by replacing regimented time-based programs with responsive, targeted scheduling. This can help increase mean-time between failures (MTBF), reduce downtime, make better use of maintenance resources, boost productivity and extend the lifespan of machinery.

Cost

Uptime

Utilization

### AI-assisted quality control

**Solution:** AI is used to analyze imagery from multiple sources—visual spectrum, infra red, etc.—to identify production issues more quickly, including catching microscopic flaws and complex defects.

**Benefits:** Automated systems achieve greater accuracy and consistency and can operate in hazardous situations. Spotting issues more quickly can help reduce waste, rework and warranty claims. QA time can be dedicated to problem solving rather than carrying out monotonous inspections.

Accuracy

Waste

Quality

### Digital twins

**Solution:** AI is used to create a virtual replica of a product, a piece of equipment or an entire factory.

**Benefits:** Manufacturers can use these simulations to test new processes, optimize layouts and predict the performance and maintenance needs of equipment without costly and risky physical trials. By creating “as built” virtual replicas of each product made the manufacturer is able to reduce warranty costs by issuing targeted recalls rather than full production year recalls.

Agility

Innovation

Costs

### Process optimization

**Solution:** AI is used to analyze production data to identify bottlenecks and inefficiencies and offer recommendations.

**Benefits:** Real-time optimization of machine settings, resource allocation and workflow can drive increased output and reduced waste.

Output

Waste

Utilization

### Mass personalization and one-off production

**Solution:** Generative AI (GenAI) takes consumer input to automatically generate a unique, manufacturable design. This may even be transmitted directly to production equipment.

**Benefits:** This enables true mass customization by creating unique product variations at scale. This allows manufacturers to increase sales by offering products tailored to individual needs without the cost-prohibitive design work traditionally required for one-off production.

Demand

Flexibility

Cost

## Human/machine collaboration



### Machine vision/video analytics

**Solution:** AI is used to continuously monitor and analyze the movement and interaction people, equipment and materials.

**Benefits:** Movement and work can be optimized for efficiency and safety. This also assists in the automated methods like foreign object damage (FOD) prevention.

Safety

Productivity

Costs

### Collaborative robots

**Solution:** AI-driven collaborative robots (cobots) work safely alongside human employees, taking on repetitive, physically demanding or hazardous tasks.

**Benefits:** This enhances overall productivity by reducing fatigue and frees up human workers for more complex tasks. It can also reduce the amount of time employees need to spend in hazardous situations, reducing the chances of injury and the associated costs.

Safety

Productivity

Costs

## Autonomous manufacturing loops



### Autonomous manufacturing loops

**Solution:** AI is used to generate time- and material-efficient production plans, monitor the process with digital twins, and autonomously adjust production flows, material usage, and resource allocation.

**Benefits:** Human involvement is shifted from daily monitoring to higher-level strategic management. Resource utilization is increase, and efficiency and flexibility increased.

Efficiency

Flexibility

Utilization

# Edge computing for accelerated deployment

Verizon AI Connect offers a compelling alternative to the traditional self-built edge infrastructure model through. Verizon provides a foundational network architecture and edge computing capabilities crucial for optimizing AI deployment and enhancing business outcomes.

Verizon AI Connect leverages Verizon's Virtual Network Services (VNS) in conjunction with GPU-as-a-Service (GPUaaS), deploying the portfolio across multiple (regional) edge data center facilities that follow Verizon's One Fiber footprint. These facilities are pre-equipped with the necessary space, power, cooling and connectivity to support advanced AI workloads.

By bringing AI modeling closer to the site, Verizon's solution reduces disruptions to production that would otherwise arise from lengthy and expensive facility upgrades. This "pay-as-you-grow" model significantly accelerates AI training and enables real-time, automated adjustments to AI models, thereby boosting their accuracy.

## Leveraging the Verizon network and API ecosystem for enhanced operations

With AI models residing at the edge of the Verizon network, the Verizon API marketplace becomes a powerful tool. It allows for the real-time spinning up of APIs that seamlessly connect multiple data sources, including video feeds, IoT sensors, and machine analytics, which directly contributes to improving overall equipment effectiveness (OEE).

### Accelerated model building

Furthermore, the robust collection of data to extract, transform, and load (ETL) from these agentic AI and physical AI models empowers DevOps teams to dream big by using large language models (LLMs), product insights, and automated code from Verizon's MNS partnerships.

### Increased model accuracy and operational efficiency

Inferencing is the process where a pre-trained AI model uses its learned knowledge to make predictions or decisions on new data. These inferences are captured through AI Pods within the enterprise's locations. This streamlined process not only enhances AI model accuracy, but also introduces new avenues for operational efficiency.

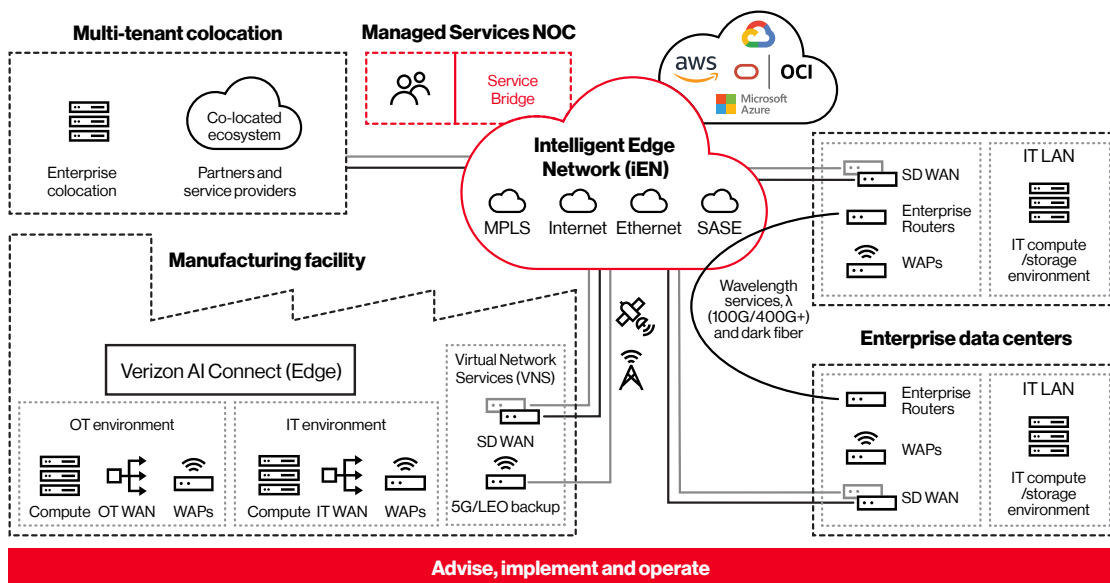
## Automated management and incident resolution

Verizon's extensive network, with multiple connection points, provides the necessary infrastructure for enterprises to build their AI capabilities closer to their end-users. Verizon's digital integration capabilities enable seamless process automation from the enterprise through to Verizon and onward to the programmable network. This allows for a streamlined flow of information and control, simplifying tasks such as code remediation, firmware patching, and anomaly detection.

A good example of this is how Verizon AI Connect allows enterprises to automate configuration changes. This mirrors Verizon's established automation of trouble ticketing through our rigorously vetted and monitored third-party providers.

The adaptive network fabric can be controlled via API, through digital integration to Verizon's platform, enabling customers to self-provision network services in near real-time. This allows changes to bandwidth requirements to be fulfilled without the traditional circuit fulfillment cycles. This can significantly reduce lead times for network connectivity and help improve business agility.

# Verizon AI Connect



## The Adaptive Network Fabric

Verizon's AI strategy is built on a core set of offerings that enable advisory services, allowing AI-ready, repeatable solutions across various industries. Network programmability is offered via Verizon's adaptive network fabric platform.

Verizon Intelligent Edge Network (iEN) infrastructure supports scalable, programmable connectivity, creating a flexible, automated and efficient networking environment that's able to adapt to evolving end-user needs and application workloads. This architecture provides network optionality, aligning each use case and process to the most efficient network. It provides:



### Simplified connectivity

Secure, direct connections with ultra-low latency and built-in redundancy.



### Improved user experience

Self-service via a web portal or APIs.



### Bandwidth flexibility

Real-time, on-demand adjustments to accommodate peak traffic.



### Simplified management

A centralized interface for visibility, control and optimization.

For a manufacturing environment, having a single source partner for all things wireless and wired simplifies administration and management.

## Infrastructure for IT/OT convergence

The convergence of IT and OT is critical for modern manufacturing. Private wireless networks inherently provide strong segmentation from public networks and corporate IT, helping to reduce interference and attack vectors for critical OT communications.

Verizon's extensive network reaches into a vast ecosystem of multi-tenant data centers and third-party colocation facilities. This approach enables seamless collaboration between our core offerings and specialized AI platforms in Cloud, Hyperscaler and Neo-scaler environments. This interconnected architecture with carrier-grade networking enables customers to blend customer-owned environments and the massive compute power of providers GPU-as-a-Service (GPUaaS) infrastructure to create a unified environment for training and running advanced AI models. The key components of this architecture are:

- **Core network:** The control system that manages devices, user authentication and data flow.
- **Radio access network (RAN):** The wireless infrastructure that provides connectivity to devices like IoT sensors.
- **Edge computing integration:** Co-locates local data processing with wireless connectivity for real-time apps.
- **User equipment (UE):** Devices like IoT sensors, industrial robots and augmented reality (AR) tools connected to the network.

A key benefit of this is the ability to share the RAN between a private wireless network and a neutral host network. This can help reduce equipment and simplify operations.

## Advisory and managed network services

This component leverages Verizon's deep expertise in AI and governance to provide a full-lifecycle approach to security for enterprise customers—crucial capabilities to achieving a secure, compliant and reliable solution. It is the OT part of the Verizon AI Connect portfolio that facilitates building the automation to spin up and spin down resources essential for managing dynamic GenAI workloads.

Verizon offers a comprehensive portfolio of services that can:

- drop the pod
- communicate
- provide a framework and advisory services
- set up the AI infrastructure and fully manage

## Security and compliance

As reliance on AI systems grows, Cybersecurity concerns are also evolving as documented by ongoing updates to [OWASP Top 10 Risks for LLM applications](#).

Verizon AI Connect addresses a wide array of security and compliance needs, including:

- Infrastructure, cloud, application and data security
- Perimeter and network security
- Identity and Access Management (IAM and PAM)
- Threat intelligence
- OT security assessment
- Assurance services

Partnership with a security-conscious organization like Verizon is crucial to help safeguard networks, systems and infrastructure that support AI applications.

### Comprehensive security strategy

Like other IT infrastructure, the security of AI systems is crucial. Many leading manufacturers trust Verizon's consistent approach to managing security, which is based upon established frameworks such as the [NIST Cyber Security Framework](#) (CSF), strong policies and standards. It includes comprehensive asset management, ongoing assessments, a layered network architecture and continuous threat monitoring.

### Reducing the risk of data poisoning and eavesdropping

AI models trained on public data more susceptible to data poisoning attacks. Data risks also appear during fine-tuning or Retrieval-Augmented Generation (RAG) if the source material is untrustworthy. In federated learning, it is harder to control what data is used at each endpoint, which increases the chances that a malicious participant could introduce harmful inputs. A hybrid network strategy, leveraging private IP backbones for critical, latency-sensitive AI applications, is often recommended to mitigate these risks.

The use of public networks can significantly increase risk due to their inherent vulnerabilities and lack of control.

With the use of dark fiber, secure cloud interconnects and high-speed wave services, Verizon's network intrinsically helps to create a secure path that aids in preventing harm to model caused by the malicious injection of bad data by securing and managing the network itself.

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### Business resiliency management

Verizon's security strategy for manufacturing is supported by a data driven approach as highlighted in the annual Verizon Data Breach Investigations Report (DBIR). This highly respected report details specific threats and trends related to different verticals, including manufacturing, based on extensive analysis.

We offer services to help ensure continuous operations and data integrity. The framework helps identify critical processes, assess impacts, and design and implement disaster recovery plans.

### Zero Trust

The Zero Trust model is based on the assumption that every user and device is a potential threat until proven otherwise. It requires defenses to continuously monitor and validate user behavior, network traffic and device health to detect anomalies in real time.

Zero Trust principles— encryption enforcing least privilege, validating every device, user and network connection— are a key part of Verizon's security strategy.

Verizon's approach includes a layered security strategy to protect AI systems with a focus on all pillars of zero trust strategy including users, devices, network, infrastructure, applications and data.

The convergence of IT and OT makes it even more crucial to implement Zero Trust principles. To help companies achieve this, we offer Zero Trust assessment services and Zero Trust workshops to help enterprises focus on the most critical aspects of the journey.

# The Verizon advantage

Verizon's network services portfolio simplifies operations, freeing up IT resources to focus on core business functions instead of day-to-day IT management. The Verizon AI Connect framework builds upon this by offering a suite of management options that provide peace of mind with end-to-end support and 24/7 network solution monitoring. Coupled with Verizon's security services, it also helps keep risk at a manageable level.

This innovative approach simplifies the rapid deployment of network, whether temporary for specific projects or long-term for sustained operations, particularly when integrating with third-party vendors.

This approach is especially critical for supporting high-value AI inference applications in manufacturing, where ultra-low latency requires placing workloads in a near network edge facility to bypass limitations of the factory floor.

Furthermore, the iEN-based adaptive network fabric provides the resilient, scalable connectivity to suitable colocation centers needed for both resource-intensive AI training and real-time edge access to models. The agility of iEN provides helps reduce misalignment between application demands and network resources, enabling operational efficiency. It also gives enterprises day-zero management capabilities helping to ensure seamless integration from the outset. By offering this flexibility, Verizon enables businesses to adapt quickly to evolving demands, optimize resource allocation and enhance collaboration within their extended ecosystem.

This approach allows for a predictable monthly cost, helping businesses control expenses while gaining access to a team of network experts.

AI Connect's agility is a key differentiator. Verizon's managed network services use automated, cloud-controlled capabilities that can scale and grow with a business's needs. This, combined with the AI-powered digital transformation and proactive application performance insights, helps modernize IT infrastructure and reduce operational costs.

This means businesses using the Verizon AI Connect framework can effortlessly scale their GPU environments and security posture as their AI workloads evolve, all through a single, integrated ecosystem with one simple bill.

## Let's talk

To explore how this solution can be deployed in your environment, please reach out directly to your Verizon account team.

1. ABI Research, [Industrial Data Generation Forecast](#), QTR 3 2024
2. Medium, [Our ML Model Was 95% Accurate in Training, 60% in Production](#), 2026
3. Rahman et al, [Beyond Synthetic Benchmarks: Evaluating LLM Performance on Real-World Class-Level Code Generation](#), 2025

