
spirent
A SPIRENT E-BOOK
Bracing for Impact
How AI Will Transform Digital Industries
AI

What's inside.

NOTE: Photography used in this eBook was generated using AI technologies.

The AI Market, Business Benefits, and Challenges

Artificial intelligence (AI) systems are expected to transform digital industries in ways still being discovered.

In recent years, generative AI (GenAI) has moved from the fringes to the forefront, igniting imaginations about its vast potential. Behind this wave of excitement, industries are diligently working to prove use cases, scale solutions to meet demand, and innovate to unlock AI's full potential.

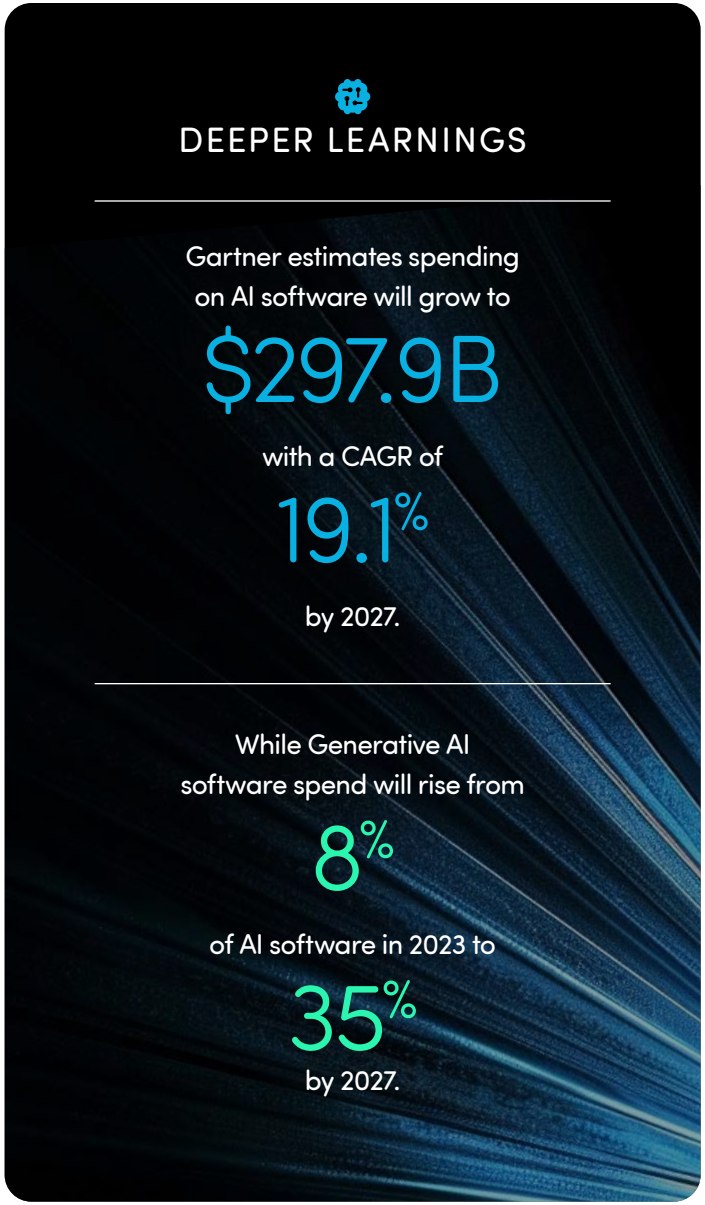
Despite a seemingly 'Wild West' environment, the sheer volume of market participants pursuing AI-based opportunities is fostering a thriving ecosystem, ripe with opportunity and underpinned by rapidly evolving ethics. As corporations race to capitalize on AI, regulators are hastily crafting rules to govern its use.

> In this eBook, we will cover the complexities of AI's impact, including challenges and practical strategies for adoption.

Stakeholders are abuzz with new opportunities but equally mindful of the growing pains and unforeseen challenges that lie ahead. Businesses don't just want to join the pack, they want to ensure they are not left behind as markets are disrupted. The starting point can seem elusive.

In this eBook, we will cover the complexities of AI's impact, including challenges and practical strategies for adoption. We'll also explore the role GenAI will have on key market sectors, including data centers, telecom, and banking and financial services.

Read on to better understand AI's potential impact on data center networking, and telecoms and enterprise digital transformation efforts, and gain actionable insights that can help better align your business with the AI revolution.

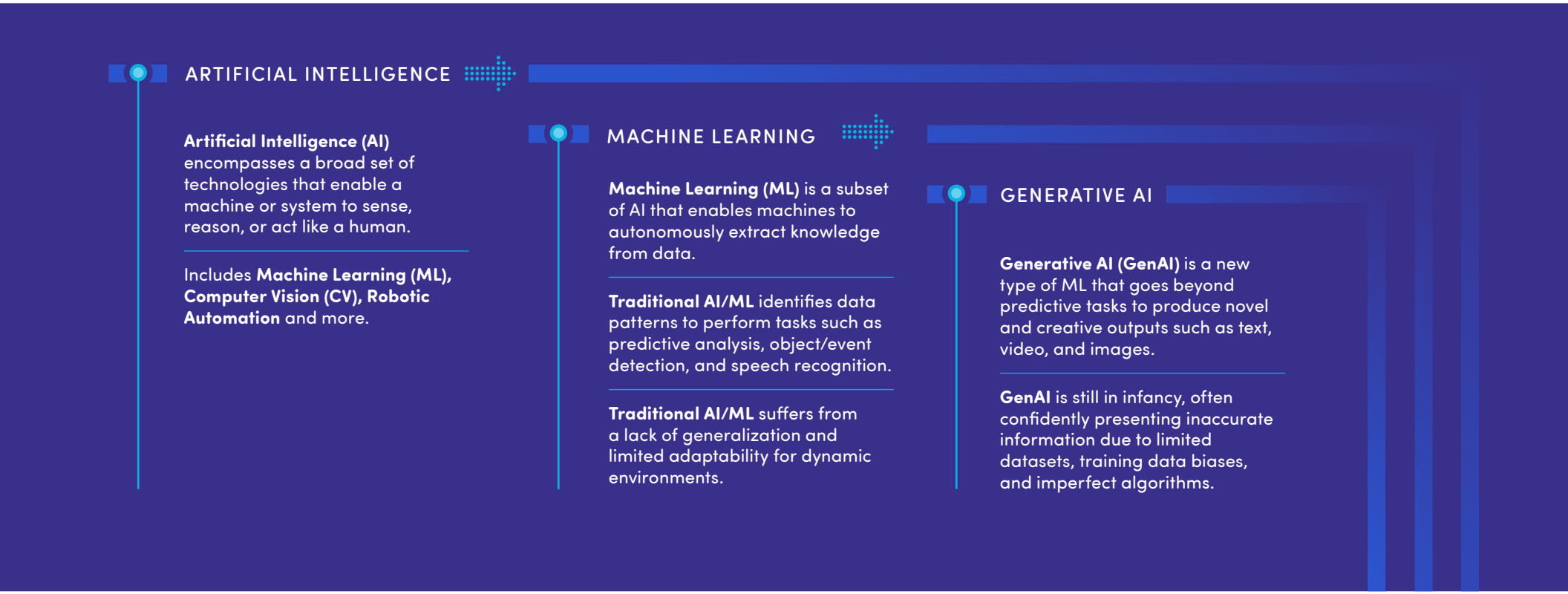


How generative AI compares to traditional AI and machine learning

Before we go further, it is important to establish a foundational understanding of the differences between traditional AI and machine learning (ML), and newer generative AI (GenAI) technology. Traditional AI and ML have laid the groundwork for predictive analytics and decision-making processes as a result of being able to analyze and learn from data. Meanwhile, Generative AI has recently gone a step further with an ability to create new, original content.

While traditional AI/ML excels in analyzing network usage and performance data for predictive planning, GenAI can leverage this analysis to generate novel outputs. Together, these technologies make possible the ongoing, explosive advancement of AI applications we are currently seeing.

The following diagram defines AI, ML, and GenAI and explains the evolving landscape of artificial intelligence as GenAI extends the capabilities of traditional AI/ML.



AI's impact on business cases

AI introduces the potential to achieve substantial operational efficiencies and new business outcomes. According to the U.S. Chamber of Commerce, 23% of small businesses already use artificial intelligence for marketing and customer communications. As focus turns to more substantive and consequential roles in strategic business operations, early adopters are targeting outcomes that span:

REDUCED

OPEX

AI streamlines operations and cuts costs by proactively identifying and addressing inefficiencies, faults, and areas for improvement in real time, leading to more efficient resource utilization and reduced downtime.

REDUCED

CAPEX

By enhancing operational efficiency and optimizing resource utilization, AI allows for more strategic and need-based management of equipment upgrades and energy costs, thus minimizing ongoing capital expenditures.

INCREASED

CUSTOMER EXPERIENCE

AI enhances customer satisfaction and service quality by analyzing engagement and sentiment, offering proactive recommendations, thereby reducing churn and boosting revenue.

INCREASED

REVENUE

AI leverages customer engagement and behavioral trends to uncover new revenue opportunities, enhancing existing services and creating personalized offerings.

DEEPER LEARNINGS

McKinsey – Generative AI technology across the Banking industry, could deliver value equal to an additional $200 billion to $340 billion annually. *Source*

Where AI can provide the most benefit

While AI offers vast potential, it is not magic. It can only thrive as part of a broader solution ecosystem focused on delivering value-generating use cases.

For example, effectively using AI for network optimization requires a well-coordinated system, beginning with clean datasets for reliable AI learning and inference. The AI's recommendations must then be seamlessly passed to the relevant systems for assessment and implementation. Following this, continuous monitoring and evaluation of these changes are essential, feeding back into the AI system for ongoing learning and improvement.

To prioritize where and how to start incorporating AI, companies need to determine the cost-benefit of use cases, considering factors such as:

- The datasets required for the use case
- The quality of the input data
- The skill sets, resources, and time required to clean the data
- The cost of developing or sharing data lakes, large language models (LLMs), and other AI-associated infrastructure

Best practice dictates that data architecture and management should be addressed first. That is why large cloud providers and data centers are redesigning architectures and interconnects to handle the huge volumes of AI training data and intensive inference processing. For example, OpenAI's GPT-4, a large language model, has about 1.8 trillion parameters and is trained on 1 petabyte of data. Tweaking existing data architectures will not scale to support that level of processing.

DEEPER LEARNINGS: USE CASES

While every industry is pursuing a unique path, use cases being prioritized for sectors like telecoms and banking, financial services, and insurance include:

TELECOMS

- Customer care chatbots and virtual assistants
- Anomaly detection
- Quality monitoring
- Process automation
- Customer experience management
- Fraud management
- Network optimization
- Churn prediction

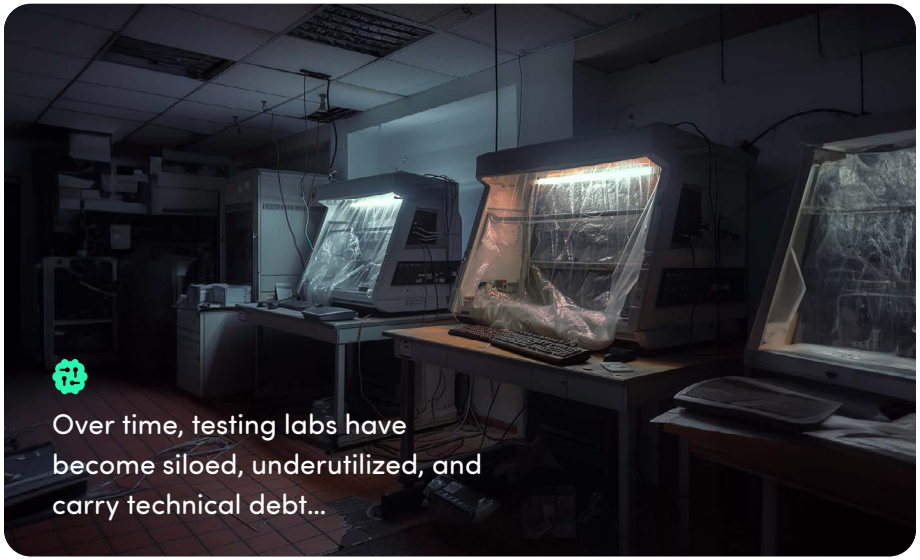
BANKING, FINANCIAL SERVICES, AND INSURANCE

- Customer service chatbots
- Robotic process automation
- Security and fraud detection
- Risk management scoring
- Market trend analysis for investments

BRACING FOR IMPACT

Automation is a common factor across all industry AI use cases. By intelligently powering automation of workflows, complex processes, and environments, AI presents incredible business value with potential for sizable efficiency gains.

Lab environments, for example, are common in many regulated or mission-critical industries. These labs are used to continuously test and validate products, systems, and technologies to assess regulatory compliance, security efficacy, conformance, performance, and interoperability. Most large industries may have tens to hundreds of global labs and workbenches. Over time, these labs have become siloed, underutilized, and carry technical debt. AI-powered automation offers the opportunity to transform and consolidate these labs into highly efficient, small footprint, and low-cost environments. Intelligent AI automation drives everything from lab access control and test bed setups to smart management of power and cooling.



Challenges for widespread adoption

AI opens the door to a new era of efficiency and opportunity, but industries embracing it will face several challenges:

1 DATA QUALITY AND BIAS. Poor or outdated datasets (convention established in this EB) and manipulations can result in biased and inaccurate AI models, leading to flawed inferences, recommendations, and actions.

2 AI PREDICTION QUALITY. Accurate and policy-compliant AI predictions are crucial as foundational models and outputs require ongoing supervision and validation to ensure reliability.

3 HIGH COSTS. Implementing AI in-house can be costly due to high data volumes, intensive processing, and maintenance needs, while third-party solutions may lack specificity and ability to customize, and still incur significant expenses.

4 REGULATORY HEADWINDS AND PRIVACY. Emerging regulations, unclear data ownership, and privacy guidelines may lead companies to start with smaller AI systems, potentially too limited to justify costs and provide accurate results.

5 INABILITY TO SCALE AI USE CASES. The lack of industry standards and complex integrations in the AI ecosystem can hinder scaling and limit value realization.

AI's Impact in Data Center Networking

The rapid growth of AI is impacting large data centers as high volumes of traffic and intensive processing requirements push the limits of hyperscaler data centers.

Data center architecture evolution

To successfully support AI's rapid growth, data center architectures and the high-speed networks they rely on must be reevaluated.

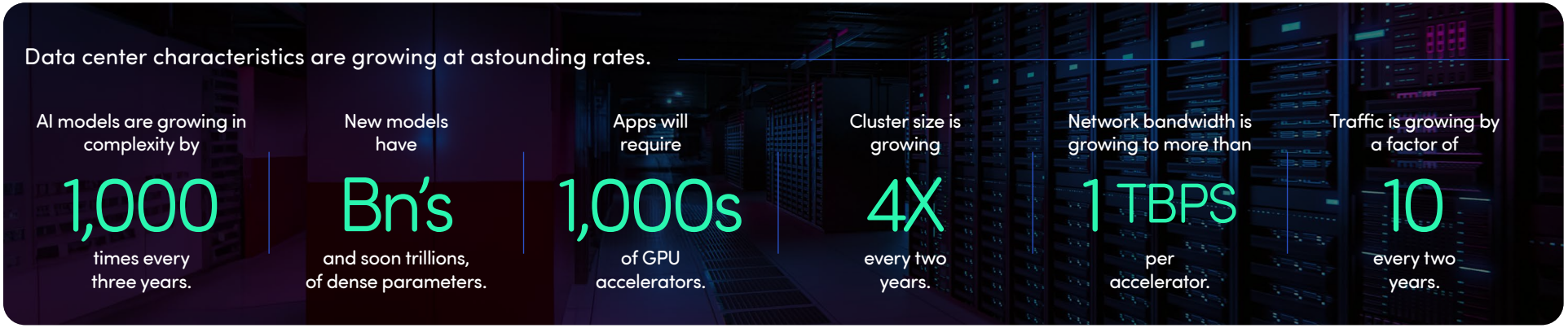
AI application model complexity and size dictate the level of compute, memory, and network type and scale needed to connect AI accelerators (like GPUs) used for training and inferencing.

At the same time, AI workloads are driving an unprecedented demand for low latency and high bandwidth connectivity between servers, storage, and accelerators.

The scale required for support doesn't come from simply adding racks to a data center. Handling large AI training and inference workloads requires a separate, scalable, routable backend network infrastructure to connect distributed GPU nodes. AI apps have less impact on the frontend Ethernet networks that use general purpose servers to provide AI data ingestion for the training process.

The requirements for this new backend network differ considerably from traditional data center frontend access networks. In addition to higher traffic and increased network bandwidth per accelerator, the backend network needs to support thousands of synchronized parallel jobs, as well as data and compute-intensive workloads. The network must be scalable, and provide low latency and high bandwidth connectivity between servers, storage, and the GPUs essential for AI training and inferencing.

The AI data center journey is just beginning and will change dramatically as AI evolves, promising to be transformative and expensive. Data center architectures should be evaluated sooner rather than later as new strategies will be required for success.



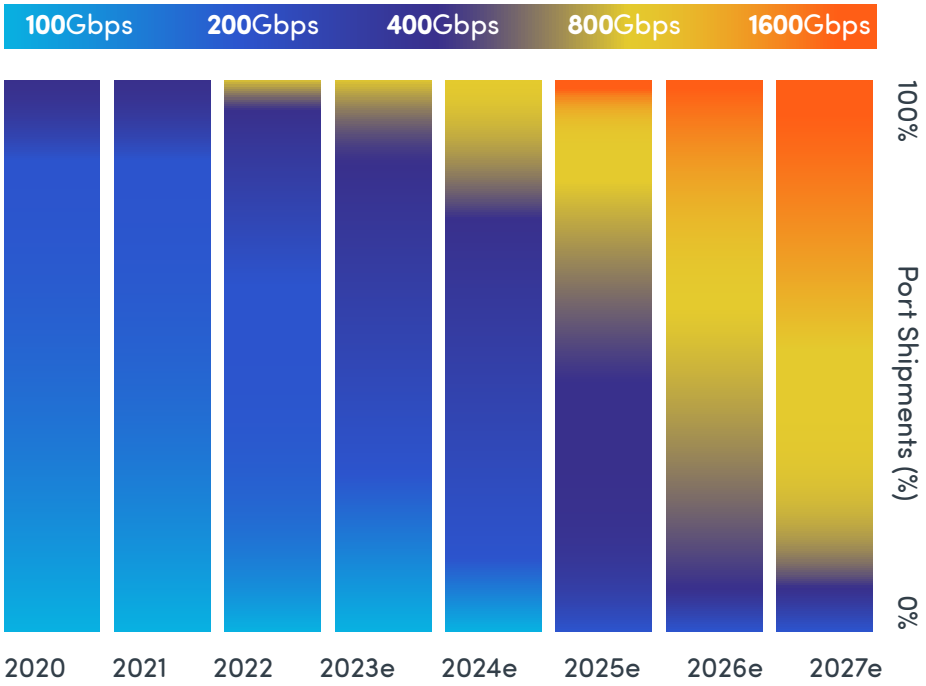
Data center networking evolution

GenAI applications are poised to accelerate a new era of high-speed Ethernet backend networks for data centers, as well as other emerging technologies.

Field deployments of 400G Ethernet have started, 800G chipsets are being manufactured, and standards specifications are in development for 1.6 Terabit Ethernet, with each iteration representing a doubling of bandwidth. Backend AI networks are projected to migrate quickly to nearly all port speeds being at 800 Gbps and above by 2027, with triple-digit CAGR for bandwidth growth.

Ethernet is a widely available standard technology that uses priority flow control to handle congestion, which is efficient, but lossy by design. For large-scale AI deployments, latency sensitivities can have a large impact on training performance, so a more deterministic flow control approach can be taken with InfiniBand. High-speed Ethernet and InfiniBand are expected to coexist in data center backend networks for the foreseeable future.

Many organizations have begun deploying 400G and 800G with the RoCE v2 advanced protocol (RDMA over Converged Ethernet, version 2) as the data center switch fabric. This low-cost data transfer network increases efficiency and improves CPU utilization and network performance while reducing network latency and increasing bandwidth availability.



Includes both Ethernet and InfiniBand
Source: Dell'Oro Group AI Networks Report

Future data center networking technologies for AI applications

Continuing industry advances are expected to support the low latency, high bandwidth needs of AI data centers. One such advancement, Ultra Ethernet Transport (UET), is being explored by the Ultra Ethernet Consortium. It proposes to replace the legacy RoCE protocol with a modern transport protocol that delivers the performance required by AI while preserving advantages of the Ethernet/IP ecosystem.

Validation Challenges: AI Data Center Ethernet Network Fabric

As AI workloads increase in complexity and volume, a strain is placed on the Ethernet network fabrics that carry data between GPUs and other accelerators. Challenges validating this critical data center architecture follow.

The massive accelerator clusters of GPUs, FPGAs and ASICs in data centers rely on continuous data transfer. A single packet drop could disrupt AI model training and create cost inefficiencies. Further, AI workloads differ from traditional data center workloads in that they are especially sensitive to traffic congestion, loss, and latency. If traditional testing methods cannot realistically emulate AI traffic, it is impossible to be sure Ethernet network fabric can withstand real-world conditions. This is only the tip of the iceberg as it relates to challenges.

The complicated role of GPUs in data centers

Investments in GPU server farms are a step toward testing realism but this effort is not without complications. GPU servers are in short supply, draw as much as 4-10 kW of power and can cost upwards of $1M. They require specialized skills to operate and take months to deploy. As a result, configuring test cases across hundreds or thousands of these servers is a near impossible task. Testing outcomes essentially become non-repeatable, yielding inconsistent results that make it difficult to detect and fix performance issues.

Ethernet standards are a moving target

While Ethernet standards and speeds development once followed a predictable pattern and timeline, AI-driven need for speed is upending market norms. Rollouts are occurring ahead of standards finalization and while 400G field deployments are in progress, 800G chipsets are being manufactured and 1.6T is already in sight. With AI networks expected to migrate to 800G or higher by 2027, testing and validation methodology development demands expedited capabilities that move at the speed of the changing market.

Changing traffic patterns and flow control

New protocols like RoCE (RDMA over Converged Ethernet) version 2 are emerging to handle the unique traffic pattern and flow control requirements of AI workloads. Optimized traffic patterns like RingAllReduce and AlltoAll are also becoming critical. These advancements are making it possible to support the high data exchange rates of AI algorithms but are error-prone and require precise configuration and coordination. Only comprehensive and scalable testing approaches that emulate real-world AI traffic, identify potential bottlenecks, and optimize network performance pre-deployment can address the new dynamics introduced by changing traffic patterns and flow control.

The new role of robust testing in the evolving AI data center

The confluence of challenges cropping up in AI data centers requires innovative testing approaches. An important industry advancement has been AI traffic emulation with Collective Communications Library (CCL) that injects realistic AI traffic patterns and validates network fabrics before they are put into production. By creating a digital twin of production worker nodes and GPUs, Ethernet fabric optimization can be tested in isolation. Expected network performance can be evaluated based on KPIs like job completion time, queue pair transmission time, and packet loss.

The methods for validating Ethernet network fabrics are evolving alongside AI data centers but must do so rapidly to remain in lockstep with new developments. Data center operators can keep ahead of the testing curve by ensuring the testing tools they rely on actively address the realities of new challenges.

AI's Impact in Telecoms

Artificial intelligence and the use of machine learning is not a new phenomenon in telecoms. It has tactically been used to help with internal processes like anomaly detection in network operations and external customer facing systems like chatbots.

The growing complexity of cloud-native 5G systems combined with the emergence of Generative AI in the real world have led telcos to accelerate focus on the use of AI from narrowly targeted tactical use cases to more strategic and encompassing implementations.

While AI offers great potential, it must be part of a broader solution focused on delivering value-generating use cases.

Network management and operations

The predictive capabilities of traditional AI are a perfect fit for streamlining and automating network management and operational support tasks, such as:

ANOMALY DETECTION
Identifying patterns that indicate network issues or security threats.

PROCESS AUTOMATION
Streamlining operational and lifecycle processes by powering automation through intelligence.

ROOT CAUSE ANALYSIS
Automatically identifying the cause and location of network failures.

PREDICTIVE MAINTENANCE
Predicting when something is about to go wrong, so proactive resolutions can be put in place to prevent outages.

NETWORK OPTIMIZATION
Dynamically aligning optimal network performance with strategic objectives that maximize return on investment.

Network security and fraud detection

With AI, network security can evolve from reacting to attacks to actively predicting threats so they can be prevented before damage is done.

By training algorithms with large quantities of historical network data, AI can learn and model normal network behaviors. The model can then accurately detect and predict anomalous or fraudulent behavior and threats. AI learning can also continuously adapt to new threats without the need for manual supervision.

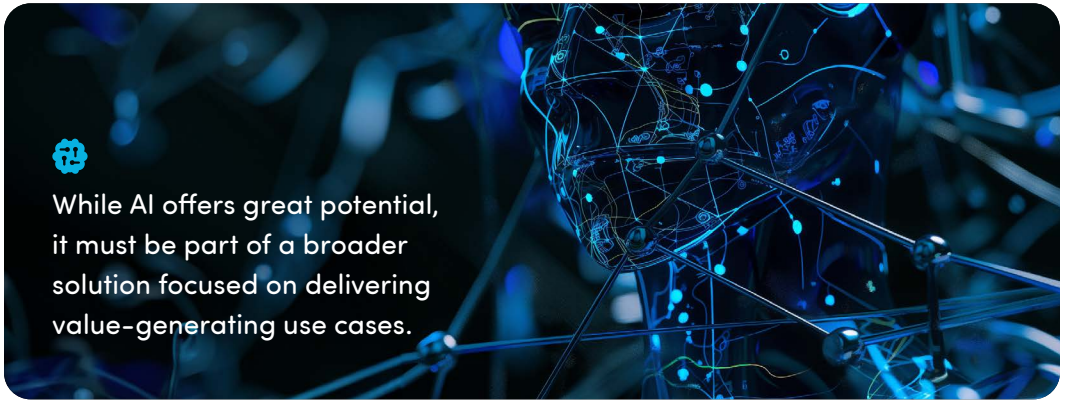
Customer experience management

AI classification and predictions can play a key role in enhancing user satisfaction to reduce churn and drive revenue growth.

Using AI insights, customer experience management can tailor services to specific customer preferences and optimize network performance to provide excellent quality of experience.

Network design and planning

Traditional network planning struggles with making sense of large, disparate, and dynamic datasets.



AI can be trained with large-scale simulations, emulations, and digital twins. The resulting insights and recommendations can simplify cell load estimation, traffic routing and network scaling, and radio map generation, for network coverage and spectrum utilization.

NG-RAN

The 5G next-generation radio access network (NG-RAN) is a prime focus area for AI, with many vendors researching and developing capabilities to enhance energy efficiency, optimize mobility events, dynamically shape cells, enhance channel quality estimation, and provide optimal load balancing.

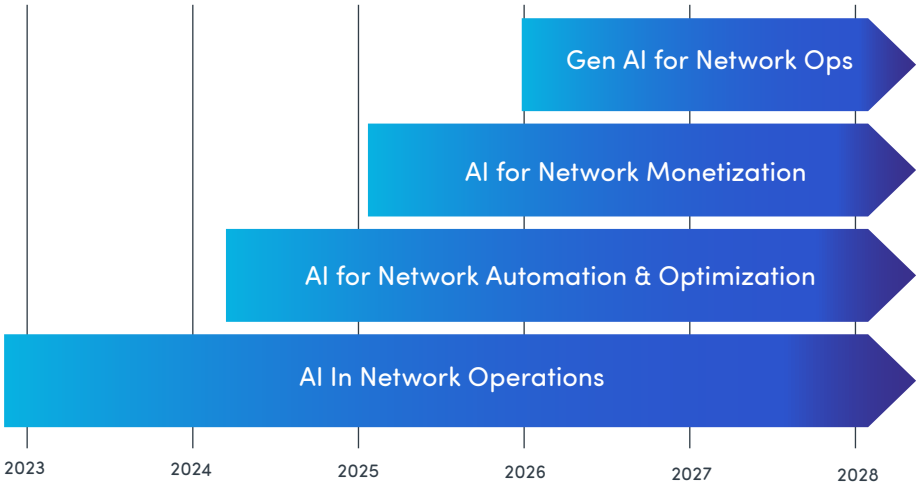
In Open RAN, the RAN Intelligent Controller (RIC) provides an open hosting platform and operationalizes third-party xApps to optimize radio spectrum efficiency in near real-time and rApps for non-real-time network automation. The RIC provides a logical mechanism for AI/ML to be used for radio resource management, optimizing network performance, optimizing energy-intensive processes, and inferring and controlling RAN functional elements.

Future cognitive networks

AI is playing an important role in 5G Advanced and its evolution to 6G as the network continues on its path to full-scale intelligent automation. This will take time, but the foundation is already being built.

BRACING FOR IMPACT

The following chart reflects Spirent's high-level view of the market evolution.



Some of the most significant applications of AI/ML in future networks includes leveraging:

AIOps, AI/ML, and big data simplify IT and network operations

- AIOps solutions use AI/ML to analyze and correlate data from different network sources and domains, carry out diagnostic, predictive, and prescriptive analytics to identify operational issues, recommend remedial actions, and trigger automated responses.
- Active testing that injects real traffic into the network is a critical component of AIOps. It provides a "single source of truth" about the operational network, and continuously feeds the AI model and validates the efficacy of remedial actions and responses.

Digital twins and AI provide real-time network optimization

- Digital twins already provide valuable insights into system behavior, resilience, and performance, via virtual representations of systems or networks. They model and test complex systems using large-scale simulation, emulation, and impairment generation.
- The integration of digital twins and AI's advanced decision-making capabilities will enable network systems to self-optimize, self-configure, and self-heal seamlessly, and in real time.

Generative AI will create valuable network data and insights

- As GenAI LLMs become telco-specific, they will enhance traditional, predictive AI by generating new data samples.
- GenAI models are expected to play a key role in network operations and management by:
  - **Enhancing predictive models** and digital twins with newly generated synthetic data and traffic patterns
  - **Improving network design** through creative insights
  - **Better understanding the large volumes** of structured and unstructured data needed for fault root cause analysis and remediation

DEEPER LEARNINGS

Omdia estimates that spending on AI Ops solutions for telecom networking will grow at a CAGR of 11% to $2.1bn by 2028.

AI's Impact on Enterprise Digital Transformation

Enterprises face growing competitive pressure, market disruptions, and persistent macroeconomic and geopolitical uncertainties.

Enterprises face growing competitive pressure, market disruptions, and persistent macroeconomic and geopolitical uncertainties. Hindered by the inflexibility and considerable technology debt of legacy systems, they struggle to improve customer experiences, increase operational agility, and optimize workforces. These challenges are driving a rethinking of operational strategies and customer value delivery methods.

Cutting-edge digital transformation technologies include cloud migration, big data analytics, robotic process automation, and proactive, automated cybersecurity. They are driving digital transformation initiatives, which are growing exponentially as enterprises replace outdated processes and technology in all business areas with new digital technologies that enable agility and innovation. AI-fueled enterprise automation will speed transformation and drive down costs.

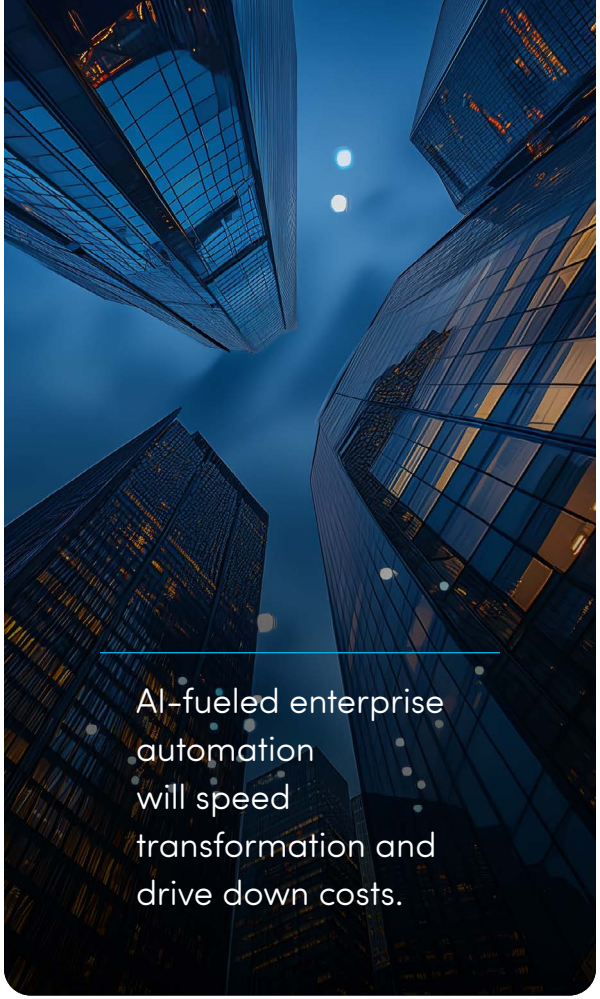
Two primary areas where AI is being embraced include robotic process automation and cybersecurity.

Robotic process automation

The competitive enterprise sector is seeing agility and an enhanced customer experience become crucial. This is particularly evident in sectors like banking, financial services, and insurance (BSFI), where there's a significant shift towards adopting Robotic Process Automation (RPA) and exploring AI's role in boosting productivity and efficiency.

RPA utilizes software robots (bots) to automate repetitive and rules-based tasks, streamlining complex processes and minimizing human errors. Traditionally, RPA operates based on structured processes set by users. However, integrating AI enables RPA to recognize patterns in unstructured data, leading to fully autonomous and intelligent processes. This advanced form of RPA can tackle more complex scenarios with less human involvement.

Take, for instance, **financial institutions** that invest considerable effort in manual regulatory compliance testing. These tests, often conducted in siloed labs with outdated technology, are prone to high incident rates and system outages. The first step towards digital transformation in such environments is automating and consolidating these isolated lab setups. Implementing robotic test process automation can yield significant cost savings and enhance agility. The next phase, transitioning to AI-based intelligent automation, further cuts overheads while boosting efficiency and fostering innovation.



Cybersecurity

Traditionally, cybersecurity has been reactive, focusing on threat detection and blockage. However, incorporating AI is essential not only for proactive threat prevention but also for countering sophisticated criminals utilizing AI for attacks.

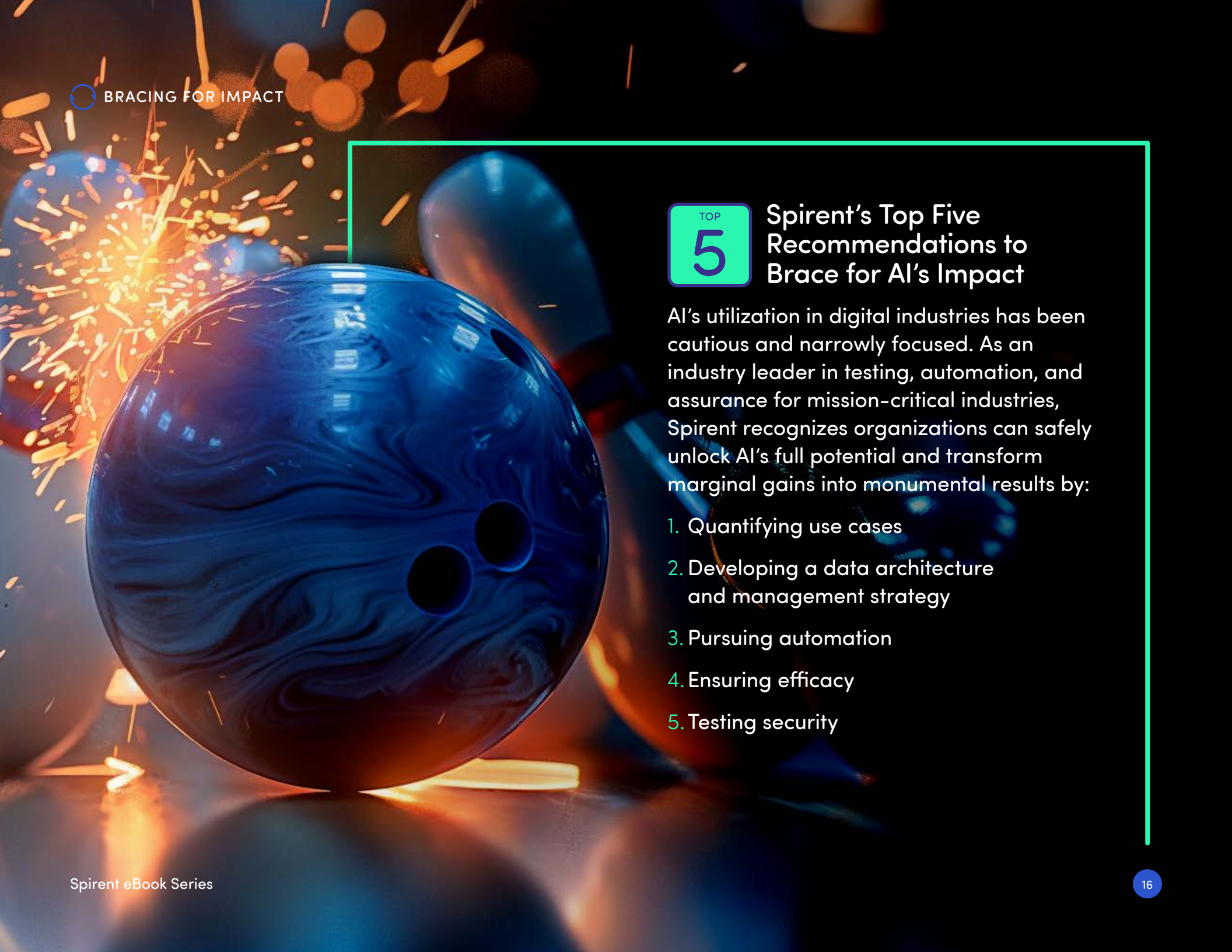
AI enhances cybersecurity by making inferences, recognizing behavior patterns, and initiating proactive measures in security systems, thus bolstering enterprise defense. It enables intelligent automation of incident responses, streamlines threat hunting, and analyzes vast data sets to spot security threats, unusual behaviors, and fraudulent activities.

Additionally, AI boosts monitoring tools, aiding in the real-time detection of attacks and predicting future threats for early defensive action. It also strengthens access control and password management.

> New security measures are necessary to ensure the efficacy of AI data.

Despite these benefits, AI introduces new vulnerabilities, such as the potential for bad actors to manipulate training data, reverse-engineer inference sources, or introduce biases in training data.

Therefore, new security measures are necessary to ensure the efficacy of AI data and to prevent the exacerbation of security risks with expanding AI models.



TOP 5

Spirent's Top Five Recommendations to Brace for AI's Impact

AI's utilization in digital industries has been cautious and narrowly focused. As an industry leader in testing, automation, and assurance for mission-critical industries, Spirent recognizes organizations can safely unlock AI's full potential and transform marginal gains into monumental results by:

1. Quantifying use cases
2. Developing a data architecture and management strategy
3. Pursuing automation
4. Ensuring efficacy
5. Testing security

1 QUANTIFYING USE CASES

- Identify AI-powered use cases that offer clear business outcomes where quality datasets are available.
- Use digital twins to cost-efficiently and rapidly test use case efficacy and value, and provide feedback loops for continuous AI model learning.

2 DEVELOPING A DATA ARCHITECTURE AND MANAGEMENT STRATEGY

- Data architecture, management, and hygiene should be addressed at the earliest stage to avoid cost shock, poor data quality, and inaccurate or biased AI models.
- Validate that data center interconnect architectures can cope with the volume of data and high-speed data transfers and access required by AI learning and inference clusters. Consider 400G/800G Ethernet supporting RoCE v2 to address the requirements of high performance, low latency, and a low-cost data transfer network.
- Use real test data to accelerate AI model training with realistic scenarios and unique variations relevant to intended environments.
- Use continuous test data from the live network to keep AI models current.

3 PURSUING AUTOMATION

- Invest in an automation framework first, integrating AI to enhance and supercharge related processes.
- Start with lower-risk internal processes and environments like labs and test beds to intelligently automate repetitive tasks, streamline complex processes, reduce human errors, and consolidate physical real estate.

4 ENSURING EFFICACY

- AI and especially Generative AI (which is in its infancy) can present inaccurate information as though it were correct. While bad or erroneous data can be to blame, so can misalignment with desired business outcomes.
- Continuously verify AI recommendation efficacy against golden scenarios and desired outcomes while providing closed-loop feedback for learning.
- Use digital twins to provide a safe and realistic offline validation environment.
- Use active testing in the operational networks to rapidly verify implemented recommendations and provide feedback loops for reinforcement or to trigger resolutions.

5 TESTING SECURITY

- Explore using modern security solutions that are evolving to utilize AI to enhance their effectiveness and to counter AI-generated attacks.
- Continuously test the efficacy of those security solutions for threat detection, false positives, prevention, and remediation response using hyper-realistic attacks, hacker attack behavior, and evasion techniques.

Validating AI Data Center Network Fabric

Data centers that support evolving AI applications, services and use cases will always race to keep pace with technology changes. Unprecedented performance demands will be a mainstay that grows in complexity.

Stakeholders will only be able to keep pace by validating AI data center Ethernet RoCEv2 networks with solutions that emulate real-world conditions and offer comprehensive performance insights with ongoing continuity. This testing will need to span existing and emerging Ethernet products, multi-vendor interoperability, and timing and synchronization with high precision.

Emulating realistic AI traffic

Data center operators are implementing advanced protocols like RoCEv2 and optimized traffic patterns to manage high data transfer rates required by AI algorithms. Accurately simulating these traffic behaviors makes it possible for stakeholders to diligently test and optimize network fabrics in controlled environments.

Effective AI validation can be accomplished with digital twins for production worker nodes and GPUs, replicating AI/ML algorithm traffic patterns like RingAllReduce and AlltoAll. Per Q-pair DCQCN rate control and Priority-based Flow Control (PFC) can be implemented to model real-world AI server congestion responses. When data center operators take advantage of these capabilities, they can better identify potential bottlenecks and optimize flow control mechanisms.

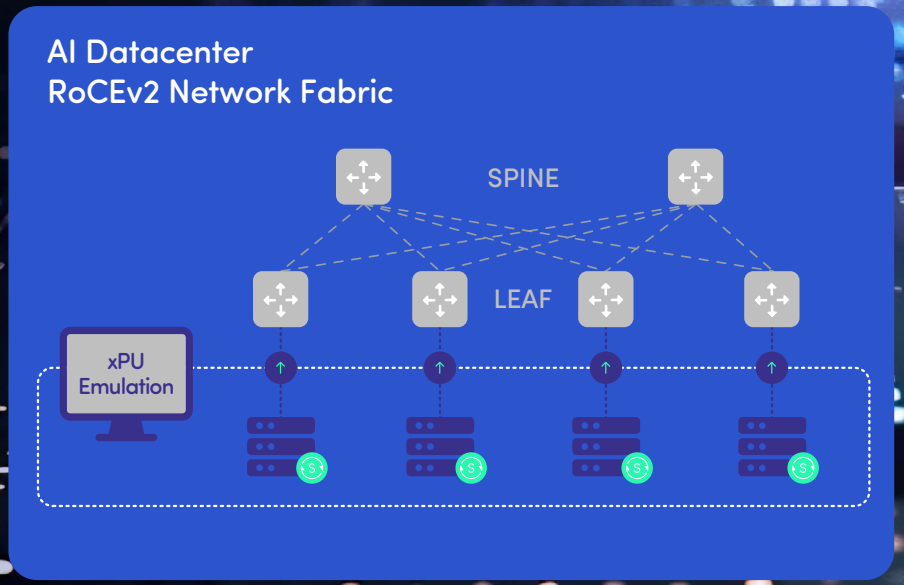
But how can data centers ensure performance in the real network is as expected? By measuring key performance indicators like job completion time, throughput, latency, packet loss, reordered packet count and late packet count, infrastructure can be continually fine-tuned for optimal efficiency and reliability.

Repeatable testing for maximum consistency

Testing outcome consistency is a crucial aspect of reliable network validation. Solutions that integrate hardware designed for high-scale testing, and easy test configuration and execution go a long way toward delivering repeatable results across hundreds or even thousands of ports. When data centers achieve testing and validation consistency, they are able to more easily diagnose and address performance issues.

Prepping for future needs

Ethernet standards and speeds are advancing faster than ever as timetables are upended and time-to-market is prioritized above all else. While the future is hard to predict, data center operators can ensure future readiness by implementing cost-effective testing solutions with high port density and strong power efficiency, with an ability to be deployed quickly and scaled rapidly. These solutions should offer a clear roadmap with support for existing and expected speeds ranging all the way up to 1.6Tbs.



Spirent: Your Partner to Unleash the Power of AI

Having a sound test and assurance strategy in place now is the gateway to AI success in the future.

And as a neutral, trusted partner across the full application and network lifecycles, Spirent's vendor- and technology-agnostic approach, combined with its cloud-centric strategy, makes it a perfect fit for a wide range of global enterprise verticals along with progressive telecommunication providers keen to deliver on the potential of emerging AI systems.

Spirent is an industry leader in:

- High-speed Ethernet testing, including 400G/800G and RoCE v2 for data centers as they evolve to support AI traffic volumes and processing capabilities
- Automation frameworks for labs, testbeds, and lifecycle processes
- Continuous testing frameworks for continuous feedback and learning
- Security efficacy testing including the world's leading L4-7 hyper-realistic testing solution
- Digital twin network emulation environments for validating networks and use cases, including our new Open RAN RIC test offering
- Active testing in operational networks to provide a continuous single source of truth

About Spirent

Spirent Communications plc. (LSE: SPT) is the leading global provider of automated test and assurance solutions for networks, cybersecurity, and positioning. The company provides innovative products, services, and managed solutions that address the test, assurance, and automation challenges of a new generation of technologies, including 5G, edge computing, cloud, autonomous vehicles, and beyond. From the lab to the real world, Spirent helps companies deliver on their promise to their customers of a new generation of connected devices and technologies. For more information visit: **www.spirent.com**.

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Spirent Communications (LSE: SPT) is a global leader with deep expertise and decades of experience in testing, assurance, analytics and security, serving developers, service providers, and enterprise networks. We help bring clarity to increasingly complex technological and business challenges. Spirent's customers have made a promise to their customers to deliver superior performance. Spirent assures that those promises are fulfilled. For more information visit: www.spirent.com

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