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2025 Trends in Applied Infrastructure & DevOps

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Many key technological trends will shape enterprise IT in 2025, including the integration of generative AI into observability, open-source software and intelligent automation platforms to enhance functionality and efficiency. The rising need for storage optimization is driven by increasing data volumes and costs, which in turn drives the adoption of advanced tooling such as intelligent data tiering and data tagging. Adoption of quantum computing is also on the rise, fueled by hardware advancements, high-profile enterprise use cases and global initiatives that promote quantum technologies.

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Executive summary

Introduction

Next year's IT operations landscape will be defined by the impactful innovations and critical shifts that are reshaping hybrid IT environments. Generative AI (GenAI) is poised to dominate the market, transforming observability and automation with its ability to predict failures, streamline workflows and continuously learn. Open-source software, long a cornerstone of IT, is adapting to the GenAI era as well, sparking debates over data ownership while driving new platform capabilities such as Kubernetes integration. Quantum computing, once futuristic, is gaining traction as hardware breakthroughs and enterprise projects bring it closer to having real-world impact. Meanwhile, soaring storage costs and global data sovereignty concerns are forcing companies to adopt smarter data optimization strategies.

About this report

Reports such as this showcase insights derived from a variety of market-level research inputs, including financial data, M&A information and other market data sources both proprietary to S&P Global and publicly available. This input is combined with ongoing observation of markets and regular interaction with vendors and other key market players.

This report specifically includes data from the following sources:

- **Voice of the Enterprise: Cloud Native, Observability 2024** — This two-part web-based survey was fielded from May 2 through June 20, 2024, among approximately 350 respondents whose organizations are using, planning, or considering observability tools and platforms with AI capabilities.
- **Voice of the Enterprise: DevOps, Open Source 2024** — This two-part web-based survey was fielded from July through August 2024, among approximately 400 IT and line-of-business decision-makers.
- **Voice of the Enterprise: Digital Pulse, Emerging Technologies 2024** — This web-based survey was fielded from January 4 through February 29, 2024, among approximately 1,200 IT and line-of-business decision-makers.

THE TAKE

The year ahead is poised to be a turning point for IT operations, with new technologies and approaches that are not just evolutionary but transformative. GenAI is already redefining observability and automation, replacing tedious manual workflows with predictive, self-improving systems that free up IT teams to focus on innovation. Open-source software — appreciated for its flexibility and cost efficiency — faces a crossroads as debates over data ownership and proprietary shifts threaten its foundational ethos, even as the open-source community aims to play a more significant role in the future of AI. Quantum computing, driven in part by the rapid rise of AI and the age-old IT law of “more, better, faster,” is finding its footing as an actionable tool for those ready to invest and think ahead. Meanwhile, skyrocketing data costs are forcing enterprises to confront a hard truth: Enterprises risk being buried under their own digital weight without smarter storage optimization and data sovereignty strategies. In 2025, the winners will be the companies forward-looking enough to embrace these changes and integrate them into their DNA rather than cling to outdated IT and AI development and operational models.

Trends we anticipate in 2025

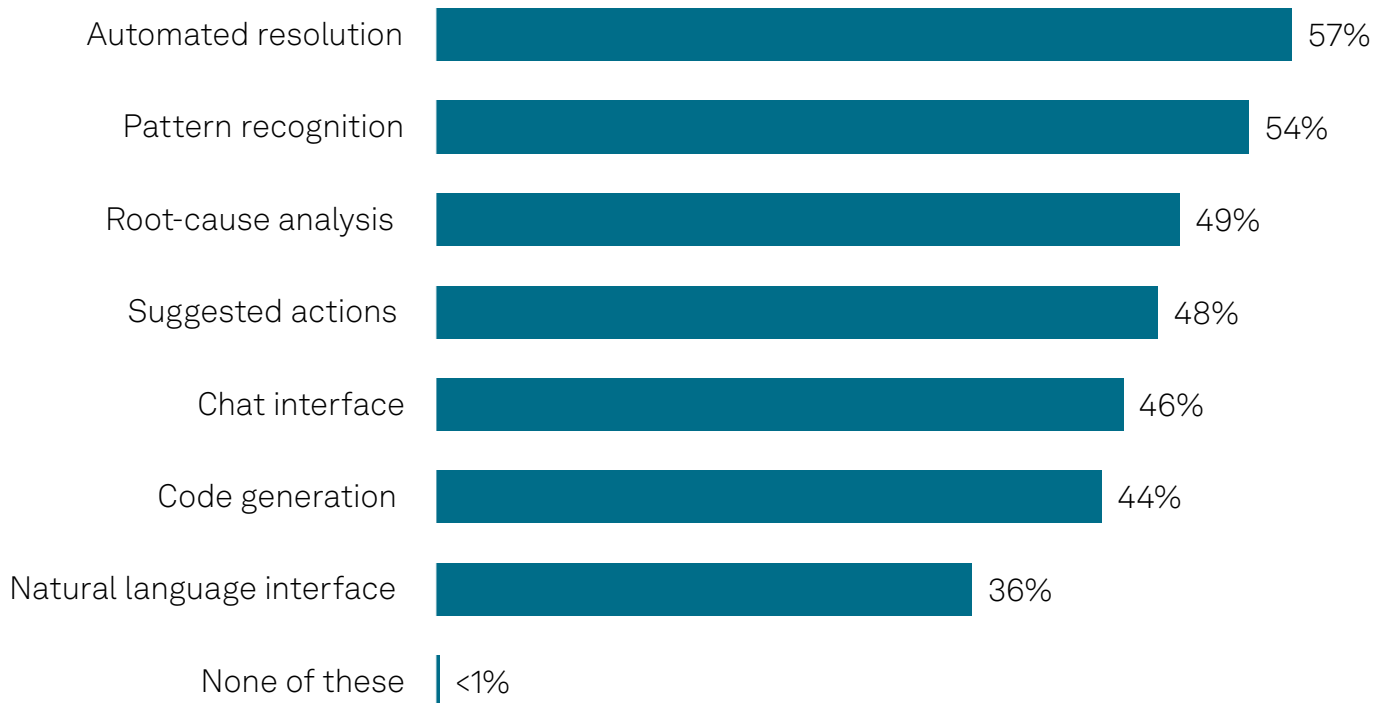
Trend 1: AI will unlock potential in observability

We anticipate a rise in the number of observability vendors incorporating GenAI capabilities into their products to complement existing AI-powered analytics. The adoption of GenAI will accelerate as enterprises increasingly recognize the benefits. Observability offers a holistic, full-stack view of application performance and behavior. However, even with advanced analytics and visualizations, IT administrators often need to sift through multiple pages of charts, graphs and tables to assess behaviors and perform root cause analysis. But once the analysis is complete and a fix is implemented, the insights gained are often confined to the administrator’s memory or recorded in post-mortem reports, rarely being utilized further.

GenAI is transforming IT workflows across all stages of observability by automating tasks such as collecting and presenting data, summarizing events and progress, and using lessons learned to continuously train and refine its models. More than any other technology, GenAI is reshaping how IT monitors and manages operations and driving innovation in the observability market. Well-trained AI models excel at performing deep analysis and correlations, enabling IT teams to predict failures before they occur, respond more quickly when issues arise, and apply insights from past events to improve over time.

GenAI enhances, rather than replaces, skilled and valuable IT staff, empowering them to focus on initiatives that deliver business value instead of being bogged down by repetitive break/fix workflows.

Figure 1: AI strengthens the core capabilities of observability tools



Q. Which of the following AI capabilities are the most beneficial to your organization’s use of observability tools or platforms? Please select all that apply.
 Base: Respondents whose organizations are using, planning or considering observability tools and platforms with AI capabilities (n=349).
 Source: 451 Research’s Voice of the Enterprise: Cloud Native, Observability 2024.

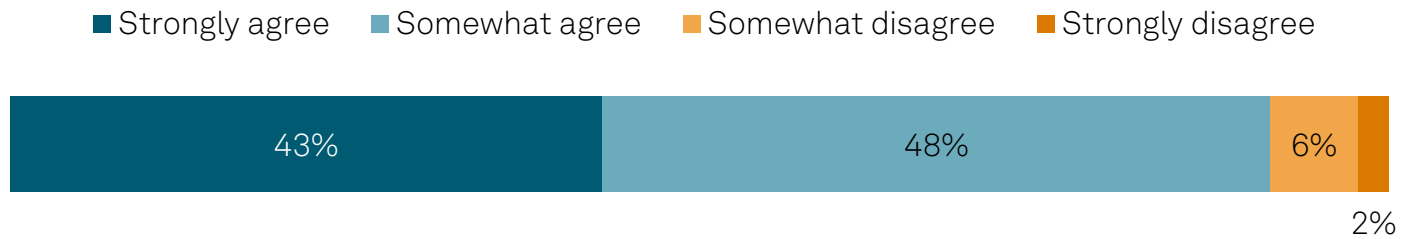
Trend 2: Open source will evolve with industry, GenAI

Open-source software has emerged as a preferred model for development and IT operations in enterprise environments, driven by benefits such as lower costs, reliability, security, easier integration and improved developer productivity. While the enterprise open-source landscape has experienced disruptions due to the shift toward proprietary licensing (and occasional reversals), open-source software is increasingly influencing the adoption and implementation of GenAI. Open-source advocates have introduced a definition for GenAI within the open-source framework, but this effort is complicated by debates over whether training data should be included or excluded in these models.

GenAI depends on massive datasets, yet our research reveals that concerns about data and intellectual property disclosure or loss are among the top challenges for enterprises leveraging this technology. Despite these concerns, open-source projects and communities are poised to play a significant role in enterprise deployment of GenAI. In fact, a majority of organizations recognize the advantages of incorporating open-source components into GenAI solutions.

The Kubernetes container management and orchestration software is a prime example of an open-source project that serves dual purposes: a platform for running GenAI models and an IT operations tool used for security scanning, testing, troubleshooting, monitoring and more. Looking ahead, much of our Voice of the Enterprise: DevOps research in 2025 will focus on open-source software usage and licensing in the modern enterprise IT market, in addition to its growing intersection with GenAI in the development and deployment of applications.

Figure 2: Enterprises see a vital role for open source in the future of GenAI



Q. Please indicate whether you agree or disagree with the following statement: The use of open-source generative AI tools and technologies is advantageous to our organization's software development efforts and goals.

Base: Uses GenAI in software development (n=312).

Source: 451 Research's Voice of the Enterprise: DevOps, Open Source 2024.

Trend 3: Agentic process automation will augment intelligent automation platforms

Agentic AI represents a new class of AI systems capable of creating intelligent and autonomous AI agents. These agents can perform tasks independently or interact with humans and other agents using natural language processing. They can understand context (to varying degrees), learn from past experiences, reason within defined parameters and make decisions in complex scenarios. To achieve this, agentic AI employs techniques such as reinforcement learning, decision trees, Bayesian networks, large language models, retrieval-augmented generation and other advanced AI methodologies. These techniques enable agents to evaluate potential actions and outcomes, learn from data, enhance performance over time and autonomously achieve specific — and sometimes unpredictable — goals with minimal human intervention.

Vendors of intelligent automation platforms are integrating agentic AI to create a new category of tools. Agentic process automation (APA) platforms leverage AI agents to examine, enhance and automate workflows and business processes. APA platforms orchestrate the independent and potentially autonomous activities of AI agents, optimize resource allocation, provide recommendations and predictions, and foster collaboration among AI agents and accountable human stakeholders.

Our 2025 research will focus on exploring AI agents and APA platforms, their functionality and potential value to enterprises, and the vendors shaping this emerging technology landscape.

Trend 4: Rising costs will drive need for storage optimization

The rapid growth of data and the high costs associated with its storage and management are driving the need for comprehensive storage optimization across all environments, including on-premises, public cloud and edge. The shift to cloud storage has exacerbated cost concerns; 65% of organizations report that they either have experienced price increases with their public cloud storage services or anticipate price hikes. Notably, rising costs are not exclusive to the public cloud, as 68% of respondents in the same study indicate they have been impacted by price increases in general.

Storage optimization technologies such as intelligent data tiering address these challenges by automatically moving idle data from expensive primary storage systems, including all-flash arrays, to more cost-effective archive storage, whether that is on-premises object storage or archive-class public cloud storage services. Managing data movement across diverse storage systems and cloud services underscores the growing need for comprehensive data management tools that enable organizations to locate and access the data their workloads require across all storage environments.

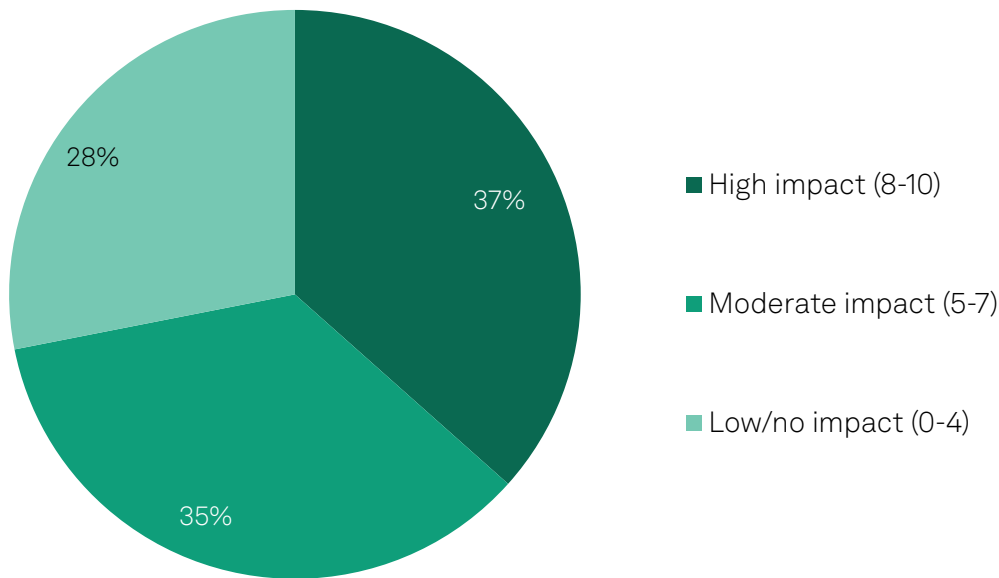
In 2025, we anticipate a surge in vendors integrating advanced capabilities such as data tagging and intelligent data placement to help organizations tackle increasing storage costs and data search challenges. Additionally, global data sovereignty concerns will necessitate careful management of data storage locations, presenting another critical challenge that will drive the demand for robust storage optimization strategies.

Trend 5: Quantum computing will see an upswing in adoption

In 2025, we anticipate that a variety of factors will contribute to a notable uptick in businesses taking their first steps toward quantum computers or expanding their use if they have already begun exploring the technology.

This increase in adoption will likely be driven by several key factors. First, 2023 and 2024 were breakthrough years for quantum hardware. Not only was progress made regarding the size of quantum processors, including the achievement in 2023 of a 1,000-qubit system for the first time, but the quality of the qubits has gotten much better. Current qubit fidelities of 99.9% are being reached, placing processors only one or two orders of magnitude away from computationally stable and commercially useful construction. Second, household names are going on record with their quantum projects, and many, including BMW, JPMorgan Chase, Rolls-Royce, Boeing and Fujitsu, are openly showcasing their work using quantum computers and providing a compelling example for other companies to follow. Finally, the United Nations has declared 2025 the International Year of Quantum Science and Technology, a worldwide promotional effort tailor-made to spark interest in quantum computing. Governments around the world have already partnered with quantum leaders to help foster talent and industry success, and a global focus on the sector will likely raise awareness and adoption across industries.

Figure 3: Quantum computing is becoming mainstream



Q. For the following emerging technologies, please indicate the degree of impact you expect each technology to have on your business in the next three years, with 0 indicating “no impact” and 10 indicating “major impact.” - Quantum computing

Base: All respondents (n=1,098).

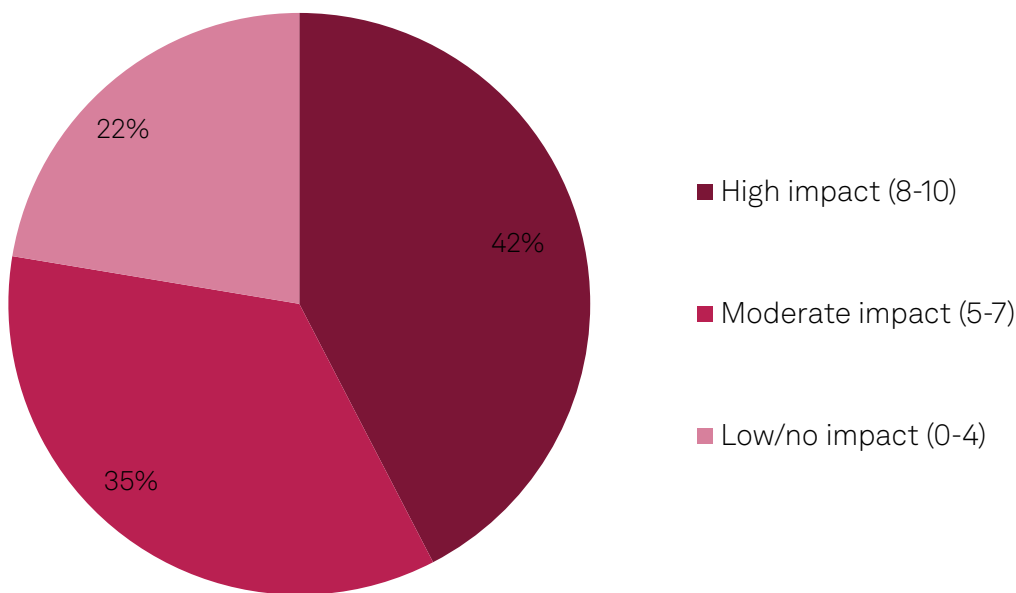
Source: 451 Research’s Voice of the Enterprise: Digital Pulse, Emerging Technologies 2024.

Trend 6: Private 5G demand will increase in support role for GenAI

The emergence of GenAI will spur demand for private 5G (p5G) networks via requirements for reliable, high-capacity, low-latency connectivity. Despite strong interest, p5G has struggled to find mainstream adoption, mostly due to high costs and complexity, in addition to competition with existing technologies, which weaken overall return on investment (ROI). We expect the ROI of p5G in industrial settings to improve both supply and demand dynamics in 2025. On the supply side, leading p5G suppliers are taking steps to make it easier to deploy private 5G networks through novel use of cloud-based management, automation, virtualization and dedicated managed services. Increasing use of GenAI-enabled applications will contribute to demand in the industrial setting.

GenAI models process vast amounts and will often require edge computing to minimize latency. P5G networks are ideally positioned for high-speed, low-latency communication between GenAI applications at the edge and centralized systems to ensure seamless performance for time-sensitive applications. P5G typically requires distributed edge computing, which can do double duty in support of AI edge inference, in which AI models process data closer to the source, thus reducing latency and conserving bandwidth. This is essential for industries such as manufacturing and healthcare, where data must be processed locally for immediate action, such as quality control or anomaly detection. Although p5G adoption has faced challenges due to ecosystem immaturity and supply chain issues, increasing device availability and the development of scalable 5G technologies suggest sustained momentum heading into 2025.

Figure 4: Private 5G wireless is viewed as a high-impact investment category for most



Q. For the following emerging technologies, please indicate the degree of impact you expect each technology to have on your business in the next three years, with 0 indicating "no impact" and 10 indicating "major impact." - Private 5G wireless networking (e.g., campus or facility networks).

Base: All respondents (n=1,144).

Source: 451 Research's Voice of the Enterprise: Digital Pulse, Emerging Technologies 2024.

Trend 7: Sustainability will remain a critical focus in AI era

Sustainability will remain a critical priority for enterprises in 2025, driven by environmental, social and governance (ESG) goals that increasingly influence purchasing decisions in compute, storage and networking. AI workloads, in particular, exacerbate sustainability challenges due to their immense energy demands, requiring enterprises to rethink on-premises infrastructure strategies. Vendors, too, will feel the pressure to design solutions that align with their customers' sustainability objectives, which will create a feedback loop of innovation and adoption.

For enterprises, the proliferation of AI workloads is transforming datacenters into energy-intensive hubs. AI models require enormous computational power, with training and inference tasks consuming significant amounts of energy. On-premises datacenters also exacerbate sustainability challenges due to aging hardware and inefficient cooling systems that fail to match the energy efficiency of cloud providers' hyperscale facilities. Advanced cooling systems, renewable energy integration and intelligent workload orchestration will be critical investments. Enterprises must also embrace tools that provide real-time insights into energy consumption and enable actionable adjustments to workload distribution and infrastructure optimization.

Vendors supplying compute, storage and networking solutions must align their strategies with sustainability demands. This includes designing energy-efficient hardware and incorporating materials with lower environmental impact. All-flash storage systems exemplify this shift, having significantly lower power and cooling requirements than legacy disk systems while providing extended production life spans. The broader infrastructure landscape will see similar pressures. Vendors across compute and networking domains will focus on delivering energy-efficient designs, modular hardware and intelligent resource management to help enterprises achieve sustainability targets. At the same time, public cloud adoption will continue to grow, with enterprises prioritizing the migration of workloads and data to cloud services that align with their ESG commitments. This trend of modernizing on-premises infrastructure with efficient storage while leveraging public cloud sustainability initiatives will define the next phase of enterprise infrastructure sustainability strategies.

Trend 8: AI chip war will escalate

The AI chip wars are set to escalate in 2025, bringing both challenges and opportunities for enterprises and vendors. As Moore's Law slows, the industry is pivoting to heterogeneous architectures, with innovations such as chiplets, advanced interconnects and open-source cores driving new designs. While graphics processing units (GPUs) currently dominate AI workloads, specialized accelerators such as application-specific integrated circuits, data processing units and neural processing units are gaining traction, and major cloud hyperscalers and industrial firms are developing proprietary solutions. Enterprises must navigate this evolving ecosystem by weighing cost, performance and ease of integration with existing systems.

Geopolitical challenges and supply chain pressures remain central to the chip industry's trajectory. Trade sanctions and market bifurcation between Asia and the West risk fragmenting technology standards and complicating cross-border operations. While efforts by the US and Europe to localize semiconductor production and diversify rare-earth material supplies are advancing, they have faced significant challenges in scaling quickly. Enterprises reliant on advanced silicon must brace for potential disruptions by diversifying suppliers, securing inventory buffers and exploring alternative technologies. Simultaneously, China's significant investments in domestic chip capabilities are reshaping the competitive balance and may accelerate global innovation while intensifying market fragmentation.

The resurgence of AI chip startups, spurred by the GenAI boom, offers a glimpse of innovation despite past failures. New technologies are lowering entry barriers, enabling fresh competition. However, market concentration — especially for GPUs — persists, forcing enterprises to balance dependency risks with the potential benefits of cutting-edge silicon. Navigating these dynamics will be critical for enterprises seeking to capitalize on AI advancements while managing cost, risk and performance trade-offs.

Methodology

S&P Global Market Intelligence 451 Research provides essential insight into key trends driving digital transformation across the entire technology landscape. By offering a combination of expert analyst insight and differentiated data, 451 Research enables the industry with the information and perspectives they require to make more effective decisions.

Reports such as this offer a holistic perspective on key trends and themes driving the technology space over the coming year. These markets evolve quickly, so 451 Research offers a wide range of research services that provide critical marketplace updates on an ongoing basis. These reports, datasets and perspectives are published frequently, in numerous short- and long-form factors. Forward looking M&A analysis and perspectives on strategic acquisitions and the liquidity environment for technology companies are also updated regularly, backed by industry leading databases such as the 451 Research M&A KnowledgeBase.

Our research is organized into channels that align with the prevailing key issues driving digital transformation. These channels are: Applied Infrastructure & DevOps; Cloud & Managed Services Transformation; Customer Experience & Commerce; Data, AI & Analytics; Datacenter Services & Infrastructure; Fintech; Information Security; IoT, Edge & Digital Industries; and Workforce Productivity & Collaboration.

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