uptime INTELLIGENCE

Executive summary

Uptime Intelligence report: March 2024

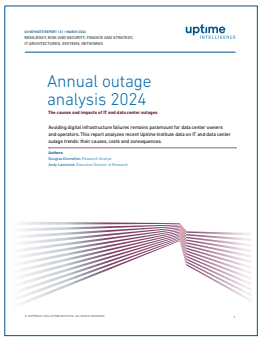
Annual outage analysis 2024

Avoiding digital infrastructure failures remains paramount for data center owners and operators. This report analyzes recent Uptime Institute data on IT and data center outage trends: their causes, costs and consequences.

This executive summary summarizes the key findings of Uptime Intelligence's *Annual outage analysis 2024* report, and includes sample pages from the full 29-page report, which is available to Uptime Institute members and Uptime Intelligence customers.

Key findings

- Despite increased media attention on outages, and a worrying increase in cyberattacks, our findings suggest that the overall frequency and severity of outages is actually decreasing.
- Uptime Institute has used multiple surveys of data center managers, and reports from our members, along with publicly available reports, to produce reliable conclusions about trends in data center outages. However, all data relating to outages should be treated skeptically. Outage information is commercially sensitive and subject to uncertainty.
- Outages are costly. More than half (54%) of the respondents to the 2023 Uptime Institute data center survey say their most recent significant, serious or severe outage cost more than $100,000, with 16% saying that their most recent outage cost more than $1 million.
- Power issues are consistently the most common cause of serious and severe data center outages. However, network-related issues are the largest single cause of IT service outages.
- Four in five respondents to the 2023 Uptime Institute data center survey say that their most recent serious outage could have been prevented with better management, processes and configuration. This suggests that, as in previous years, there is an opportunity to reduce outages through training and process review.
- Uptime data suggests that each year there are, on average, 10 to 20 high-profile IT outages or data center events globally that cause serious or severe financial loss, business and customer disruption, reputational loss and, in extreme cases, loss of life.



Report contents

Outage frequency and severity

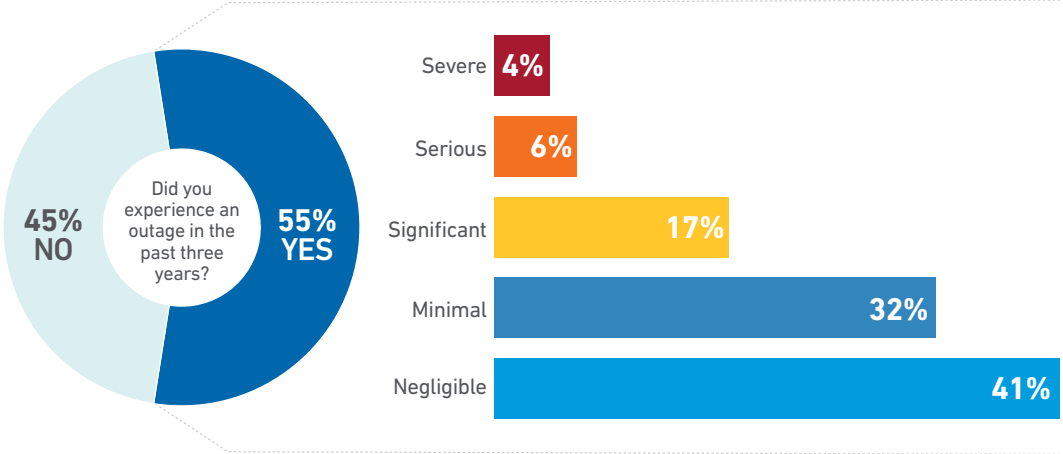
As the global data center footprint expands to meet new demand, the overall number of data center-related outages is expected to increase. However, Uptime data reveals a consistent, downward trend in the frequency and severity of outages relative to the overall growth in IT. This trend has been observed for several years.

More than half (55%) of operator respondents to the 2023 Uptime Institute data center survey report having an outage in the past three years — down from 60% in 2022 and 69% in 2021. At the same time, only one in 10 outages in 2023 was categorized as either serious or severe (see **Figure 1**). This is an improvement of four percentage points from the 2022 response and an improvement of 10 percentage points compared with 2021. When analyzing this data, Uptime focuses on data center outages and not all IT service outages. To collect more precise survey data and to improve accuracy, respondents to our annual survey are now asked about outages at the specific facility that they are most familiar with, rather than the largest site within the data center operator's organization. This may have led to some shifts in the data — however, our control questions suggest the effect on longitudinal comparisons has been minor.

Figure 1

While majority of operators experienced an outage, most had negligible impact

On a scale of 1 (negligible) to 5 (severe) how would you classify your data center's most impactful outage in the past three years, either in your own facility or because of a third-party service provider? (n=781)



(Responses for "Don't know" are not included.)

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What do these outage rates tell us? The answer is complicated because the technology is never static and external factors (such as weather or utility reliability) can play a significant role. Uptime Intelligence can, however, make the following observations:

- **Overall decrease.** The data collected over several years suggests that outages are decreasing relative to the overall rise in IT. This is likely due to many different reasons (see below).
- **No complacency.** Although the outage frequency has decreased, there is no room for (or any sign of) complacency. Instead, there is strong consensus across the sector, including among regulators, that outage rates are still concerning. The high financial and/or reputational costs, which can result from a data center outage, mean that resiliency consistently registers as one of the top concerns among industry stakeholders and is a strong driver of investment.
- **Public cloud.** The move to the public cloud does not necessarily mean that there will be fewer outages. However, it may mean that, for example, "third-party supplier" is registered as the cause of more IT service disruptions while fewer on-premises data center outages are recorded.
- **Long COVID.** The COVID-19 pandemic had a significant impact on the data center industry, particularly in terms of decreasing and then increasing demand, straining supply chains and distorting outage rates. These aftershocks are still being felt in 2024, even if indirectly, while their longer-term impact remains unclear. For example, supply chain disruptions continue to stall capital projects, which has led many organizations to delay maintenance and infrastructure upgrades. It is possible that these factors have temporarily reduced the rate of incidents, which can sometimes cause an outage, and that a rebound effect in the near- to medium-term will be seen.
- **Grid instability.** There is evidence that the global shift toward more transactive, dynamic and renewable power grids is reducing, or will reduce, grid reliability. If this is the case, data centers may experience an increase in outages. Many outages occur when an uninterruptible power supply (UPS) or generator fails to respond to a grid disruption.
- **Climate change.** Extreme weather events — such as high and low temperatures, high winds and floods, and forest fires — exacerbated by climate change have been associated with data center outages over the past few years. This trend is likely to intensify and will increase the outage risks until pre-emptive action is taken.
- **Adoption of new technology.** To comply with anticipated and recently passed regulations around the reporting and improvement of resiliency and energy performance, operators may adopt technologies and practices that require careful management. These may even add new risks, for example:
  - The use of distributed, software-based resiliency (i.e., moving traffic and workloads dynamically) can reduce outage risks and their associated impact over time, but during an introductory period, these may increase.
  - The use of liquid cooling may reduce some thermal risks, but the impact of component failure may reduce thermal ride-through times, which, in some cases, increases risk.

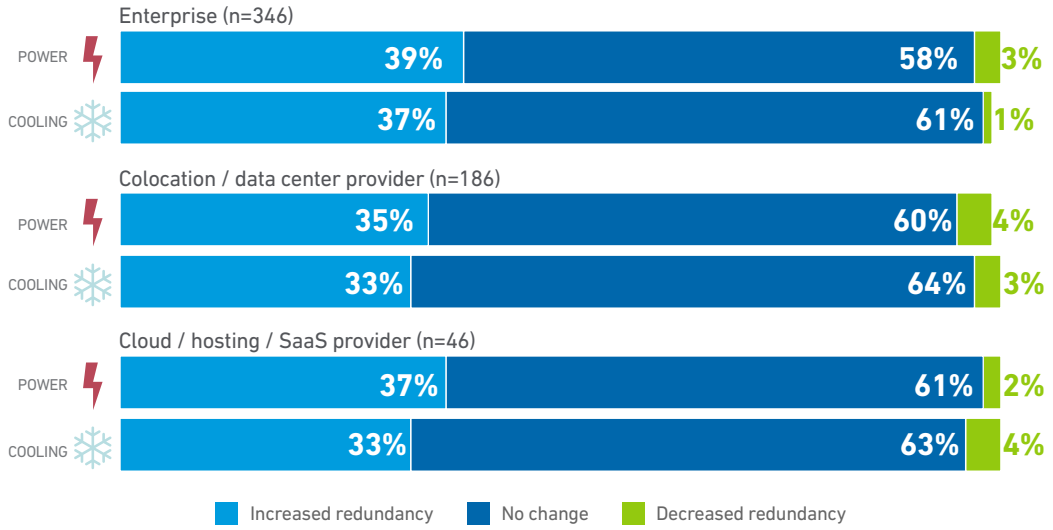
Despite the increase in risk factors, Uptime's annual survey data up to 2023 suggests that the rate of outages per facility is falling. What could be driving this trend? One factor stands out: Uptime research finds that, year-on-year, most organizations are investing more in physical infrastructure redundancy (see **Figure 2**).

This trend contradicts expectations that multisite approaches will undermine expensive, physical site redundancy strategies. While the industry may indeed move further toward distributed and software-based resiliency models, maintaining and increasing site-level redundancy remains a high priority for most operators.

Figure 2

Physical site redundancy still climbing

How have redundancy levels changed in the past three to five years in your data center?



(All figures rounded.)

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Outage causes

Establishing the root cause of a data center outage is imperative for preventing repeat instances of disruption and for identifying areas that require greater investment to mitigate the risks. However, assessing outage data poses challenges due to the multifaceted nature of most incidents, which often stem from a combination of factors.

Uptime's annual surveys consistently show that disruptions to on-site power distribution are the most common cause behind impactful outages (see **Figure 4**). This is unsurprising given the intolerance of IT hardware to any significant power disturbances, such as voltage fluctuations or complete loss of power, that last more than fractions of a second.

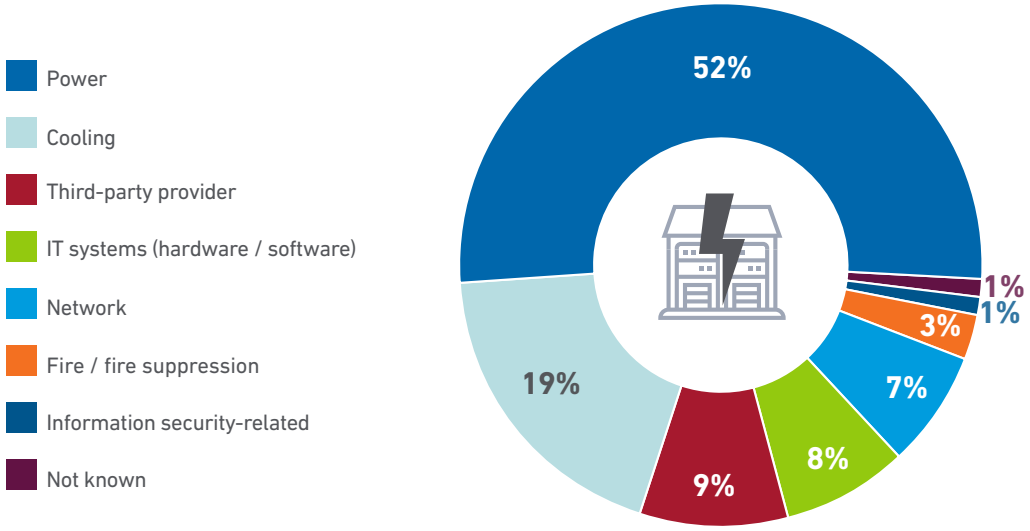
Conversely, failures or underperformance of cooling equipment are generally tolerated for longer durations, often measured in minutes, due to thermal ride-through mechanisms or network traffic redirection capabilities. While IT-originating failures may occur more frequently, they often have isolated, minor effects that go unrecorded and primarily impact specific applications or datasets.

Third-party provider issues have seen a marginal but consistent uptick since 2020, rising by five percentage points to account for nearly one in 10 outages in 2023. This steady increase reflects the growing reliance on cloud / hosting, software as a service (SaaS) and colocation providers.

Figure 4

Power remains the number one root cause of outages

What was the primary cause of your data center's most recent impactful incident or outage? (n=108)



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PUBLICLY REPORTED OUTAGES

Commercial operators in the limelight

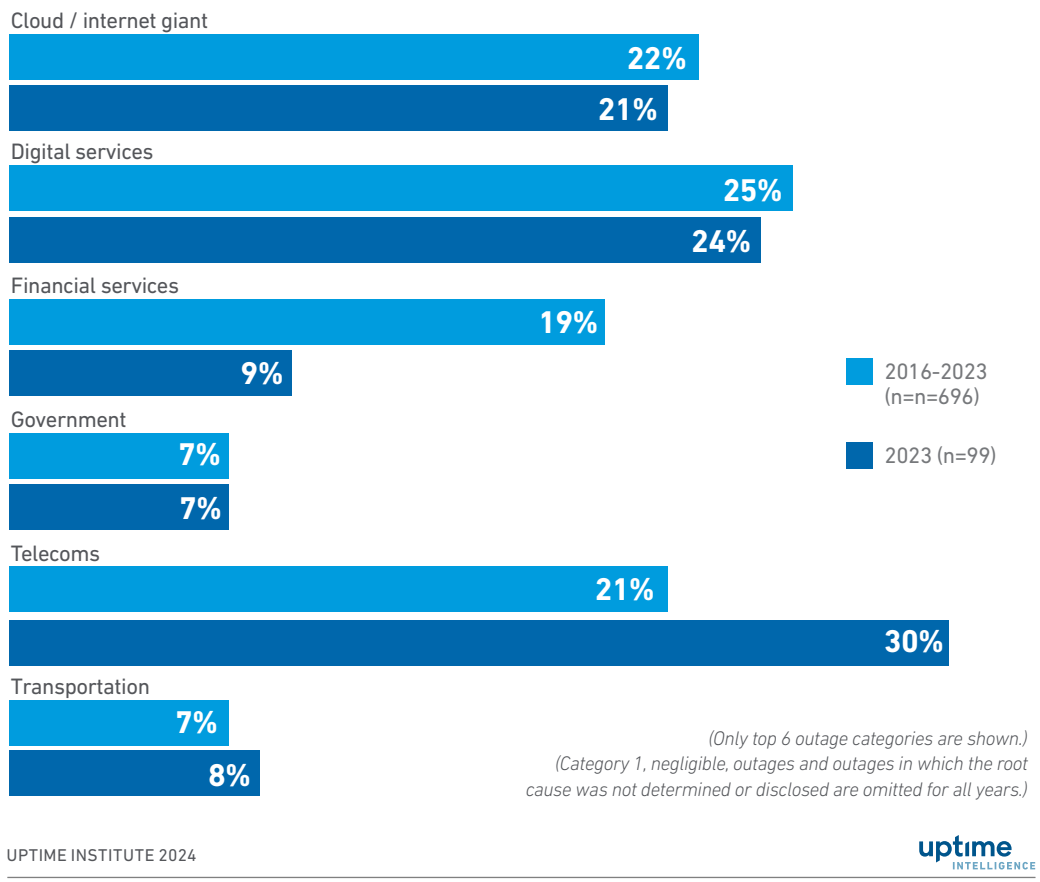
Over the past eight years, third-party commercial operators of IT and/or data centers combined (cloud / internet giants, digital services, telecommunications, etc.) have accounted for more than two-thirds (67%) of publicly reported outages recorded by Uptime (see **Figure 7**). This reflects the growth of professional, outsourced IT services, from colocation to cloud and hosting. Moving to third-party venues and services may reduce risks but failures still occur, and they can be very serious.

Compared with the average over this period, financial sector outages fell in both 2022 and 2023. This may be influenced by stricter regulations and oversight following a series of large, high-impact outages before 2021.

The telecommunications sector, on the other hand, has experienced an uptick in outages. This has been driven by various factors: rising demand for connectivity and capacity across all sectors has put a strain on networks and legacy infrastructure, while the criticality of mobile networks, in particular, means outages can have an outsized impact. The increasing use of standardized and less expensive data centers — compared with earlier, resilient but limited designs — may have increased some risks while lessening others. The adoption of technologies, such as software-defined networking, 5G and network function virtualization, adds complexity to these systems.

Figure 7

Publicly reported outages by sector, 2016 to 2023



The human factor

Data center operators face considerable challenges when it comes to preventing and mitigating downtime caused by human error. This is because failures can stem from various factors, such as the adequacy of training, the effectiveness of procedures in place, staff fatigue, resource availability and the complexity of equipment operation. There is also uncertainty around how such incidents should be defined; for instance, whether a machine failure caused by a software error at the factory constitutes human error.

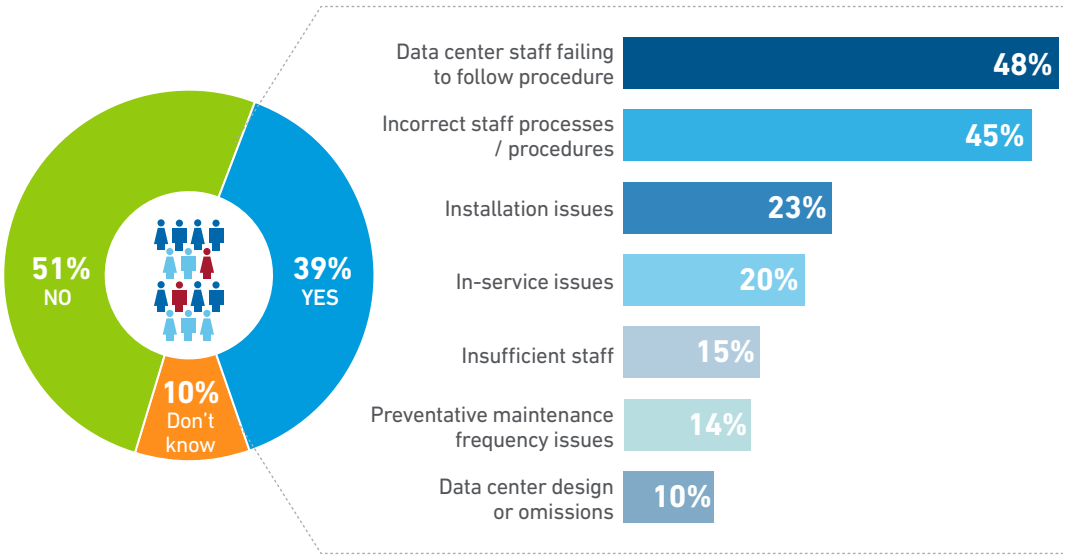
As a result, Uptime tends to analyze human error as a contributing factor rather than the sole or primary cause of outages. Drawing on 25 years of data, Uptime estimates that human error, whether directly or indirectly, contributes to a significant majority — ranging from two-thirds to four-fifths — of all downtime incidents.

In recent surveys on resiliency, Uptime has tried to understand how the makeup of some of these failures relates to human error. **Figure 13** shows that human error-related outages are mostly caused either by staff failing to follow procedures (even if they have been agreed upon and codified) or by the procedures themselves being inadequate.

Figure 13

Most common causes of major human error-related outages

Has your organization experienced a significant, serious, or severe IT service outage(s) that was caused by human error over the past three years? If so, what are their most common causes? Choose no more than three. (n=418)



(Responses for "Other" and "Don't know" are not included.)
(The sum percentages for most common causes exceed 100% due to respondents being asked to choose up to three options.)

UPTIME INSTITUTE DATA CENTER RESILIENCY SURVEY 2024

Find out more

We hope you found this executive summary of our *Annual outage analysis 2024* report valuable.

The full report analyzes the outage catergories and the primary causes of outages in more detail. It also includes an updated review of the cost of outages, based on our latest survey data and research.

The full report is available to Uptime Institute members and Uptime Intelligence customers.

To enquire about an annual subscription, which includes this report; or to purchase this report, please contact info@uptimeinstitute.com

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About Uptime Institute

Uptime Institute is the Global Digital Infrastructure Authority. Its Tier Standard is the IT industry's most trusted and adopted global standard for the proper design, construction, and operation of data centers — the backbone of the digital economy. For over 30 years, the company has served as the standard for data center reliability, sustainability, and efficiency, providing customers assurance that their digital infrastructure can perform at a level that is consistent with their business needs across a wide array of operating conditions. With its data center Tier Standard & Certifications, Management & Operations reviews, broad range of related risk and performance assessments, and accredited educational curriculum completed by over 10,000 data center professionals, Uptime Institute has helped thousands of companies, in over 100 countries to optimize critical IT assets while managing costs, resources, and efficiency.

Uptime Institute is headquartered in New York, NY, with offices in London, Sao Paulo, Dubai, Riyadh, Singapore, and Taipei.

For more information, please visit **www.uptimeinstitute.com**