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Executive summary

July 2023

Uptime Institute Global Data Center Survey 2023

The Uptime Institute Global Data Center Survey, now in its 13th year, is the most comprehensive and longest-running study of its kind. The findings in this report highlight the experiences and strategies of data center owners and operators in the areas of resiliency, sustainability, efficiency, regulations, staffing, cloud and innovative technologies.
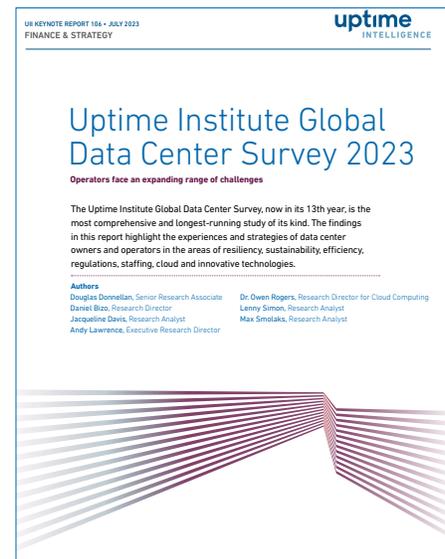
Uptime Intelligence: actionable insight for the digital infrastructure ecosystem
This executive summary includes excerpts from a subscriber-only report published by Uptime Intelligence (a service of Uptime Institute).
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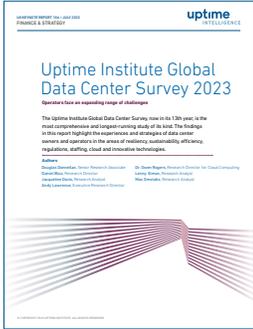
Uptime Intelligence *is a research subscription service offered by Uptime Institute. It delivers in-depth, clear analysis and practical guidance focused on the present and future of data center and digital infrastructure strategies, technologies and operations. It serves enterprises that are operating their own digital infrastructure or contracting with third parties; providers of colocation, cloud and other infrastructure-as-a-service offerings; and suppliers of technology and services to all operators of digital infrastructure.*

Uptime Institute *serves all stakeholders that are responsible for IT service availability through industry-leading standards, education, membership, consulting and award programs delivered to enterprise organizations and third-party operators, manufacturers and providers.*

Synopsis

The Uptime Institute Global Data Center Survey 2023 reveals an industry that continues to grow in importance and scale, but must overcome a widening range of challenges. Operators face ever stricter regulations and pressure to reduce energy use, along with persistent staffing and supply chain issues. New technologies present a promising way forward — but are expensive and lack standardization and scalability. While investments in efficiency and resiliency are starting to pay off for many organizations, progress is slow with a growing proportion of workloads being outsourced.

- Average global power usage effectiveness (PUE) levels, have remained flat for four years. Further improvements in PUE levels will require a wave of investment.

- The share of workloads placed in corporate, on-premises facilities has fallen below half — and is expected to shrink further — as more organizations opt for a hybrid approach to IT.

- More than half (55%) of operators say they have had an outage at their site in the past three years. This continues a trend of steady improvement.

- About 8% of the data center workforce are women. In the US, this rate is below that of mining and construction.

- Enterprise operators say data security is the biggest impediment to moving mission-critical workloads to the public cloud.

- Server rack densities are climbing — steadily, but slowly. Most operators do not have any racks beyond 20 kW.

- AI in data center facilities will be adopted cautiously. Operators are distrustful of its ability to make reliable operational decisions.

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Introduction

The 13th annual Uptime Institute Global Data Center Survey is the most comprehensive and longest-running study of its kind. The survey tracks the state of the industry in terms of resiliency, sustainability, efficiency, regulations, staffing, cloud and the use of innovative technologies.
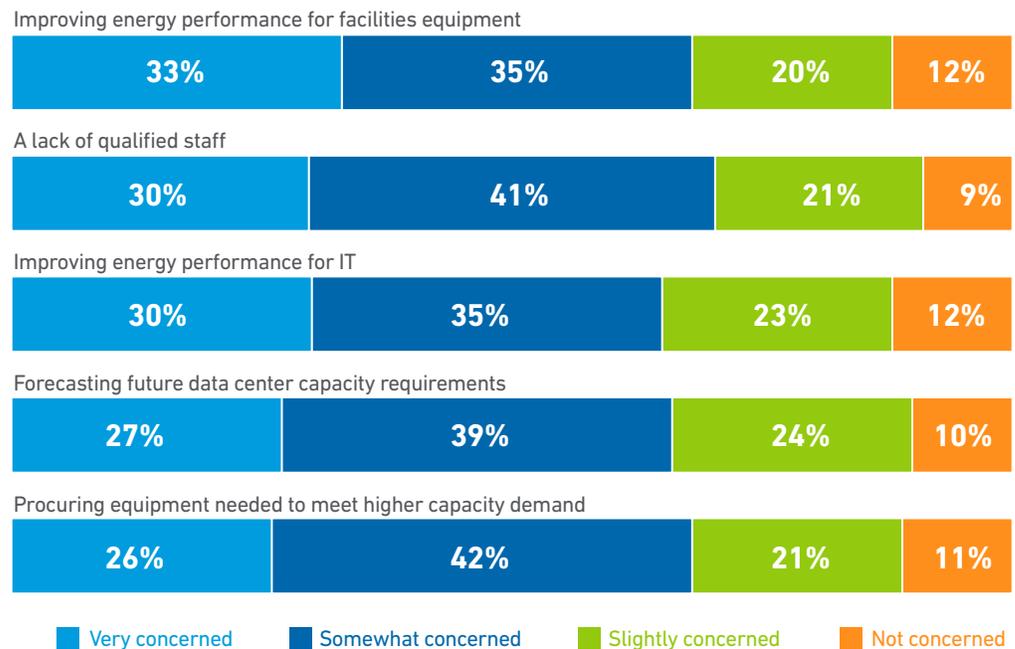
The survey was conducted online from February 2023 to April 2023 and collected responses from more than 850 data center owners and operators, as well as nearly 700 vendors and consultants. This report focuses on owners and operators of digital infrastructure (an analysis of the experiences and views of vendors and consultants will be published separately). For more details, including demographics, see the **Appendix**.

For the first time, the survey asked operators to identify and weigh up some of their key management concerns. While the lingering effects of the COVID-19 pandemic have receded in 2023, new challenges have taken their place: digital infrastructure managers are now most concerned with improving energy performance and dealing with staffing shortfalls (see **Figure 1**). Government commitments to reduce carbon emissions are nearing their target deadlines and, as a result, regulations aimed at data center energy use require urgent attention, investment and action.

Figure 1

Staffing and energy efficiency are managers' top concerns

Looking at the next 12 months, how concerned is your digital infrastructure management regarding each of the following issues? (n=629)

Improving energy performance for facilities equipment

33%	35%	20%	12%

A lack of qualified staff

30%	41%	21%	9%

Improving energy performance for IT

30%	35%	23%	12%

Forecasting future data center capacity requirements

27%	39%	24%	10%

Procuring equipment needed to meet higher capacity demand

26%	42%	21%	11%

■ Very concerned　■ Somewhat concerned　■ Slightly concerned　■ Not concerned

(Only the top five response categories are shown.)
(All figures rounded.)

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Sustainability and metrics

In several studies in recent years, Uptime has noted that the collection and reporting of sustainability-related data, and the calculation of related metrics, is patchy at best. Once again, the survey confirms this view. Many operators will struggle to meet emerging sustainability reporting requirements, or indeed the requirements of some customers and even the public.
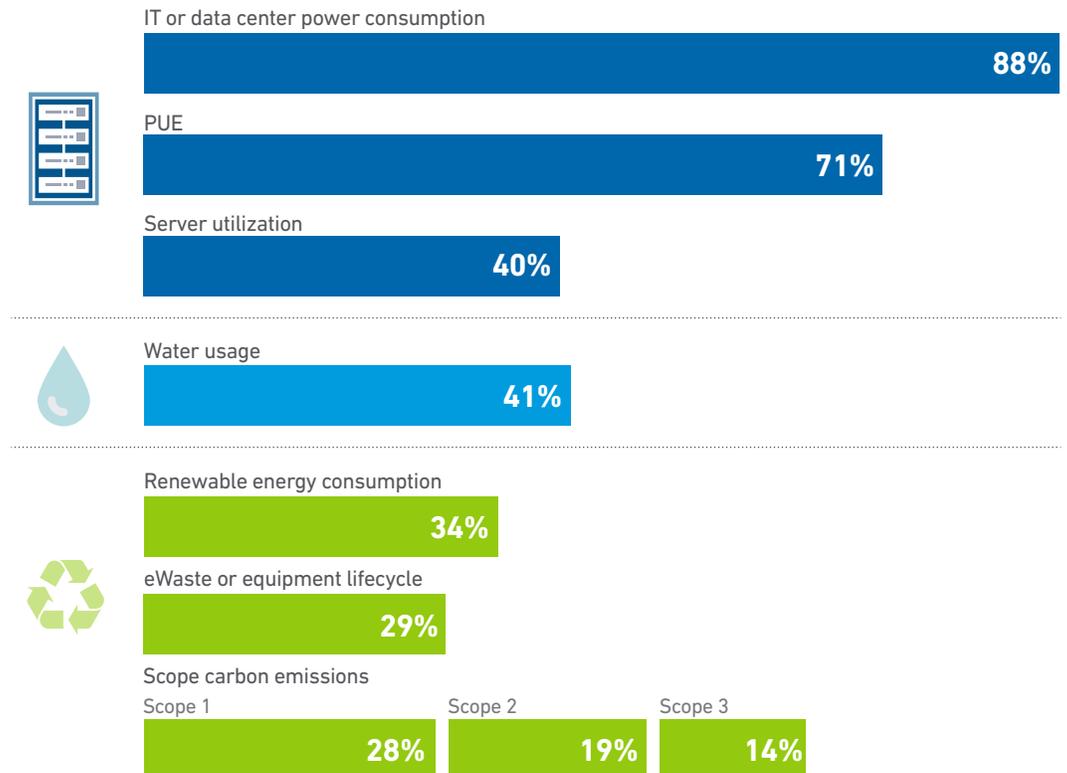
Organizations focus on efficiency over carbon

Sustainability reporting today focuses primarily on infrastructure (energy) efficiency rather than reducing carbon emissions (see **Figure 6**). One interpretation of this is that operators have chosen to focus on tracking the amount of work (e.g., CPU cycles) that can be derived from a resource, such as a unit of power, rather than minimizing the carbon footprint of that resource. The data, however, may tell a simpler story: power consumption, PUE and water are easy to track, and any improvement in these areas can often save money. Carbon reduction — which, of course, can be partly achieved by good energy management — is much more complicated and less directly rewarding.

Figure 6

IT / data center power consumption is top reporting priority

Which IT or data center metrics do you compile and report for corporate sustainability purposes? Choose all that apply. (n=716)

IT or data center power consumption
88%

PUE
71%

Server utilization
40%

Water usage
41%

Renewable energy consumption
34%

eWaste or equipment lifecycle
29%

Scope carbon emissions

Scope 1	Scope 2	Scope 3
28%	**19%**	**14%**

("Renewable energy consumption" was not an option in 2022.)
(2022 options included "Scope 1 and 2 carbon emissions" and "Scope 1, 2 and 3 carbon emissions".)

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Resiliency and outages

Uptime data shows that data center owners / operators have been investing in resiliency, adding more redundancy. In spite of this, outages remain an issue.

Tracking outages in data center infrastructure, which includes the IT and networks, is saddled with complexities. What constitutes an outage, how severe it is, and what is understood as a root cause have all become less clear in the highly interconnected world of IT services. Despite the industry's shared mission of delivering highly reliable and available digital infrastructure, many outages and their root-cause analyses remain hidden from public view; nondisclosure is still the first instinct of many operators.

Unfortunately, this environment means outage data is inevitably ambiguous and incomplete, which prevents the industry from learning potentially useful lessons on how to avoid or contain similar incidents. Despite these difficulties, Uptime's outage data has been largely consistent over many years.

Overall, the picture that has emerged is one of gradual improvements (i.e., reductions) in the frequency and severity of outages in data centers. This may be surprising to some, given the increased press coverage of data center outages in recent years. But this coverage has more to do with the growing importance of digital services to everyday life, and the swell in the global data center footprint. The data does not point to any deterioration in the average number of incidents per site.

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Operators report fewer disruptive outages

Uptime has tracked a steady improvement in the outage rate per site (or per survey respondent) for several years. In the 2023 Uptime Institute data center survey, 55% of operators say they had had an outage in the past three years, which is down from 60% in 2022, 69% in 2021 and 78% in 2020, and extends the gradual downward trajectory.

However, there are multiple caveats. One of these relates to the statistical methodology. For this year's annual survey, Uptime changed the survey questions for better accuracy — and respondents are now asked about outages at the specific facility that they are most familiar with, rather than the largest site of the data center operator's organization. This change may introduce some underlying shift in the data, although our control questions suggest the effect has been minor.

A second caveat: the uncertain impact of the COVID-19 pandemic and other major disruptions on business. The current trend of small year-on-year improvements runs through the turbulent years of the pandemic, which had a significant impact on the data center sector. The lockdowns associated with COVID-19 led to an initial fall in demand at most sites, followed by a surge as the world adapted to more online services. Pandemic and post-pandemic supply chain disruptions and ongoing shortages of some key facility equipment and IT components then kicked in.

It is difficult to track what the net effect of all these factors has been. For example, the COVID-19 pandemic led to a fall in business and an uncertain outlook for many enterprises, which (coupled with conservative management) reduced budgets for innovation and retrofits, yet lockdowns and contagion controls to halt infections reduced the number of available on-site staff.

Cloud and provisioning

Many organizations remain wary of using the public cloud for mission critical applications. Their primary concern is data security, with concern about infrastructure performance and resiliency being less significant.

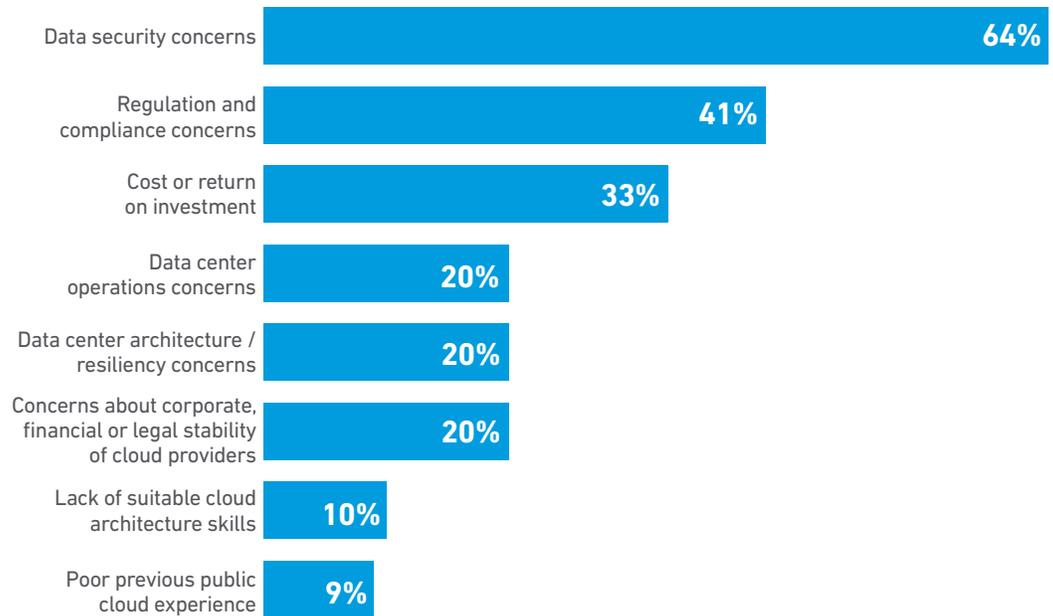## Data security, not infrastructure, blocks cloud adoption

Two-thirds (65%) of respondents to the 2023 Uptime Institute data center survey are not hosting any mission-critical applications in the public cloud — a high proportion. In the past, many Uptime members have said that a lack of clarity in hyperscaler data centers' operations and resiliency had discouraged cloud adoption. Many said they preferred to operate their own data centers and have greater control. Respondents also believed that their data centers were less likely to experience outages than public cloud operators, which have suffered from some much-publicized failures across availability zones and regions.

However, Uptime's 2023 research suggests that visibility into public cloud operations and resiliency may not be the main reason for not using the public cloud — the challenge is data protection. Respondents who did not place mission-critical workloads in the cloud were asked to identify the reasons: almost two-thirds (64%) cited data security as a barrier to adoption; with 41% also expressing concerns over regulation and compliance (see **Figure 15**). Compared with other obstacles, concerns relating to data center operations and resiliency ranked relatively low — each was selected by 20% of respondents. Only 9% said a previous negative experience with the public cloud had deterred them from using it again.

Figure 15

Data security and compliance concerns impede adoption

What are the main reasons you do not place mission-critical workloads into public clouds? Choose no more than three. (n=240)

Reason	Percentage
Data security concerns	64%
Regulation and compliance concerns	41%
Cost or return on investment	33%
Data center operations concerns	20%
Data center architecture / resiliency concerns	20%
Concerns about corporate, financial or legal stability of cloud providers	20%
Lack of suitable cloud architecture skills	10%
Poor previous public cloud experience	9%

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Innovation and impact

Artificial intelligence (AI) is an umbrella term that is used to describe computer software that is capable of learning from data and improving its performance over time in similar ways to humans. The technology is typically used to perform tasks such as problem solving, pattern recognition and natural language processing.

So far, the impact of AI on data center operations has been limited to the dynamic optimization of power and cooling, anomaly detection, predictive maintenance and other types of predictive analytics. Case studies that detail successful implementations of AI in the data center remain rare. Nevertheless, the properties of AI mean that this technology could be applied to almost every area of data center management and operations.

## Perception of AI's looming influence does not reflect reality

Nearly three-quarters of respondents to the 2023 annual survey believe that AI-based software tools will eventually reduce data center operations staffing levels — a viewpoint that Uptime has observed consistently for the past five years (see **Figure 20**). The number of respondents who think this will be achieved in the short term has increased in 2023, in line with more coverage of AI in the mainstream media and greater awareness of consumer-facing AI models, such as Stable Diffusion and ChatGPT.

The perception of AI's looming power and influence has not reflected reality, however — or at least not so far. Back in 2019, 29% of respondents said they believed that AI would reduce the need for human data center staff in the next five years. Nearly five years later, there is little evidence of this occurring.

Figure 20

More operators expect AI to lower staffing needs in the near term

Do you believe artificial intelligence will reduce your data center operations staffing levels in the next five years?

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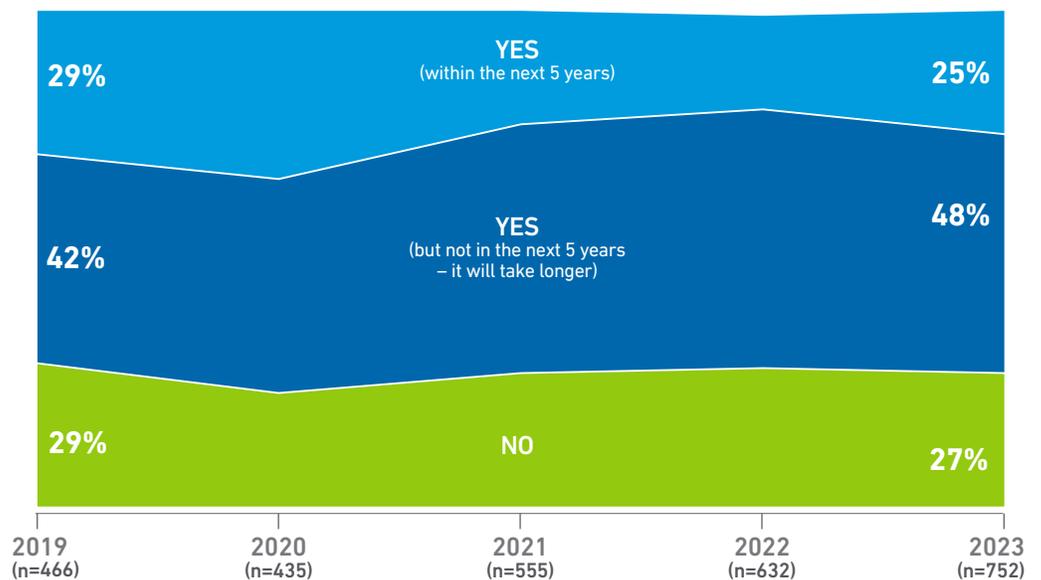
Appendix

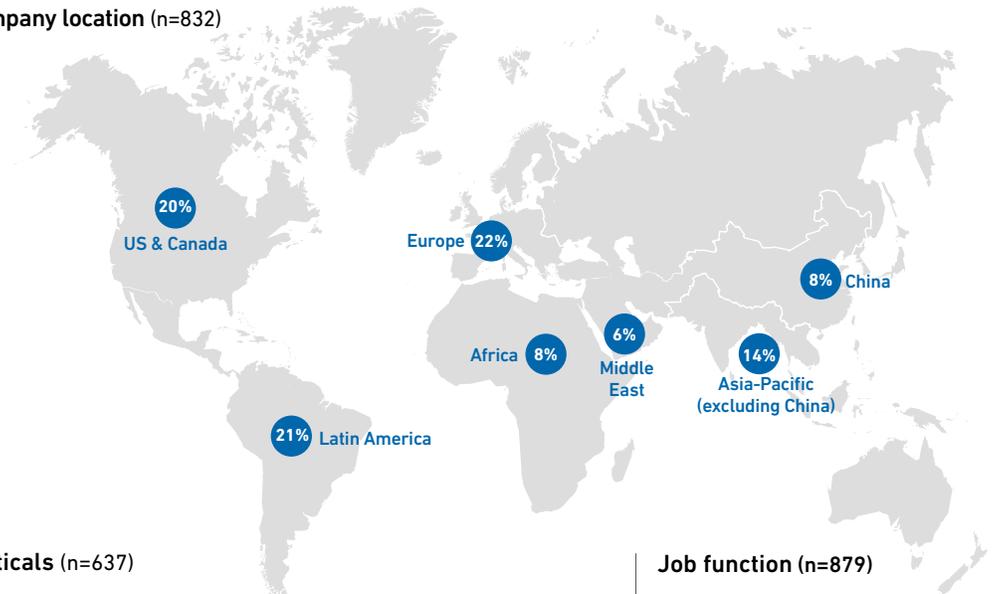# Survey methodology and demographics

Uptime Institute's Global Data Center Survey, now in its 13th year, is conducted annually online and by email. The 2023 survey was conducted in the first half of the year.

This report focuses on responses from the owners and operators of data centers, including those responsible for managing infrastructure at the world's largest IT organizations. Job titles include senior executive, IT manager, IT operations staff, critical facilities manager, critical facilities operations staff, design engineer and consultant.
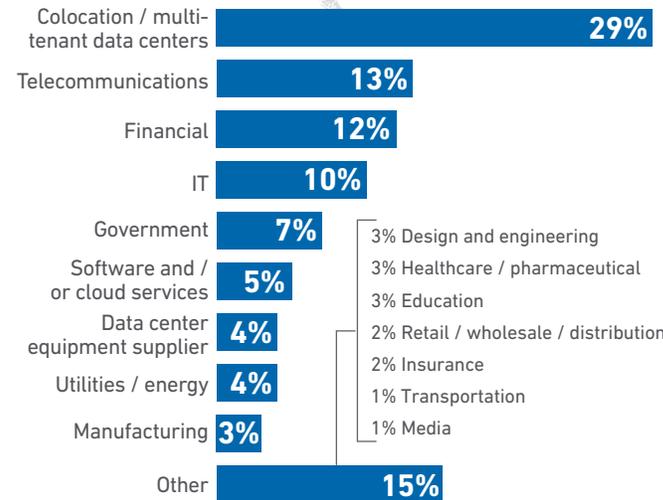
Figure 22

Respondents by location, industry vertical and job function

Company location (n=832)

- **20%** US & Canada
- **22%** Europe
- **8%** China
- **8%** Africa
- **6%** Middle East
- **14%** Asia-Pacific (excluding China)
- **21%** Latin America

Verticals (n=637)

Vertical	%
Colocation / multi-tenant data centers	29%
Telecommunications	13%
Financial	12%
IT	10%
Government	7%
Software and / or cloud services	5%
Data center equipment supplier	4%
Utilities / energy	4%
Manufacturing	3%
Other	15%

3% Design and engineering
3% Healthcare / pharmaceutical
3% Education
2% Retail / wholesale / distribution
2% Insurance
1% Transportation
1% Media

Job function (n=879)

23% Critical facilities manager	**19%** Senior executive (VP or C-level)
12% Critical facilities operations staff	**11%** IT manager
7% IT operations staff	**7%** Design engineer
7% Consultant	**13%** Other

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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 25 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.

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