Monitoring a modern-day hybrid cloud environment

Abstract: Most enterprises are in the middle of their cloud migration journey, and 83 percent of enterprise workloads will be in the cloud by 2020, according to research by HostingTribunal. Of the enterprises that are migrating, many are choosing a hybrid cloud strategy. The combined on-premises and public cloud architecture benefits organizations by maximizing cost savings and addressing security concerns.

For a successful digital transformation journey, organizations also need to implement full-stack monitoring of their hybrid cloud environment. The biggest challenge is finding a monitoring tool that offers complete visibility across the entire hybrid cloud architecture. This white paper discusses the essentials for adopting a hybrid cloud strategy, as well as the components that need to be monitored.

The evolution of cloud infrastructure

The IT landscape has seen tremendous changes since mainframe computers were first introduced in the 1950s. From then on, there have been various transformtions, such as the development of personal computers, client-server architecture, and enterprise computing. With the unprecedented technological developments in recent times, the emphasis has shifted from hardware to software. We're now in the era of cloud computing, and legacy systems are undergoing a rapid transformation. With the advantage of on-demand resources and high scalability, this era has spawned new cloud strategies such as hybrid cloud and multi-cloud environments.
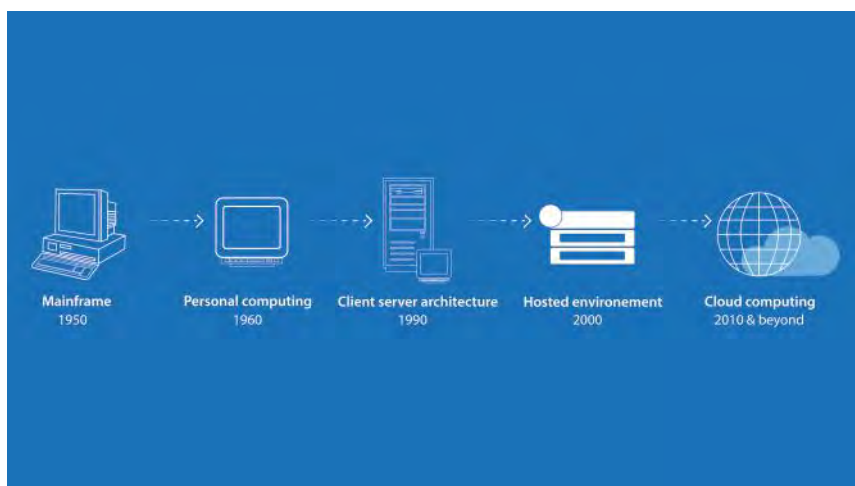
Hybrid cloud and its relevance

Any organization that has decided to adopt cloud technology, aside from businesses that are just starting out, is bound to have physical resources on-premises. No amount of planning will help businesses completely migrate to the cloud in one easy step. While some workloads and resources are easily moved to public clouds such as Amazon Web Services (AWS), Azure, or Google Cloud Platform, other resources will need to remain in the data center.

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For businesses, moving only part of their infrastructure proves to be cost-effective, and sharing the workload between platforms also gives the business greater flexibility and agility. There are a few compelling reasons why a hybrid cloud strategy is the way to go formost businesses:

Elasticity

The pay-as-you-use model gives businesses the flexibility to increase or decrease resource usage based on seasonality, trends, and other changes in demand. Companies in the retail sector are often challenged with addressing fluctuations in the amount of traffic visiting their website. During a sale, retailers need to scale up their resource usage in the cloud and then reduce it to a lower capacity. SaaS solutions enable retail companies to quickly meet new resource demands and maintain optimal application performance, which can't be easily achieved with just on-premises infrastructure.

Cost

While the initial cost of moving a part of a business's infrastructure to the cloud can be significant, it outweighs the cost of maintaining a fully on-premises infrastruture. As businesses expand, a hybrid cloud strategy provides them with the ability to cost-effectively scale their resources and gain access to the latest technology while setting up new servers, backup systems, or even a new data center.

Security

It can be argued that public clouds are more prone to security attacks even though cloud providers keep security measures in place. Organizations that adopt a public cloud strategy often prefer to retain sensitive data on-premises, behind a private network. This ensures that data is stored as per the organization's internal security policies and industry compliance regulations. Although data is transferred between public and private clouds, implementing necessary encryption mechanisms provides an added layer of security to protect the flow of data between private and public clouds.
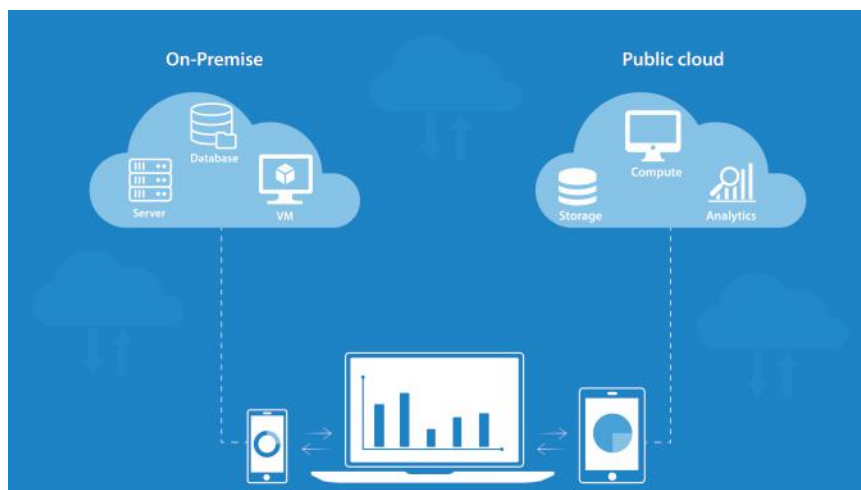
The challenges of moving to a hybrid cloud environment

While moving to a hybrid cloud environment brings numerous benefits to organizations and eases the operational process for IT teams, there are a fewunique complexities that need to be addressed.

Interoperability

An organization that adopts a hybrid cloud strategy must use an Infrastructure as a Service (IaaS) platform such as AWS, Azure, or Google Cloud Platform to access compute or storage resources. The organization should have a private cloud either on-premises or through a third-party provider, and establish smooth communication between the private and public cloud environments by ironing out compatibility issues.

The APIs offered by the public cloud can be used to achieve interoperability. For this, organizations may need to deploy a virtualization layer so data is shared seamlessly between the public and private clouds. While no one model suits hybrid cloud platform, a clear understanding of virtualization tools and auto-scaling techniques is required to implement and handle the setup.

Capacity planning

Allocating computational resources across public and private clouds requires proper planning. Without adequate administration, resources may be overprovisioned or underprovisioned, resulting in extra costs or a failure to fulfill the demand for adequate resources.

Automation

With various parts of an organization's infrastructure running in either private or public clouds, it is difficult to keep track of individual resource allocation. For example, if disk utilization reaches critical levels and goes unnoticed, the application will crash. What follows is the tedious task of wading through different components across various platforms to identify the problem. A business's public cloud providers should be able to provide fail-safe actions like automating a disk cleanup or restarting processes.

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Latency

With wide area networks (WANs), there is bound to be latency in data transfer between private and public clouds. Bandwidth issues may arise and reduce throughput dramatically, resulting in bottlenecks across the network. As workloads increase in an organization's public cloud, having an effective network management system to instantly spot bottlenecks becomes vital.

Visibility

As workloads run in both public and private cloud environments, users only get a disparate view of the infrastructure the workloads are hosted in. In-house tools provide visibility only for an organization's on-premises solutions, while organizations have to depend on a third party to obtain metrics for their resources hosted in the cloud. When data is gathered in silos, it is difficult to trace a problem back to its root cause.

What should you monitor?

Moving your infrastructure fully or partially to the cloud is not a question of if, but when. Gartner predicts that overall cloud computing revenue will grow from $219.6 billion in 2016 to $411.4 billion in 2020. To ensure that your hybrid cloud setup is working as it should, you'll need end-to-end visibility of your complete hardware and software stack hosted on-premises and in the cloud.

System metrics (CPU, memory, and disk usage)

Whether your system is running on-premises or hosted in the cloud, system metrics are crucial and should be monitored around the clock. These are the indicators of resource utilization, and are used to track if resource allocation is handled properly. A spike in the CPU indicates that a singleprocess is handling all requests, and the other processes are either idle or not getting sufficient CPU to process requests. If this occurs for a prolonged period, it will result in an application crash. Similarly, an infinitely looped thread will result in a memory spike and bring the application to a standstill.

Database

A hybrid cloud environment generally has a heterogeneous database system. Monitoring this system for CPU utilization, memory utilization, connection statistics, buffer cache details, query response times, user sessions, reads and writes, and replication status will help identify the efficiency of your database response for individual web transactions, and track slow database calls, database usage, and overall performance of the database.

Network devices

A switch failure or a misconfigured router affect a large number of users in your LAN. Firewalls contain the rules, filters, and exceptions to allow incoming traffic from public clouds. Any glitch in the firewall can cause restricted and unauthorized users to easily access your network. Monitoring network devices gives complete visibility into the health of all network components, enabling you to immediately identify potential network failures.

Bandwidth and packet loss

The applications and servers taking up the most bandwidth tend to slow down other applications. When there's insufficient bandwidth, large file transfers get delayed, internal and external applications get bogged down, and database synchronizations and backups are affected. To identify bottlenecks causing network strain, it is essential to monitor the bandwidth, plus the incoming and outgoing traffic to the network.

Load balancers

Whether it's a hardware device with built-in virtualization capabilities or software hosted in the cloud, load balancers ensure service availability and scalability. It is vital to monitor load balancers to ensure that the millions of concurrent incoming requests are efficiently distributed, and the correct resource is returned to each end user.

Logs

As data is constantly shared between the private and public clouds in a hybrid cloud environment, it is important to capture the changes made to systems. When log files are stored, IT admins can refer to them to identify the origin of a performance or security issue. An efficient log management tool organizes log files from multiple servers and applications so the IT team can reduce its mean time to detect (MTTD).

Resource availability and user experience

Along with collecting the critical KPIs for each metric, tracking the uptime of an individual resource is just as important. User experience takes a hit when an application is unavailable while visitors try to access it. It's impossible to manually check if all applications and components in the hybrid cloud are available at all times. This process should be automated to track the availability and general behavior of an application, as how an application performs largely contributes to the digital experience of the end user.

Billing

With the pay-as-you-use model of public clouds, organizations can easily overshoot their budget without proper planning. Monitoring the cost incurred, by breaking down the spending across regions and resources consumed, helps control infrastructure expenses.

Centralized monitoring to the rescue

While organizations have an idea about the metrics that need to be monitored in a hybrid cloud environment, the challenge lies in the lack of a comprehensive view of the entire system. Legacy monitoring tools do not work well with the public cloud, or are simply incompatible with it. Monitoring a hybrid cloud environment using a legacy solution is even more difficult due to lack of access to cloud infrastructure. Siloed monitoring tools for on-premises and cloud resources complicate the troubleshooting process; switching back and forth between tools is time-consuming.

Third-party tools that deliver full-stack monitoring provide organizations with much-needed visibility into their hybrid cloud environment. Monitoring tools should be scalable to accommodate the growing number of servers, network devices, and other resources. Just as important, the tool should have APIs that help with customization and deliver a highly reliable alerting system. The monitoring tool should be able to provide data security, ensure compliance according to industry standards, and adhere to the organization's SLAs.

Site24x7: A full-stack monitoring solution

Any organization, if migrating partly to the cloud, will consider retaining sensitive information on-premises. Say, you're using Hadoop for analytics and you have a firewall in place to track incoming requests, and your computing resources are hosted in the public cloud. Site24x7, a full-stack monitoring solution, monitors all components in the hybrid cloud and gives complete visibility with real-time metrics like these:

Server health: Track over 60 server metrics including CPU; memory; disk usage; the number of services and processes, as well as their status; load average; plus thread and handle count of processes. Analyze input traffic, output traffic, and bandwidth utilization to gain a complete picture of your server and network infrastructure.
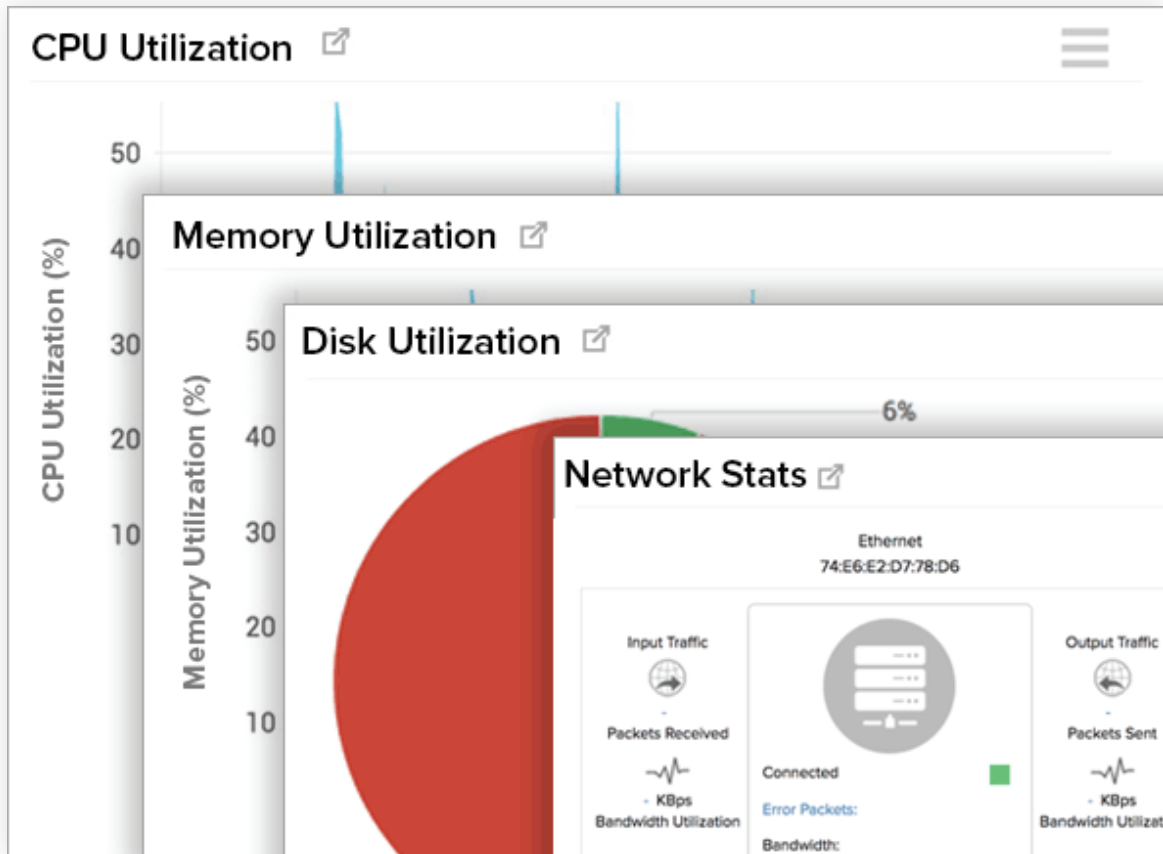
Distributed database systems: Monitor heterogeneous distributed systems in your infrastructure like Apache Cassandra, Hadoop, MySQL, and Oracle Database, and obtain critical metrics in a single dashboard.

Firewall monitoring: Keep your network security intact by monitoring incoming and outgoing traffic in real time. Additionally, keep an eye on all network devices such as switches and routers, and track packet loss.
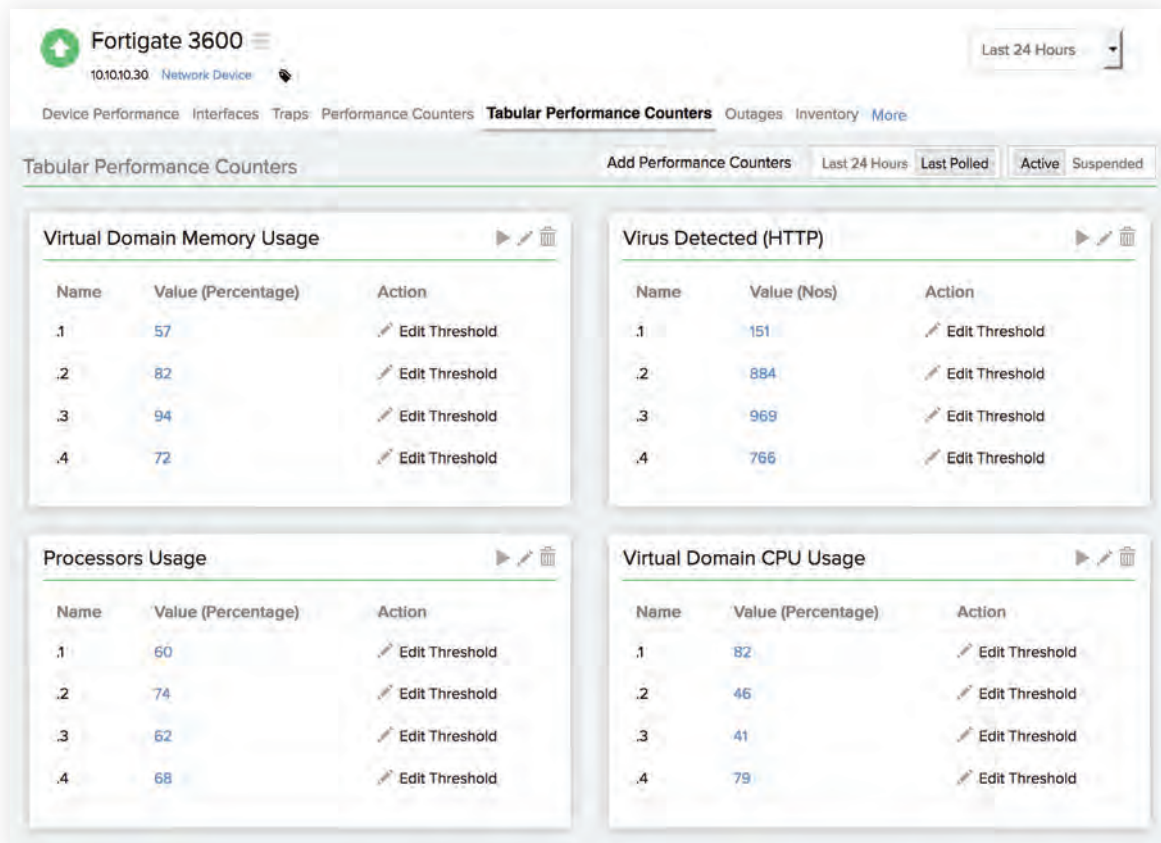
VMware monitoring: Auto-discover your entire virtual infrastructure and monitor every component such as data centers, clusters, resource pools, ESX/ ESXi, and virtual machines.

Application performance: Understand the performance of your applications and track every transaction that happens. Gain insights that enable you to optimize applications and enhance the user experience.

Intranet resource health check: Monitor the uptime and health of internal applications, URLs, payroll systems, and virtual machines with the Site24x7 On-Premise Poller.
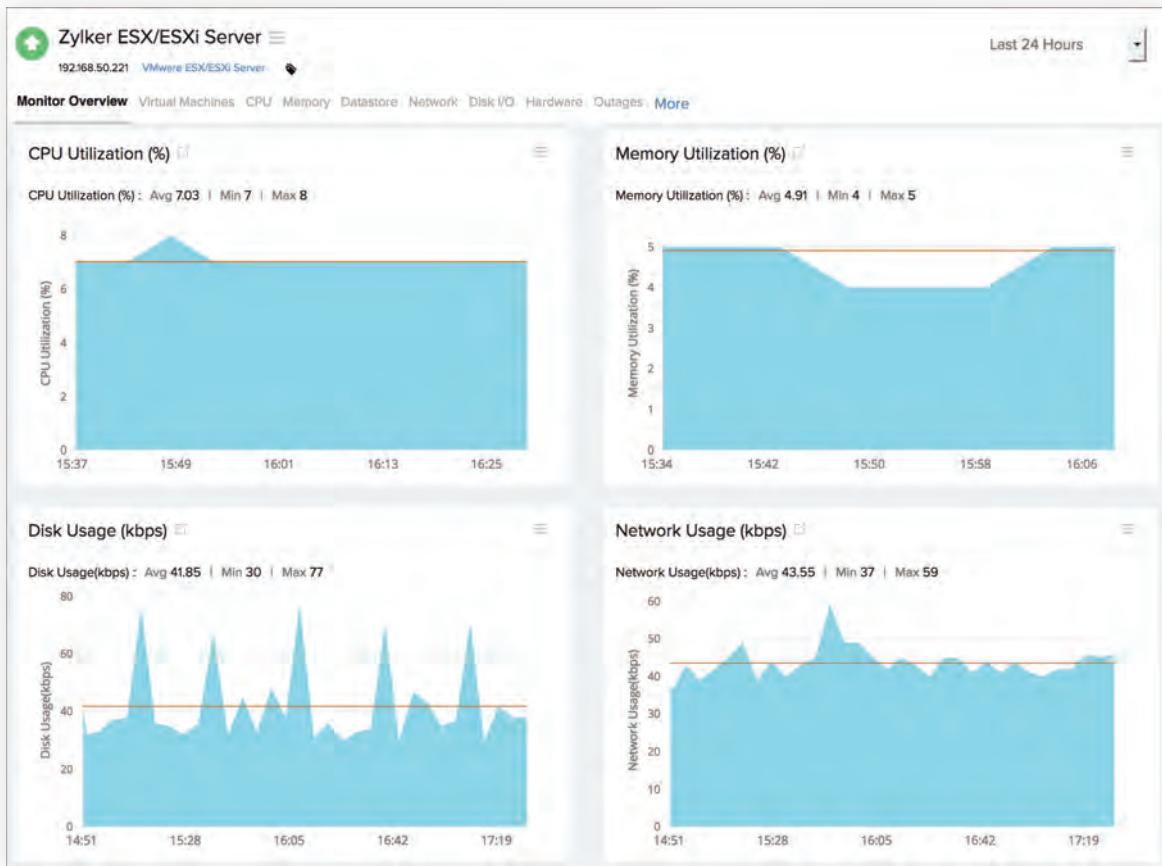
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Log management:
The Site24x7 AppLogs agent instantly identifies and categorizes logs from multiple servers and applications, and indexes them so they can be easily searched. An easy-to-use, query-based interface helps DevOps and IT admins easily filter the logs for troubleshooting.

Plugins: Monitor any metric or component of your infrastructure with out-of-the-box plugin integrations. Customize the metrics monitored by creating your own plugin integration.

AWS monitoring: Site24x7 provides monitoring support for over 30 AWS services including compute, storage, database, network, analytics, and security components. CloudSpend, a carefully crafted cost management tool, gives you granular insights into your spending categorized by region, instance type, component, data transfer, and more.

Azure monitoring: If you've hosted your resources in Azure, we've got you covered with support for monitoring over 100 Azure products in near real time.

Google Cloud Platform monitoring: Monitor your resources hosted in Google Cloud Platform by automatically discovering services like Google Compute Engine,Google App Engine, Google Kubernetes Engine, Virtual Private Cloud, Cloud IAM, Cloud Audit Log, Cloud SQL, and BigQuery.

That's not all. Site24x7 provides additional features at no extra cost:

Alerts: Notifications are sent to assigned technicians via SMS, phone, and email, and can also be set up to be sent as persistent alerts. You can also configure alert escalations to notify stakeholders if a component isn't back up after a specified duration.

Automation: Reboot an EC2 instance or clear up disk space automatically by executing a script as soon as there is a threshold breach, or simply automate repetitive actions by scheduling them.

Dashboards: Choose the critical metrics across all resource types, and build a custom dashboard that displays the live status of the health of all critical metrics. Correlate metric performance across resources to understand the dependencies between each resource type.

Anomaly detection: A sudden increase in the request count to your web server could either be a denial-of-service attack or a seasonal trend. Site24x7's AI-powered anomaly detection engine will analyze changes in traffic and resource consumption, differentiate between what is and isn't ananomaly, and warn you before any resource goes down.

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Reports: Historical data is stored for up to five years in Site24x7, so you can generate reports for custom periods or schedule reports to be sent to your mailbox at anytime.

There's no universal cloud migration technique that works for all organizations, and your organization should choose a strategy that best fits its needs. Deciding which resources to host on-premises or in the cloud depends on the infrastructure you already support on-premises and how much your organizationis willing to invest in cloud technology. Irrespective of your organization's architecture, all critical infrastructure components should be monitored around the clock to ensure business continuity.

> ## About Site24x7.
>
> Site24x7 is a full-stack monitoring solution that empowers IT operations and DevOps with AI-powered performance monitoring and cloud spend optimization. Its broad capabilities help quickly troubleshoot problems with end-user experience, applications, servers, public clouds, and network infrastructure. Site24x7 is a cloud offering from Zoho Corporation, which has offices worldwide, including the Netherlands, United States, India, Singapore, Japan, and China. For more information about Site24x7,
> please visit http://www.site24x7.com/.

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