

A guide to monitoring software-defined networks



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Introduction

As IT organizations' center of gravity shifts to the cloud, organizations have begun to redesign their networks. Software-defined networks (SDNs) are no longer a novelty restricted to organizations with substantial resources. They are now being gradually embraced by organizations of all types and sizes alongside on-premises networks, providing support and filling in gaps to create a dynamic, robust, customizable, resilient backbone for everyday operations.

Analyzing the shift towards the cloud continuum

Enterprise IT has swiftly embraced the cloud, but enterprise networks have lagged behind. Designed for a bygone era dominated by desktop PCs, these networks now struggle to bend and flex to match the number of devices that flit in and out randomly. Traditional networks find it challenging to keep pace with digitalization. Network administrators are stretched thin, juggling outdated infrastructures, integrating cloud services, and monitoring everything with a patchwork of tools. Yet change is underway.

Organizations are gradually moving their enterprise networks and their infrastructure monitoring to the cloud. Like renovating an ancient palace to include conveniences like plumbing and electricity, this transition is crucial for organizations to stay relevant and operational. But it's worth the effort.

What are SDNs?

Traditional networks rely on physical devices like routers and switches to manage traffic. With software-defined networking, software plays the role of the traffic cop, directing data where it needs to go, whether through hardware or virtual paths. SDNs present a monumental shift in network architecture, promising unparalleled agility, cost-efficiency, and performance optimization.

SDN architecture

At its core, SDN architecture decouples the network control and forwarding functions, enabling the network control function to become directly programmable and the underlying infrastructure to be abstracted from applications and network services. This architecture is comprised of three vital layers:

- ✔ **The application layer:** This is the topmost layer where applications reside, communicating with the SDN controller via northbound APIs to request network services.
- ✔ **The control layer:** The central piece of the SDN architecture, the SDN controller, acts as a strategic command center, managing the flow of information between the application and infrastructure layers. It provides a comprehensive view of the network, making it easier to optimize resources and adapt to changing conditions.

- ✔ **The infrastructure layer:** This is composed of the physical network devices (switches, routers, etc.) that transmit data packets across the network. Within an SDN, these devices are simple forwarding mechanisms that operate under the directives sent from the SDN controller.

Challenges and considerations

While an SDN offers compelling advantages, organizations must navigate certain challenges during its implementation, such as:

- ✔ Technological complexity.
- ✔ Integrations with existing infrastructures.
- ✔ Scalability and interoperability.

Challenges in monitoring SDNs

Monitoring SDNs introduces several challenges that stem from their dynamic, programmable, abstract nature. Here are some of the key challenges:

- ✔ **Complexity and scalability:** Monitoring solutions must scale as networks grow in size and complexity. The dynamic provisioning and management of resources in SDNs can complicate monitoring due to the fluctuating number of elements that need to be tracked.

- ✔ **Visibility across different layers:** SDNs separate the control plane from the data plane to improve network management and efficiency. However, this can obscure visibility into network operations, making comprehensive performance monitoring difficult.
- ✔ **Integrations with existing systems:** Integrating legacy monitoring tools with new SDN architectures without losing critical functions or information can be challenging for many organizations.
- ✔ **High-volume data management:** Managing massive data volumes in SDN environments for meaningful insights while avoiding system or team overloads is a major challenge.
- ✔ **Security and privacy concerns:** Monitoring networks often involves collecting and analyzing sensitive information. Ensuring the security and privacy of this data in SDNs is more challenging due to their dynamic nature and increased attack surface.
- ✔ **Real-time monitoring and analysis:** SDNs require monitoring solutions that provide real-time or near-real-time analysis so you can quickly identify and respond to issues or optimize performance.
- ✔ **Costs and resource allocation:** Implementing and maintaining advanced SDN monitoring solutions can be expensive, so organizations must allocate resources carefully for effective, economically viable monitoring.

Addressing these challenges requires monitoring solutions designed specifically for the unique architecture and functions of SDNs. These solutions must be scalable, comprehensive, and capable of integrating with existing systems while ensuring data security and supporting real-time analysis.

Key metrics for SDN monitoring

In SDN monitoring, several key metrics are crucial for ensuring high network performance, security, and reliability. These metrics can be categorized broadly into management metrics, traffic metrics, and security metrics.

Management metrics

- ✔ **System availability:** This metric measures the uptime of the network. High availability is essential for business continuity and customer satisfaction.
- ✔ **Resource utilization:** Monitoring the utilization of network resources (e.g., switches and routers) helps in optimizing performance and planning for future expansion.
- ✔ **Configuration changes:** This includes tracking who makes changes and what changes are made. It is crucial for auditing and ensuring that unauthorized changes are detected.

Traffic metrics

- ✔ **Volume:** This measures the rate at which data is successfully transmitted from one point to another in the network. It's essential for understanding the network's data handling capacity.
- ✔ **Latency:** Latency refers to the time delay between a signal being transmitted and that signal being received. In SDNs, minimizing latency is critical for applications that require real-time interactions.

- ✔ **Packet loss:** This metric measures the percentage of packets that are lost during transmission. High packet loss can significantly affect the quality of services, especially in video and voice transmissions.
- ✔ **Bandwidth utilization:** Monitoring the bandwidth usage helps in understanding the traffic flow and congestion in the network. It is crucial for capacity planning and management.

Security metrics

- ✔ **Unauthorized access attempts:** Monitoring and recording unauthorized access attempts can help in the early detection of potential security breaches.
- ✔ **Compliance violations:** In SDNs, policies define network behavior. Tracking violations of these policies is key to maintaining the integrity of the network.
- ✔ **Threat detection rates:** The ability of the system to identify and respond to potential security threats, like firmware vulnerabilities, is critical.

By closely monitoring these metrics, network administrators can ensure that their SDNs are performing optimally, secure from potential threats, and aligned with business objectives. Effective monitoring tools and strategies are essential for managing these metrics in real time.

How Site24x7 can help monitor SDNs

Site24x7 already has a strong suite of features, including network mapping, that makes it a formidable tool for gaining complete visibility into your enterprise networks. It is an AI-powered observability solution that provides complete visibility and is secure and scalable.

Additionally, since Site24x7 is user-friendly, it requires no prior training. As you intuitively navigate through the tool, you will uncover the various facets that make it one of the [best network monitoring tools](#) on the market. Let's do a quick walk-through of how to monitor your [Cisco Meraki](#) and Cisco Application Centric Infrastructure (ACI) networks in Site24x7.

Monitoring Cisco Meraki networks in Site24x7

Site24x7 offers an efficient solution for monitoring Cisco Meraki network devices, including switches, cameras, security devices, and wireless products. It uses REST APIs to observe device availability, response times, and packet loss, facilitating the quick detection and resolution of connectivity issues and downtime.

Prerequisite

- ✔ Users must generate a Meraki REST API key with read-only access on the Cisco Meraki dashboard and provide this key to Site24x7. Site24x7 encrypts and securely stores the Meraki REST API key.

The deployment and monitoring process

- ✔ **Device discovery:** Post-authentication, Site24x7 discovers and inventories your Meraki devices automatically.
- ✔ **Custom monitoring setup:** Via the Site24x7 interface, select and configure specific Meraki devices and organizations for detailed monitoring.
- ✔ **Comprehensive metrics:** Access metrics like response times and packet loss to evaluate device performance accurately.
- ✔ **Instant alerts:** Receive real-time notifications about device status changes via emails; SMS messages; voice calls; or integrations with platforms like Jira, Zapier, Slack, Microsoft Teams, and ServiceNow.

Performance metrics and dashboards

- ✔ Gain critical insights into device behavior through detailed performance metrics.
- ✔ Set custom threshold values for alerts to manage device performance proactively.
- ✔ Use the Cisco Meraki Map View in Zoho Maps to geographically visualize device locations and statuses for enhanced operational oversight.

This streamlined, secure monitoring solution is designed to offer comprehensive visibility into Cisco Meraki network devices, enabling faster troubleshooting and improved network reliability.



Figure 1. Track relevant metrics on a single dashboard.

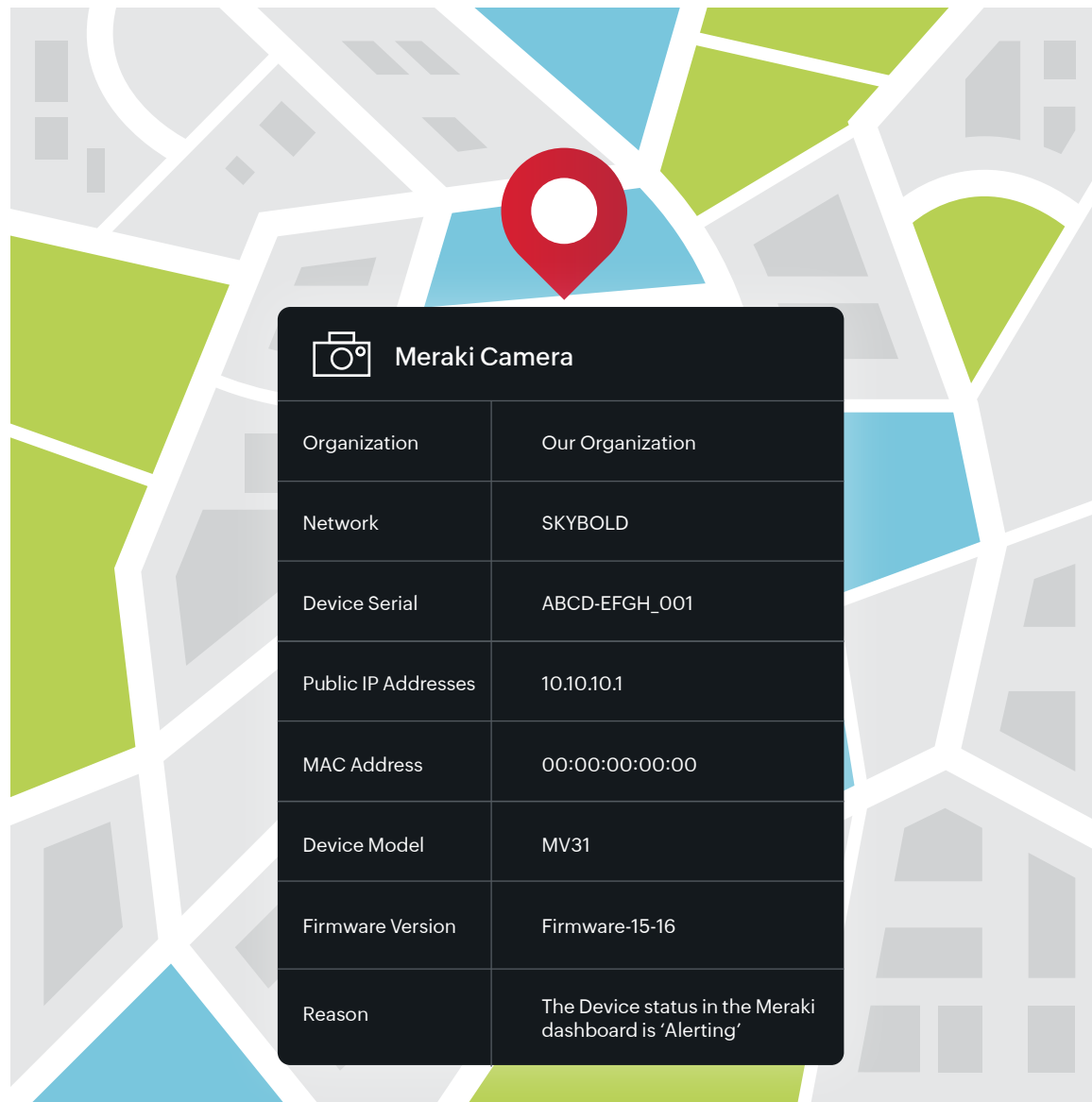


Figure 2. Visualize your Cisco Meraki devices on a map.

Monitoring Cisco ACI networks with Site24x7

Cisco ACI monitoring with Site24x7 employs REST APIs for enhanced visibility into network operations, focusing on elements like the Application Policy Infrastructure Controller (APIC), the operational fabric, tenants, and endpoint groups within a Cisco ACI setup. This approach streamlines data center management by offering a detailed view of both physical and virtual network components.

Key components of Cisco ACI monitored in Site24x7

- ✔ **The Cisco APIC:** The APIC serves as the centralized automation and management point for the Cisco ACI fabric, ensuring simplified, scalable, dynamic provisioning across the network.
- ✔ **The fabric:** The fabric serves as the network's backbone, consists of spine and leaf switches, and operates as a unified system to facilitate high performance and resilience.
- ✔ **Spine and leaf switches:** Spine switches form the core network backbone, connecting all leaf switches, which in turn aggregate traffic from servers and other endpoints.
- ✔ **Tenants:** Tenants provide logical network separation, allowing multiple entities to share physical infrastructure while maintaining privacy and security.
- ✔ **Endpoint groups:** These groups of network endpoints with similar policy requirements aid in streamlined management and security enforcement.

Prerequisites

- ✔ The On-Premise Poller (version 5.6 and above)
- ✔ Accurate credentials for connectivity

Advantages

- ✔ Helps simplify data center operations
- ✔ Enhances network visibility and control, promoting proactive management
- ✔ Ensures the secure, encrypted storage of sensitive details

Monitoring features and functions

- ✔ **Dashboards and reporting:** Gain a consolidated view of network health and performance, including real-time data on the fabric, tenants, and endpoint groups.
- ✔ **Health scores and thresholds:** Evaluate the performance and health of the ACI environment, fabric, tenants, and end point groups with customizable thresholds for proactive issue detection.

Whether for streamlining data center operations, enhancing performance monitoring, or ensuring the secure, efficient management of network resources, Site24x7's Cisco ACI monitoring tools offer a comprehensive solution to address the challenges of modern network environments.

The screenshot shows the Site24x7 dashboard for monitoring a Cisco ACI network. The main content area is titled 'Zylker Cisco ACI' and displays a table of node health scores. The table is organized into three sections: Super Spine, Spine, and Leaf. Each section has a 'Threshold Configuration' button and an 'Action' button. The Super Spine section shows one node (ss-2) with a health score of 68. The Spine section shows one node (spine-1) with a health score of 0. The Leaf section shows two nodes (leaf-1 and leaf-2) with health scores of 90 and 78, respectively. The dashboard also includes a search bar, navigation menu, and a sidebar with various monitoring tools.

Super Spine							Threshold Configuration
Name	IP Address	Serial Number	Pod ID	Node ID	Super Spine Health Score	Action	
ss-2	10.0.0.34	TEP-1-146	13	1,023	68	/	

Spine							Threshold Configuration
Name	IP Address	Serial Number	Pod ID	Node ID	Spine Health Score	Action	
spine-1	10.0.0.65	TEP-1-103	1	201	0	/	

Leaf							Threshold Configuration
Name	IP Address	Serial Number	Pod ID	Node ID	Leaf Health Score	Action	
leaf-1	10.0.0.64	TEP-1-101	1	101	90	/	
leaf-2	10.0.0.66	TEP-1-102	1	102	78	/	

Dashboard View created for a on June 18, 2024 11:50 AM Asia/Kolkata for the time period: June 18, 2024 12:00 AM Asia/Kolkata to June 18, 2024 11:50 AM Asia/Kolkata.

Figure 3. View the health score of leaf, spine, super spine nodes and more in your Cisco ACI networks

Why use Site24x7 for monitoring SDNs?

Typically, vendors offer simple dashboards to help you monitor SDNs. But if you're working with a mix of old and new—what we call hybrid networks—keeping tabs on everything can get tricky. You might find yourself flipping between different tools to get the full picture.

That's where an innovative tool like Site24x7 comes in. It brings metrics from SDNs and traditional on-premises networks together in one place. Additionally, by leveraging SNMP, Site24x7 helps you [monitor traffic](#), [manage network configurations](#), [detect firmware vulnerabilities](#), and stay on track for [network configuration compliance](#).

There are many reasons for choosing a cloud-based monitoring tool like Site24x7 to keep an eye on SDNs. Here are a few:

- ✔ The growing demands of incorporating AI into enterprises are gradually outstripping the current capabilities of older monitoring tools. Comprehensive [network observability](#) is urgently needed across traditional and modern networks, and modern tools like Site24x7 can easily provide this.
- ✔ Site24x7 helps enhance the reliability of an organization's product or service by effectively detecting potential issues and sending alerts about them.
- ✔ Site24x7 already supports API-based monitoring for Cisco Meraki and Cisco ACI, with more in the pipeline. Additionally, by leveraging SNMP, you can track multiple metrics that are not generally available on the dashboards provided along with the SDNs.

- ✔ Site24x7 offers custom dashboards where you can monitor the relevant metrics of on-premises networks alongside SDNs, eliminating tool sprawl.
- ✔ You get greater network resiliency at a lower cost.
Site24x7 also monitors cloud services, virtualization platforms, websites, and more in a single application.

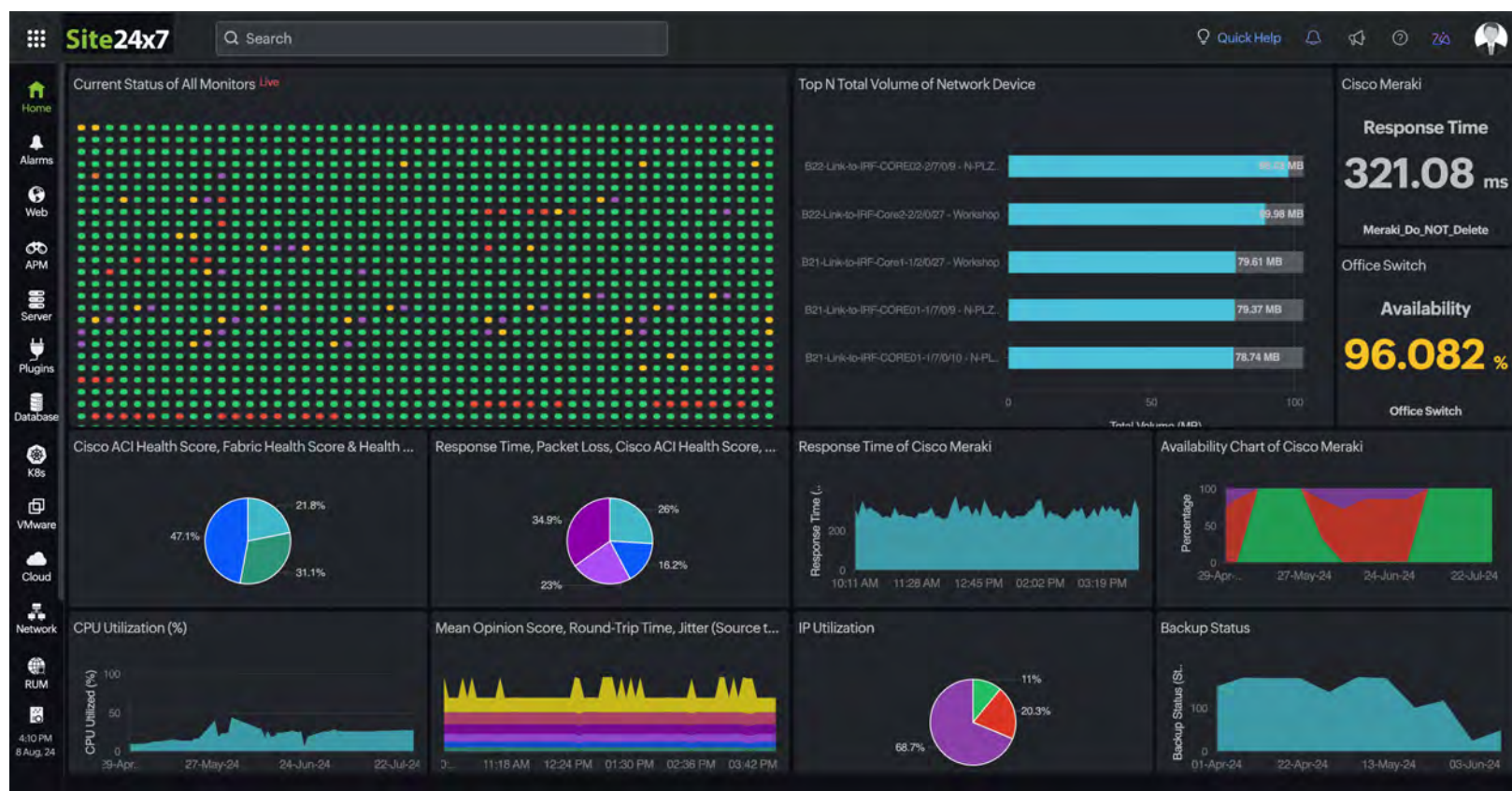


Figure 4. Monitor all your networks on one dashboard.

Experience what Site24x7 can do for you

Monitoring SDNs is crucial for a successful cloud network journey. Organizations should consider how to make the most of our tool to prepare for long-term growth. Site24x7 enables you to stay ahead and regularly introduces new features to enhance your monitoring. Our cloud-based solutions can address your industry-specific issues, leading to significant, lasting benefits. [Sign up for a free, 30-day trial](#) to experience the benefits firsthand.

About ManageEngine Site24x7

ManageEngine Site24x7 is an AI-powered observability platform for DevOps and IT operations. The cloud-based platform's broad capabilities help predict, analyze, and troubleshoot problems with end-user experience, applications, microservices, servers, containers, multi-cloud, and network infrastructure, all from a single console. For more information about Site24x7, please visit www.site24x7.com.

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