



How To Guide

NetApp Cloud Insights

Enhance Monitoring by Understanding the Relationships Between Resources

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Abstract

Your IT environment is more complex and more dynamic than ever before. Heterogeneous infrastructure, hybrid and multi-cloud deployments, and a mix of traditional and cloud-native applications make monitoring even more critical—and more difficult. NetApp Cloud Insights is a SaaS monitoring solution that provides powerful, easy-to-use dashboards, queries, annotations, and alerts. This How To Guide looks at how to monitor your environment and meet critical SLAs with less effort.

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1 About This How To Guide Series

This How To Guide is number two in a series about NetApp® Cloud Insights, an innovative software-as-a-service (SaaS)–based monitoring tool that spans on-premises and cloud environments. Cloud Insights helps you monitor, troubleshoot, and optimize your storage systems, from legacy hardware to container environments. The papers in this series cover these topics:

- [NetApp Cloud Insights: A New Way to Monitor Your Cloud Infrastructure](#)
- NetApp Cloud Insights: Enhance Monitoring by Understanding the Relationships between Resources
- How to Troubleshoot Problems in Your Cloud Infrastructure
- How to Optimize Your Cloud Infrastructure

This series focuses on monitoring in virtual machine (VM) environments, both on premises and in the cloud. A future How to Guide series will explore the same issues for containers and Kubernetes environments.

2 There Are No Silver Bullets, but There Is a Better Way

Monitoring the health of the applications, services, and infrastructure in your IT environment has always been important, but today effective monitoring has become essential. In this digital era, enterprises across all industries depend on IT services to control business operations, to inform decisions, to drive revenue, and to enable growth. Your company's reputation is now closely tied to the effectiveness and security of your customer-facing and internal digital services.

But your IT environment is more complex and more dynamic than ever before. Your current operations can include:

- **Hybrid cloud and multicloud.** Your critical services might run not just on premises, but also across multiple cloud service providers, including SaaS providers. The number and importance of remote offices, production facilities, and distribution centers have also increased.
- **Diverse infrastructure.** You have a broad range of infrastructure and infrastructure services to support, from legacy hardware to virtualized infrastructure to containers.
- **Traditional and cloud-native applications.** You must contend with traditional enterprise applications such as critical enterprise resource planning and customer relationship management software along with new cloud-native applications that have much different expectations from, and impacts on, infrastructure.

As a result, monitoring your IT environment—and effectively troubleshooting problems that arise—is more challenging than ever. You continue to look for better tools to monitor the entirety of your environment while minimizing the number of false alarms and the time that you spend on chasing down problems.

NetApp Cloud Insights overcomes the limitations of traditional monitoring tools, so you can efficiently monitor infrastructure on premises and in the cloud. With Cloud Insights, you can understand at a glance how the elements that make up your IT environment are connected, so you can troubleshoot problems more effectively and optimize your environment to deliver better results at lower cost.

This white paper explores the monitoring capabilities of Cloud Insights in more depth. It also explores how you can take advantage of Cloud Insights dashboards, queries, annotations, and alerts to create a more effective monitoring framework so that you can meet critical SLAs.

3 Monitoring Is a Skill, Not a Job

As Mike Julian notes in his book, [Practical Monitoring](#), monitoring is a skill that everyone on your IT team needs. It's not something that you can simply assign to one person—or to a team of people—and forget about. No one can design effective monitoring for applications or infrastructure if they aren't directly connected with it.

Everyone on your team has to perform monitoring tasks. For example, virtualization administrators have to be directly involved in monitoring virtual environments. Effective monitoring tools enable them to recognize trends in the virtual environment and to plan for growth. The same thing goes for storage administrators and network specialists, who need monitoring tools for their specific tasks. No single tool satisfies every need. Your operations team will continue to rely on monitoring tools and element managers that are suited to particular tasks, even as you adopt new tools to get a more global view.

As your organization moves to a DevOps approach, your team needs real-time service-level indicators (SLIs) to confirm that your systems are meeting SLAs and service-level objectives (SLOs) both on premises and in the cloud. You might also be facing the challenges of managing hybrid applications that rely on services in multiple locations. A simple example is an application with customer-facing components in the cloud that uses a database in your data center.

Domain-specific tools for managing hypervisors, networks, and storage weren't created for this type of monitoring, but more comprehensive monitoring frameworks also have limitations. Even using today's best practices and the best available tools, it can be difficult to get the information you need, when you need it. Existing monitoring tools:

- Cannot store and analyze data at cloud scale
- Don't keep up with the dynamic nature of the cloud and cloud-native applications
- Monitor things (servers, VMs, storage, and so on), but not the relationships between things

NetApp has designed Cloud Insights to help your team bridge these gaps.

A Day in the Life: Monitoring and Troubleshooting Without Cloud Insights

To understand the monitoring challenge, consider a hypothetical day in the life of a virtualization administrator.

9 a.m. Arrive at work. Check the VM dashboard. It's all clear.

9:05 a.m. Start working on a critical, high-value project.

9:30 a.m. Users report that an important application is "slow."

9:32 a.m. Check the VM dashboard again. It's all clear.

9:35 a.m. Identify and check VMs associated with the application. They look "okay," but there's some latency.

9:45 a.m. Identify and check the physical hosts where VMs are running. CPU and memory usage are okay.

9:50 a.m. Attempt to determine whether storage is the issue; identify datastores being used by application VMs.

9:55 a.m. The VM monitoring tool doesn't show correlated storage device metrics.

10 a.m. Access the storage management tool. Try to correlate information between VM management tools and storage management tools.

10:05 a.m. Call the storage administrator. The administrator doesn't answer.

10:10 a.m. File an **urgent** trouble ticket.

10:15 a.m. No response to the ticket is received yet.

10:30 a.m. Escalate the ticket.

10:45 a.m. Work with the storage administrator on the phone to try to correlate the affected VMs with the storage device data.

11:15 a.m. By comparing VM and storage views, verify that a shared volume is the culprit.

11:30 a.m. Determine that another unrelated VM is hammering the same volume.

11:45 a.m. After discussing alternatives, the storage administrator suggests moving the offending VM to a different volume.

11:50 a.m. Move the offending VM.

Noon. Application performance returns to normal.

12:05 p.m. Make a note to follow up with the owner of the offending VM.

12:10 p.m. Eat lunch.

1 p.m. Restart work on the critical project.

1:15 p.m. Users are reporting slowdowns for a different application.

Repeat the process...

Staff time: VM administrator—2.5 hours; storage administrator—1.25 hours

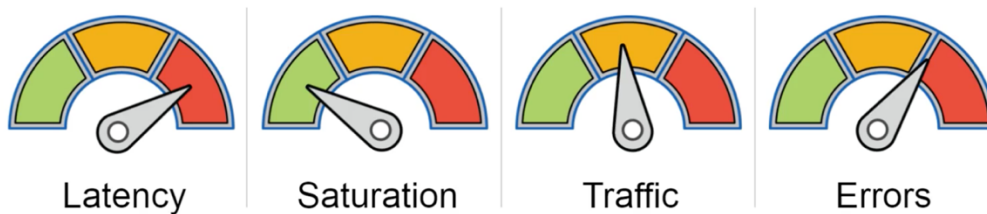
User impact: 2.5 hours

4 Understand the Relationships Between Resources with Cloud Insights

NetApp Cloud Insights gives you the power to store and analyze critical monitoring data at cloud scale. A single tool shows you everything in your IT environment, both in your data centers and in the cloud. You see updates in near real time and can view trends and changes over extended periods (90 days with the Cloud Insights Standard Edition).

To help you make sense of your environment, gain a better understanding of your operations, and confirm that you meet service levels, best practices suggest that you focus on four key SLI signals. As Figure 1 shows, those signals are latency, saturation, traffic, and errors. (The book [Site Reliability Engineering: How Google Runs Production Systems](#) is a good reference for monitoring best practices.)

Figure 1) Cloud Insights signals.



- **Latency.** When latency spikes, users are affected and start submitting trouble tickets. Cloud Insights dashboards focus on latency as a key indicator so that you can identify and correct latency problems before users complain.
- **Saturation.** Latency issues often result when you ask too much of a device and begin to push it beyond its resource limits. Understanding the cause of saturation is a key step in root-cause analysis. Cloud Insights simplifies identification of saturation points and provides intelligent alerts that distinguish between momentary spikes and real problems.
- **Traffic.** Saturation might be triggered by an increase in traffic. An unexpected rise in user demand or a misbehaving application can create noisy-neighbor effects that can affect unrelated applications. Cloud Insights helps you correlate increased latency with other events that are driving traffic.
- **Errors.** Errors and alerts are a fact of life in any IT environment. Cloud Insights helps you quickly determine when an error indicates that a real problem exists, discover the root cause, and begin remediation.

The “Day in the Life” scenario above illustrates a problem that is common with many monitoring tools. In large-scale IT environments, it is difficult or impossible to correlate metrics across resources—between VMs and storage devices in the example—to identify and correct performance problems. Often it can require hours of effort from people with significant domain expertise to get to the bottom of what should be a simple problem.

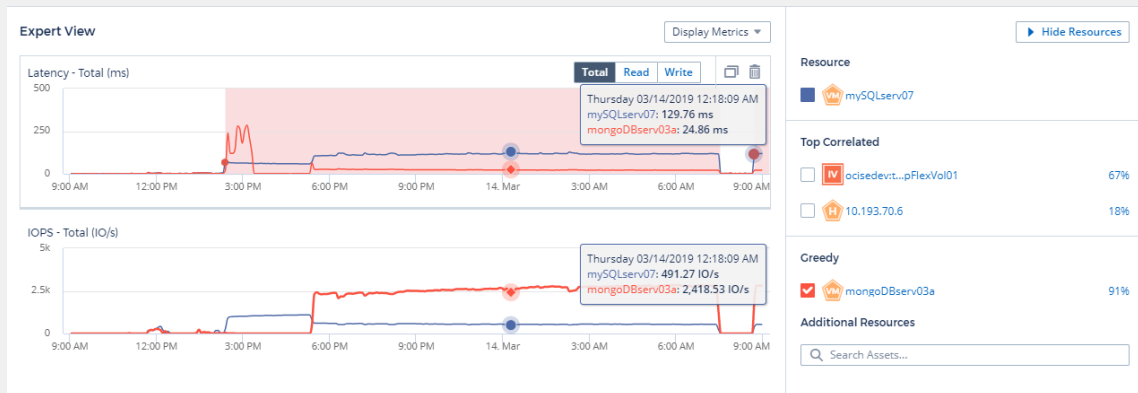
A key advantage of Cloud Insights is that it automatically discovers service paths, so you can see the relationships between resources and can correlate events to understand cause and effect. To illustrate the difference that this capability can make, let’s revisit the same scenario, this time with Cloud Insights.

A Day in the Life: Monitoring and Troubleshooting with Cloud Insights

Let's revisit the hypothetical "day in the life" of a virtualization administrator that was presented earlier, this time with Cloud Insights.

9:00 a.m. Arrive at work. Check the Cloud Insights VM violations dashboard. Note that an important application VM experienced high latency overnight and that the problem is starting to occur again as users log in for the day.

9:01 a.m. Drill down on the affected VM expert view in Cloud Insights. Note immediately that the VM is being affected by a "greedy" VM on the same storage volume.



9:02 a.m. Move the application VM to an appropriate datastore on another storage volume that you can see from a Cloud Insights storage dashboard is lightly loaded.

9:05 a.m. to noon. Finish a critical, high-value project.

Staff time: VM administrator—5 minutes; storage administrator—0 minutes

User impact: None

The rest of this white paper explores the monitoring features of Cloud Insights.

5 Setting Up Your Cloud Insights Environment

NetApp Cloud Insights provides various capabilities that enable you to better monitor your operations, both on premises and in the cloud. This section explains how to get started collecting data and describes how to configure:

- Annotations
- Queries
- Policy-based alerts

5.1 Configuring Acquisition Units

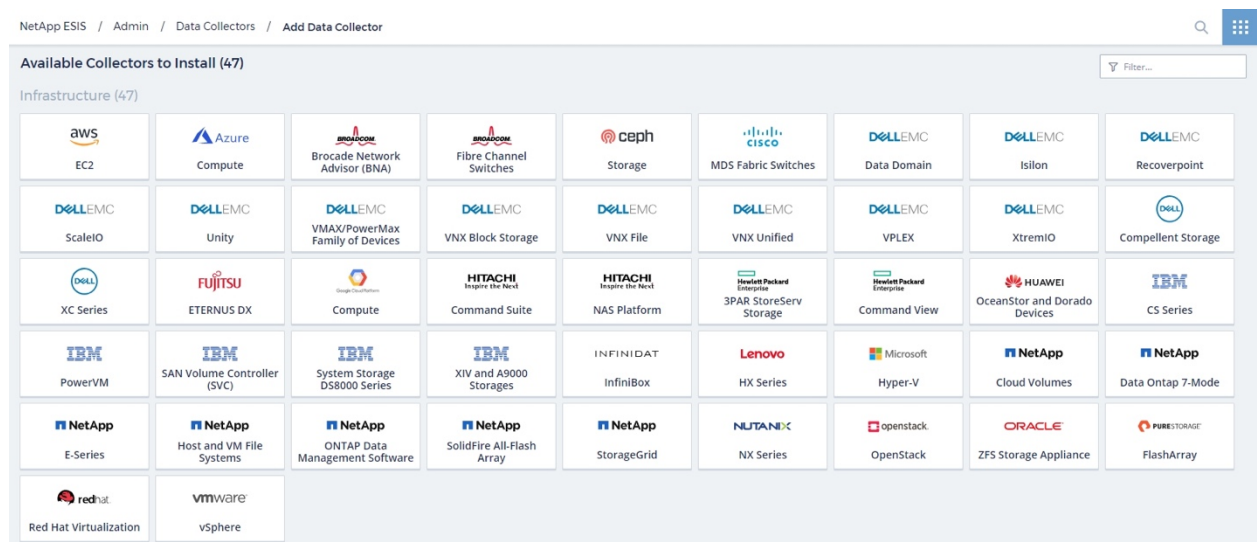
To launch NetApp Cloud Insights, go to cloud.netapp.com/cloud-insights. After you have registered for a free trial, you must create an acquisition unit as described in the previous white paper in this series, [NetApp Cloud Insights: A New Way to Monitor Your Cloud Infrastructure](#).

The acquisition unit sits behind your firewall, virtual private cloud, or virtual network and injects data from your operations into Cloud Insights for analysis. You can use a single acquisition unit for multiple data collectors. You can set up additional acquisition units as needed. For example, you might want different acquisition units for data centers in different regions or for public cloud environments.

5.2 Collecting Data

Cloud Insights supports a wide range of data collectors, including collectors for the major cloud providers and a broad selection of enterprise infrastructure hardware and software providers, as illustrated in Figure 2. A *collector* is a purpose-built tool for a particular device type that runs vendor-specific, read-only commands to gather inventory and performance metrics from discovered devices. After you have at least one acquisition unit, you can add as many data collectors as you need. You can access the list of data collectors from the Admin menu in the left-hand pane of the Cloud Insights UI.

Figure 2) Configuring Cloud Insights data collectors. (Not all available data collectors are shown; Cloud Insights supports more than 100 collectors.)



To add a data collector, click the associated tile. NetApp makes the data collector configuration process as painless as possible. To configure an AWS collector, for instance, you simply choose an AWS region and supply your existing AWS access credentials.

Because data collectors are the primary source of information for Cloud Insights, NetApp displays the status of the associated data collector in the upper-right corner of each asset page. Clicking the message displays a table with the data collector name, status, and last successful acquisition time.

The Installed Data Collectors page gives you access to all the data collectors that you have configured for Cloud Insights. Use this page to manage your existing set of data collectors.

After you have at least one acquisition unit and at least one data collector, there's nothing else that you need to do. You can start using Cloud Insights to monitor your environment. However, to get the most from your Cloud Insights environment, you might want to take some additional steps, including:

- Set up annotations
- Use queries to automate annotations
- Configure alerts on critical resources

5.3 Setting Up Cloud Insights Annotations

Some information can't be obtained through discovery alone. By using annotations, you can add custom data that is specific to your needs and your business. Cloud Insights provides a set of default annotations that you can use, such as asset lifecycle, building or data center location, and tier. However, you might find that you need to slice monitoring data in other ways.

To create an annotation, click the Manage button in the left-hand pane and select Annotations to access the Annotations page as shown in Figure 3.

Figure 3) Cloud Insights Annotations page.

Annotations (55)			+ Annotation	<input type="text" value="Filter..."/>
Name	Description	Type		
Admin		Text		
Alias	Custom name for SAN resource	Text		
Business Concept		Text		
Business Group		List		
Business Unit		Text		
Cloud Identified resources		List		
Cloud Low Usage	Right Sized or Delete Candidates	Text		
Compute Resource Group	Group assignment used by host/VM collection datasource	List		
Cost Center	2013633	Number		
Cost Center List		List		
Cost value		Number		
Country	Country	Text		
Creator	AWS creator	Text		
Customer		Text		
CVS-Standard \$10/GB per month		Text		
Data Center	Physical location of SAN resources	List		
DS		Text		
Environment	Production, Dev or Lab	Text		
Fabric Connected	Fabric Connected Infrastructure	Text		
FabricName		Text		
FakeName		Text		
GCP Instance Type	dummy annotation for GCP dashboard	List		
hci_is_netapp_hci		Boolean		
Hot	Over-utilized devices	Boolean		
Hyperlink test		Text		

The Annotations page shows all the predefined annotations that are available and any custom annotations that you have created. You can create custom annotations by clicking the + Annotation button in the upper-right corner. Each annotation has a name, a description, and a type, as shown in Figure 4.

Figure 4) Adding an annotation to Cloud Insights.

Add Annotation

Name: Unique Annotation Name

Description: Description

Type: Text (dropdown menu with options: Boolean, Date, List, Number, Text)

Buttons: Cancel, Save

You can assign the annotations to assets manually, or you can use Cloud Insights queries to automate the process.

5.4 Using Queries to Create Annotations

Cloud Insights provides a flexible query mechanism that enables you to monitor and troubleshoot your hybrid cloud environment easily. You can search assets at a granular level based on various criteria, including annotations and performance metrics.

You can slice data by adding filters and by sorting the results to view inventory and performance data in one view. For example, you can quickly create a query to find all storage systems in a particular data center as shown in Figure 5.

Figure 5) A Cloud Insights query to find storage based on subnet.

NetApp CDS Sa... / All Queries / Find My NANE Storage

Filter By: Storage, Name, Any, IP, 10.197.143.25

Query Results (2)

Name	IP	Capacity - Raw (GB)	Family	Model	Microcode Version	IOPS - Total (I/O/s)	Latency - Total (ms)
lawry	10.197.143.25	80,020.27	FA56200	FA56210	8.3.2 clustered Data ONTAP	3,954.15	0.46
tokaj	10.197.143.37	87,091.43	FA53200	FA53270	8.3.2 clustered Data ONTAP	424.31	0.10

In this example, the query filters by Storage and then by IP address to narrow the results to a particular subnet. You can use as many criteria as you need to achieve the desired results. After you have created the query that you want, you can give it a name and save it for future use. In this example, we have named the query “Find My NANE [NetApp New England] Storage.”

You can embed queries in dashboard widgets, and you can access all your saved queries from the Queries menu in the left-hand pane of the Cloud Insights UI. After you create a query, you can use it again (the view updates as new data is collected), modify it, or delete it.

You can also combine the power of queries and annotations to confirm that new assets are annotated automatically by applying annotation rules. From the Manage menu, you simply select Annotation Rules to bring up the Annotation Rules page that shows all your existing rules. Select + Rule in the upper-right corner to add a new rule, as illustrated in Figure 6.

Figure 6) Adding an annotation rule to a query.

The screenshot shows a modal dialog titled "Add Rule". It has a close button (X) in the top right corner. The dialog contains four input fields arranged in a 2x2 grid. The top-left field is labeled "Name" and contains the text "Tag My NANE Storage". The top-right field is labeled "Query" and is a dropdown menu with "Find My NANE Storage" selected. The bottom-left field is labeled "Annotation" and is a dropdown menu with "Data Center" selected. The bottom-right field is labeled "Value" and contains the text "NANE ISElab". At the bottom right of the dialog are two buttons: "Cancel" and "Save".

In this example, we add an annotation rule called Tag My NANE Storage and associate it with the query that we created in the example in Figure 5. The specific annotation is Data Center, and the associated value is NANE ISElab.

After you create a rule, Cloud Insights automatically runs the rule every 15 minutes. So, in this example, if any new storage systems were added to the data center NANE ISElab, they would be detected within 15 minutes and annotated automatically.

5.5 Creating Alerts Based on Performance Policies

With Cloud Insights, you can create performance policies to generate alerts when a resource exceeds a specific SLI. This feature enables you to proactively monitor your environment to detect problems before they affect your operations. You can quickly create targeted alerts to detect problems while reducing the noise in your monitoring environment to avoid *alert fatigue*.

As Figure 7 illustrates, to create an alert, you specify a name, the object type, and any specific annotations that the policy applies to. You can also specify the severity of the alert and when it is triggered.

A key to the power of Cloud Insights alerting is the ability to easily specify multiple thresholds. Suppose that you have an SLA that mandates that certain VMs maintain total latency below 25ms. In the example in Figure 7, we have created a threshold to generate a warning when any of the VMs in the NANE ISElab exceed 20ms for more than 5 minutes. A second threshold on this alert takes effect when CPU utilization exceeds 80%, a sign that a VM might be at risk of becoming overloaded.

Figure 7) Add Policy dialog box.

Add Policy [X]

Policy Name: Level 1 Latency and CPU Util Warning

Apply to Objects of Type: Virtual machine

With Annotation: Data Center

Annotation Value: NANE ISElab

Apply After a Window of: 5 minutes

With Severity: Warning

Email Recipients
Email will be sent to global recipient list. Click [here](#) to override.

Create alert if **all** of the following are true:

Primary Rule: Latency - Total > 20 ms

CPU Utilization - Total > 80 %

+ Threshold

☐ Stop processing further policies if alert is generated

Cancel Save

You can specify as many thresholds for an object type as you need. An alert can be set to take effect only if **all** of the thresholds are crossed, as in this example, or you can specify that it is triggered if **any** of the thresholds is reached. This feature gives you the ability to fine-tune alerts by changing when they are applied, by increasing or decreasing a threshold value, or by adding more thresholds. This capability enables you to limit the number of false alarms and to receive alerts only when they are truly warranted.

Figure 8 shows an example Cloud Insights alerts page.

Figure 8) Cloud Insights alerts.

Alerts for High Latency VMs					
210 items found					
ID	Time ↓	Duration	Description	Severity	Policy
VL-755771	03/27/2019 8:35:17 AM	11 minutes (active)	Win2K8R2-Pool2_DaveD violation with 'Latency - Total' > 6.00 ms (value of 6.08 ms)	Warning	Find High Latency VMs
VL-755755	03/27/2019 8:25:17 AM	10 minutes	win2k16serv07 violation with 'Latency - Total' > 6.00 ms (value of 7.07 ms)	Warning	Find High Latency VMs
VL-755748	03/27/2019 8:15:21 AM	14 minutes	OCL_DWH violation with 'Latency - Total' > 6.00 ms (value of 6.37 ms)	Warning	Find High Latency VMs
VL-755705	03/27/2019 8:10:17 AM	19 minutes	win2k16serv24 violation with 'Latency - Total' > 6.00 ms (value of 6.55 ms)	Warning	Find High Latency VMs
VL-755686	03/27/2019 8:05:17 AM	10 minutes	blw2k1254 violation with 'Latency - Total' > 6.00 ms (value of 7.81 ms)	Warning	Find High Latency VMs
VL-755753	03/27/2019 7:59:59 AM	14 minutes	vls-ndas-werlma27061323/rcr2019	Warning	Find High Latency VMs
Alerts for High Latency FlexVols					
17 items found					
ID	Time ↓	Duration	Description	Severity	Policy
VL-755095	03/27/2019 5:04:41 AM	30 minutes	OSTK-07-CI-Infra-01_barnacle_openstack of OSTK-07 violation with 'Latency - Total' > 3.00 ms (value of 50.13 ms)	Warning	Find High Latency FlexVols
VL-755053	03/27/2019 4:57:15 AM	29 minutes	tawny:tawny_svm_oc_dev/ms_RHEV_NFS of tawny violation with 'Latency - Total' > 3.00 ms (value of 11.71 ms)	Warning	Find High Latency FlexVols
VL-754827	03/27/2019 4:12:15 AM	29 minutes	tawny:tawny_svm_oc_dev/ms_RHEV_NFS_0 of tawny violation with 'Latency - Total' > 3.00 ms (value of 5.54 ms)	Warning	Find High Latency FlexVols
VL-754761	03/27/2019 3:42:15 AM	45 minutes	tawny:tawny_svm_oc_dev/vm_archive of tawny violation with 'Latency - Total' >	Warning	Find High Latency FlexVols

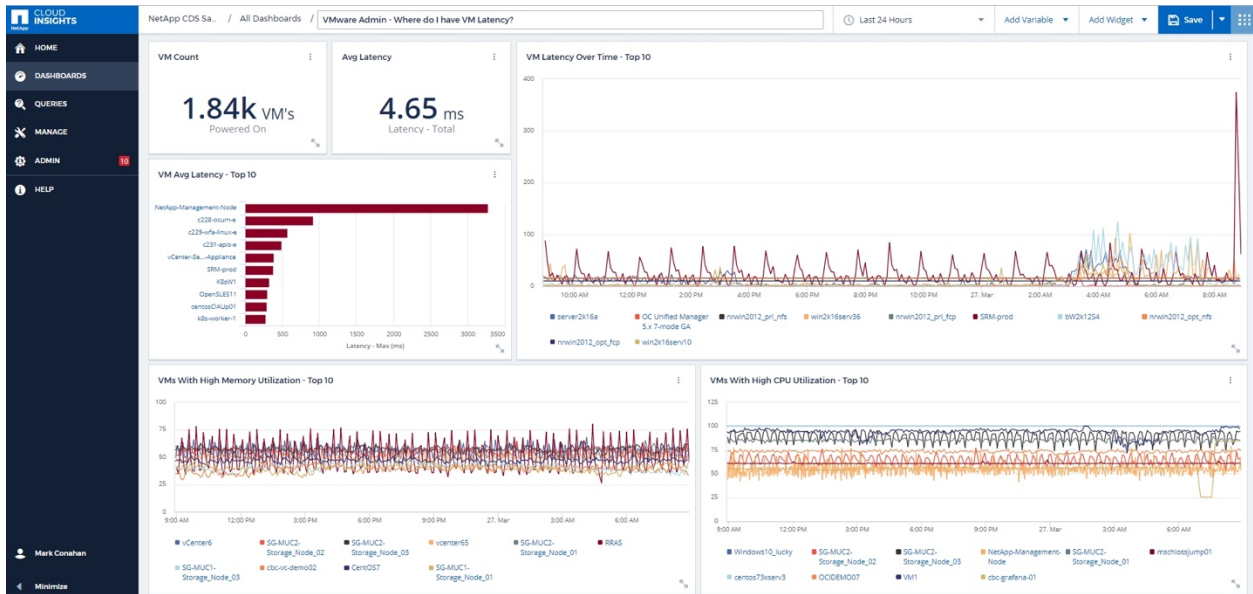
6 Monitoring Your Environment with Cloud Insights Dashboards

After you have configured NetApp Cloud Insights, much of your day-to-day monitoring can be accomplished using dashboards. Cloud Insights comes with a default set of dashboards that is based on the data collectors that you enable. Each dashboard is designed to help you answer specific questions about your infrastructure, such as:

- Where is your system experiencing high latency?
- Where have SLOs been exceeded?
- Where are errors occurring?

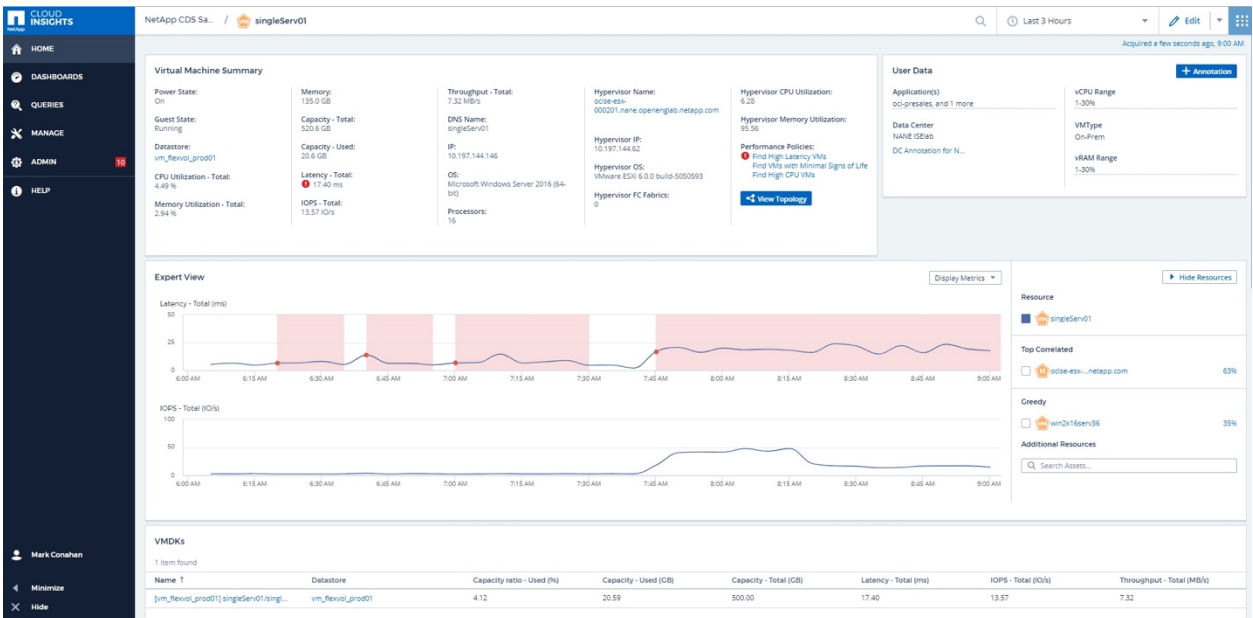
Cloud Insights dashboards are designed to provide immediately actionable information. For example, Figure 9 illustrates a dashboard that shows VM latency.

Figure 9) Example Cloud Insights dashboard that shows VM latency.



You can filter this view to show data for a longer or a shorter period. (Many monitoring and management tools provide access only to a few hours of data.) You can also click the name of any VM to drill down to more information about that particular asset. For instance, you might want to drill down on each of the high-latency VMs to identify any issues. Figure 10 shows example results when an operator drills down on a high-latency VM.

Figure 10) Drilling down to an individual resource.



6.1 Identifying Correlations and Viewing Topologies

From an asset page like the one in Figure 10, you can explore all the metrics that are associated with the asset (in this case, a VM) to identify sources of latency. The pane in the center-right shows the top correlated resources and any greedy resources. You can also view the full topology for the VM, as shown in Figure 11, to see what hypervisor the VM is connected to and what back-end storage the VM is using.

Figure 11) Topology for the VM that is shown in Figure 10.

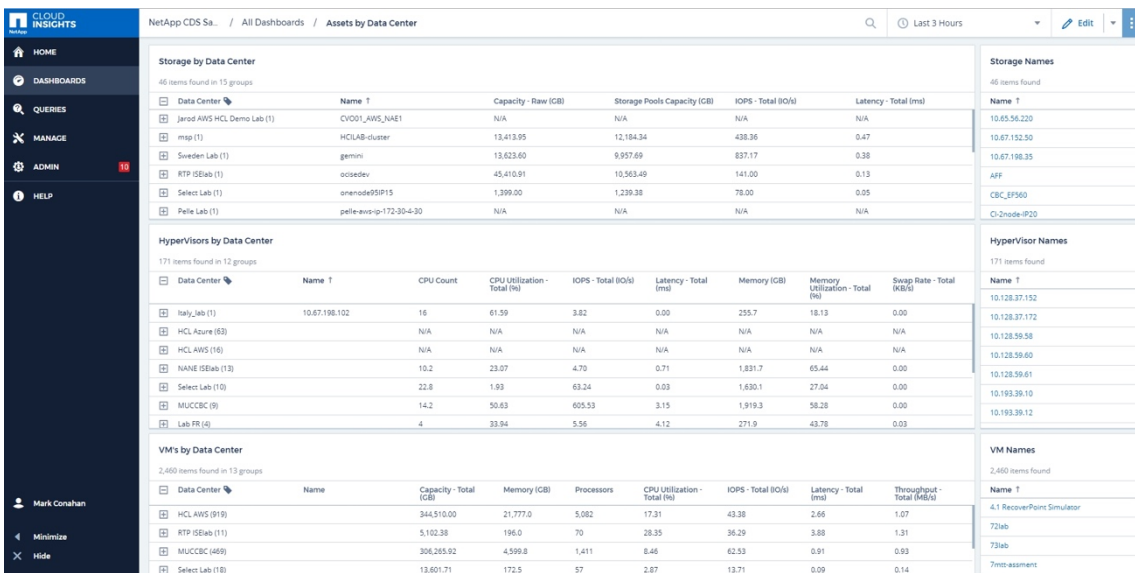


6.2 Custom Dashboards

Cloud Insights allows you to create custom dashboards by using various widgets and gives you great flexibility in displaying and in charting your data. Although you can accomplish a great deal by using the default dashboards, as you use and become familiar with the solution, you will see ways that you can accomplish even more.

With custom dashboards, your team can create highly tailored views to meet diverse monitoring and troubleshooting needs. You can start from an existing dashboard and customize it, or you can create entirely new dashboards from scratch, using powerful tools to visualize your data. Each of your administrators can set a particular custom dashboard as their home page within Cloud Insights. For example, Figure 12 shows a simple but useful custom dashboard that is designed to make it easy to find all storage, hypervisors, and VMs grouped by data center.

Figure 12) Custom dashboard that groups all storage, hypervisors, and VMs by data center.



The advanced capabilities of Cloud Insights extend far beyond this simple example. Some of the available dashboard widgets include:

- **Line, Spline, Area, Stacked Area Charts:** time-series chart widgets on which you can display performance and other data over time
- **Bar, Column Charts:** displays of top or bottom *N* values; for example, top 10 storage systems by capacity or bottom 5 volumes by IOPS
- **Box Plot Chart:** minimum, maximum, median, and the range between the lower and upper quartile of data in a single chart
- **Scatter Plot Chart:** plots that relate data points; for example, IOPS and latency
- **Violations Table:** displays of up to the previous 1,000 performance policy violations
- **Table:** table that displays data according to filters and columns that you choose

Cloud Insights dashboards and widgets give you great flexibility and control over how data is processed and displayed, including:

- **Queries.** Use this powerful tool to manage the data that is displayed in a widget. Some types of widgets support up to five queries.
- **Roll-up and Aggregation.** Roll up data or aggregate time-series data to display the average, maximum, minimum, or sum.
- **Top/bottom Results.** Easily display the top or bottom results for rolled-up data.
- **Expressions.** Any time-series widget allows you to build expressions from the metrics that you choose and to show the result of those expressions. For example, you can calculate and show the read percentage by using the following expression:

$$\text{Read Percentage} = (\text{Read IOPS} / \text{Total IOPS}) \times 100$$

- **Variables.** Change the data that is displayed in some of or all the widgets on a dashboard at once based on the value of a variable that you supply.

Cloud Insights dashboards give you the capabilities that you need today, and they are designed to grow with your experience and with the needs of your organization.

7 Summary and Next Steps

NetApp Cloud Insights can help you monitor, troubleshoot, and optimize your infrastructure. This guide examined the monitoring capabilities of Cloud Insights, including dashboards, queries, alerting, and more. Cloud Insights goes far beyond the capabilities of simple element managers, showing you the relationships between resources so that you can identify problems and bottlenecks more quickly. Multi-threshold alerts help you minimize the occurrence of false positives and maximize your ability to identify problems before they affect users.

The next guide in this series will explore how you can use these capabilities to prevent problems from occurring and to more quickly troubleshoot problems that arise. And that includes the kind of troubleshooting in which your boss is looking over your shoulder and reminding you that the company is losing \$5 million an hour during the outage.

To see Cloud Insights in action for yourself, register for a 14-day free trial. Go to NetApp Cloud Central at <https://cloud.netapp.com/cloud-insights> to learn more about NetApp Cloud Insights and to start your free trial.

Refer to the [Interoperability Matrix Tool \(IMT\)](#) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

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