Dell EMC CloudIQ streamlined the user experience in five cloud-based storage preventative management tasks

Compared to HPE InfoSight with an HPE Primera array, CloudIQ with a Dell EMC Unity array let us identify potential issues and troubleshoot problems in less time and fewer steps

Ease administrative burdens

42X faster to identify reclaimable storage

Simplify maintenance and troubleshooting

10X faster to predict future storage capacity consumption

Identify potential issues

Discover VMs with high resource utilization, storage performance anomalies, and reclaimable storage

Modern companies require effective IT operations to succeed, and managing storage is an essential component of keeping business-critical applications running smoothly. When storage admins can anticipate problems before they occur, they can address them proactively to maintain the integrity of storage systems and maximize uptime. However, monitoring storage capacity and performance to identify potential issues can require a great deal of time and energy. This is especially true in environments that include a variety of storage solutions—possibly across multiple locations—each with its own management tool.

At Principled Technologies, we examined two software platforms that aim to ease this administrative burden by collecting and analyzing data: Dell EMC™ CloudIQ with a Dell EMC Unity™ array and HPE InfoSight with an HPE Primera array. We used each platform to carry out scenarios involving identifying potential issues and troubleshooting performance. Dell EMC CloudIQ streamlined the tasks, requiring less time and fewer steps than HPE InfoSight did.

We also evaluated the CloudIQ mobile app, which lets storage admins monitor resource utilization, storage health, and performance via their mobile devices. This can lead to speedier identification and resolution of problems.

Boosting the efficiency of your storage admins can help your business

For storage admins, a certain amount of stress comes with the territory—after all, your vital business applications depend on storage running consistently, even when activity spikes without notice. The right storage management platform has the potential to help admins do their jobs. Below, we look at several hypothetical situations your company might face.

The situation: Over the years, your company has accumulated a variety of storage hardware, each with its own management tool. Some of it is housed in remote locations, and keeping an eye on all of this is a nightmare. Your storage admins have ideas for improving efficiencies, but are unable to pursue these innovations due to the amount of time they spend on routine monitoring and proactive maintenance activities.

How the right storage management platform can help: Storage admins benefit from a platform that assembles administrative data from disparate storage solutions into a unified interface and gives them a more streamlined way to monitor performance and analyze usage. They get back time and energy they can use to help the company.

The situation: Business is booming, and so is the demand on IT infrastructure. The time has come to increase capacity, but the rate at which application, user, and administrative requests are coming in makes it difficult for your storage admins to predict when you should buy your next system before storage runs out.

How the right storage management platform can help: Storage maintenance is always easier when you've planned it. CloudIQ uses machine learning to predict potential problematic scenarios, such as when your capacity is approaching full. This gives storage admins essential information to plan for storage capacity upgrades or storage migrations.

The situation: Your applications don't take the evenings or weekends off, so being on call to respond to emergencies is part of the storage admin job description. To receive alerts for problems after hours, admins might have to periodically check into systems remotely.

How the right storage management platform can help: A robust mobile app can notify admins of issues while they go about their lives and let them monitor storage resources from wherever they happen to be. This can shorten the time between the problem and the admin's learning about it, which can in turn speed the time to problem resolution.

About Dell EMC CloudIQ

According to Dell EMC, CloudIQ is a cloud-native, software-as-a-service (SaaS) offering that simplifies monitoring and troubleshooting for storage environments.[1] Dell EMC includes CloudIQ at no additional charge for the following platforms: Dell EMC Unity, PowerScale, SC Series, XtremIO, PowerMax/VMAX, PowerVault™, VxBlock, and PowerStore storage systems as well as Connectrix® switches. Dell EMC claims that its infrastructure, which hosts CloudIQ, is "Highly Available, Fault Tolerant, and guarantees a 4-hour Disaster Recovery SLA."[2]

About HCIBench

HCIBench is a testing tool VMware created to measure storage performance, including in hyper-converged infrastructure environments. According to VMware, this tool "fully automates the end-to-end process of deploying test VMs, coordinating workload runs, aggregating test results, and collecting necessary data for troubleshooting purposes."[3] HCIBench generates a test workload using either Vdbench or Fio; in our testing, we created I/O profiles using Vdbench. Learn more at https://flings.vmware.com/hcibench.

Comparing the admin experience with two storage management platforms

To learn how Dell EMC CloudIQ and HPE InfoSight stacked up, we carried out a series of tasks on two storage solutions hosted remotely in the Dell EMC lab. For complete details of our testing, see the science behind this report.

We tested a Dell EMC Unity array-based solution monitored by CloudIQ and an HPE Primera array-based solution monitored by InfoSight. On both solutions, we ran workloads simulating various I/O profiles that are present in some business workloads, using the HCIBench tool (see box above) to create and execute the following I/O profiles:

- Steadily increasing storage writes over a 24-hour period to simulate logs, new customers and orders, and other cumulative data

- Bursts of mixed I/O at the end of each day to simulate close-of-business sync operations

- High-demand mixed I/O at random times to simulate unexpected traffic and an increase in storage activity

Each storage solution consisted of two storage service processors with 24 all-flash SSDs and two Dell EMC PowerEdge™ R740 servers for load generation. We used VMware vSphere® 6.7 and HCIBench to create our testing environment.

Using the web-based user-interface for CloudIQ and InfoSight to monitor the arrays, we simulated five use cases reflecting the work that storage admins perform:

- Assessing capacity approaching full

- Investigating a host that is no longer highly available

- Assessing performance impact and anomaly detection

- Identifying "noisy neighbor" VMs and workloads

- Identifying reclaimable storage opportunities

As we worked, we recorded the amount of time, number of steps, and management tools that our admin needed to assess storage performance or identify problems. We also explored the CloudIQ mobile app.

Use case 1: Assessing capacity approaching full

Running out of storage space is a scenario that storage admins work to avoid at all costs. Dell EMC CloudIQ uses predictive analytics to assist in this effort. CloudIQ determines trends based on past capacity usage and predicts when storage space could run out. With this knowledge, organizations can better plan for future expansion and avoid near-term crises.

CloudIQ uses two algorithms for capacity prediction: a long-term algorithm that can predict months ahead, and short-term algorithm focused on 24 hours that further safeguards against unexpectedly running out of storage.

Figure 1 shows the CloudIQ Capacity Approaching Full dashboard. Admins can select each storage object and see trend lines of past capacities over time. For certain storage pools and clusters, CloudIQ provides charts that predict future capacity. This screen shows the platform's estimates of how soon the resource will reach capacity—within a week, month, or quarter.
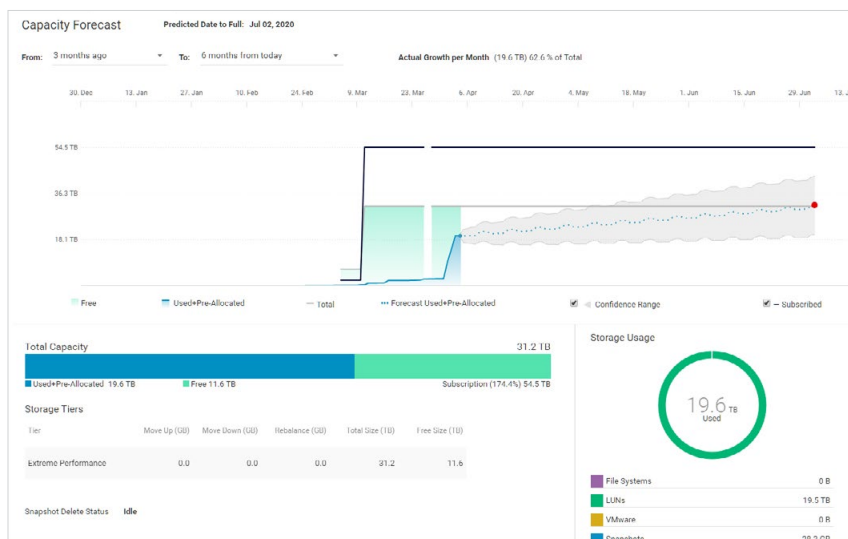

Figure 1: The CloudIQ dashboard showing capacity approaching full.
Source: Principled Technologies.

We tested this scenario using a workload designed to simulate the daily operations of a growing business. On both storage arrays, we ran a small block, all-write I/O workload continuously, increasing the volume of storage writes each day. We chose I/O rates that would fill the targeted logical unit number (LUN) in 40 days and ran the workload for two weeks to see if and how each platform alerted us to the fact that the data would soon exceed capacity. Finally, we recorded the time and steps each platform required for us to become aware of the potential issue.

CloudIQ displayed capacity forecast information on the overview landing page upon logging in. We've used one step and 1 second to account for our administrator getting oriented and locating the information. When using HPE InfoSight, it took our admin 11 seconds and five steps to locate the capacity forecasting trendline (see Figure 2). In addition, CloudIQ needed only two weeks of historical data to begin forecasting capacity usage, whereas HPE InfoSight requires six months' worth of data before it can make a prediction.[4] Thanks to these advantages, administrators using CloudIQ could potentially save time and move on to other tasks faster.

	Dell EMC CloudIQ		HPE InfoSight		
Time	1.0s	Time	11.2s		**10X faster**
Steps	1	Steps	5		**80% fewer steps**

Figure 2: Time and steps to assess that storage capacity was almost full.
Source: Principled Technologies.

Use case 2: Investigating a host that is no longer highly available

Storage environments rely on high availability (HA) to protect against unexpected data loss. By keeping data highly available, organizations avoid having a single point of failure and can ensure that applications relying on the storage continue to operate effectively. However, HA applies to more than storage arrays and monitoring. Upstream components that help deliver data from storage arrays to the user must also remain highly available. Therefore, storage admins need a way to monitor the data flow from the storage, through the network and servers, to the applications.
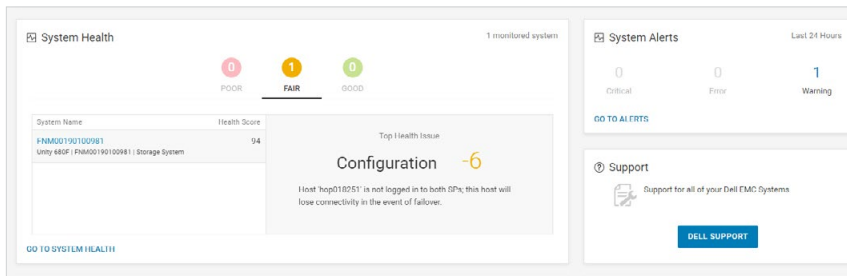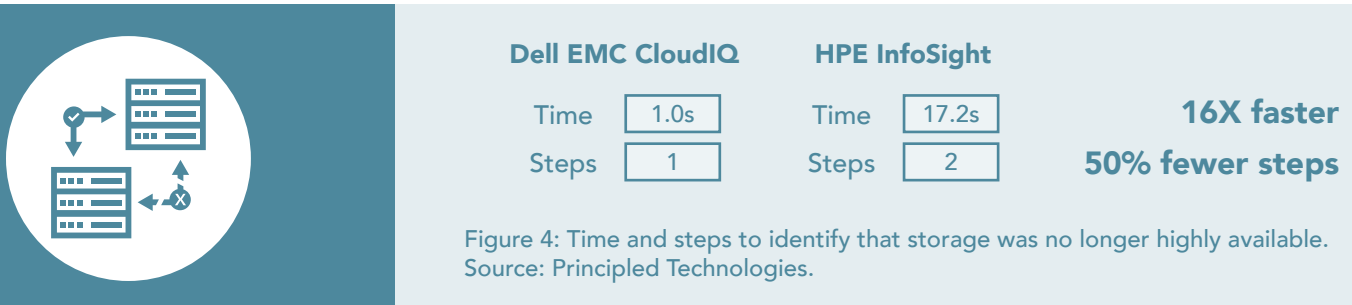

Figure 3: The CloudIQ dashboard showing loss of high availability on the storage array. Source: Principled Technologies.

We tested this scenario by disabling initiator ports on one of the array host bus adapters in each testbed. We recorded the time and steps each platform required for us to become aware of the issue.

CloudIQ displayed HA information on the overview page, including specifying exactly which host lost HA. We have again used one step and 1 second to account for our administrator getting oriented and locating the information. When we tested HPE InfoSight, we found that an admin needed 17 seconds and two steps to access two screens to view the offline ports. Critically, HPE InfoSight did not specify which host lost HA, requiring the admin to use other tools to identify the impacted host. Because loss of HA is a time-sensitive alert, admins using CloudIQ can potentially avoid losing data and save time and effort by finding the exact cause of the problem sooner.

Dell EMC CloudIQ

Time | 1.0s
Steps | 1

HPE InfoSight

Time | 17.2s
Steps | 2

16X faster

50% fewer steps

Figure 4: Time and steps to identify that storage was no longer highly available. Source: Principled Technologies.

Use case 3: Assessing performance impact and anomaly detection

Storage admins have the unvarying responsibility of ensuring their solution is free of bottlenecks that might negatively affect user experience. CloudIQ shoulders this task by looking for performance impacts and alerting admins when latency increases without a corresponding increase in IOPS or throughput. CloudIQ can even help admins find the specific LUN or VM impacting performance. We cover this feature in more depth on the next page.

Along with performance impacts, CloudIQ delivers proactive performance anomaly indications to admins about storage patterns that deviate from the norm. Performance anomaly indications can help admins make necessary adjustments, such as increasing resources to a newly active database or changing rate limits to match actual demand versus predicted demand. CloudIQ can provide these indications thanks to sophisticated analytics and machine learning technology. Instead of spending time consistently monitoring and calculating potential scenarios, admins can focus on other tasks such as performance tweaks or workflow automation, resulting in direct benefits to the users that come before, not after, an unexpected event.

Figure 5: The CloudIQ dashboard showing performance impacts caused by an increase in latency and a drop in IOPS. Source: Principled Technologies.

For this scenario, we ran a daily I/O burst designed to simulate close-of-business operations such as syncing remote devices, backups, or other activities that occur on a regular schedule. After two weeks of end-of-day I/O bursts, we added a burst of heavier I/O in the morning. We then recorded how long each solution took to identify the anomaly and the time and steps each platform required to become aware of the issue.

At the time of our testing, HPE InfoSight offered no comparable feature to the performance impact and anomaly detection abilities of CloudIQ. An admin for a Primera array would need to analyze the performance of each LUN to determine where the impact was. Our admin used another HPE monitoring tool, 3PAR StoreServ Management Console (SSMC) to assess virtual volume performance. Once the admin had logged into SSMC, accessing the LUN details required 43 seconds and six steps.

Dell EMC CloudIQ		HPE SSMC		
Time	19.8s	Time	43.6s	**54% less time**
Steps	3	Steps	6	**50% fewer steps**

Figure 6: Time and steps to navigate to assess performance impacts on storage. Source: Principled Technologies.

Use case 4: Identifying "noisy neighbor" VMs and workloads

In storage, a noisy neighbor is a component, such as a storage object or VM, that monopolizes resources in a way that degrades the I/O performance of other components nearby. CloudIQ compares I/O patterns across storage pools, LUNs, and VMs to find instances of workloads affecting neighboring I/O performance. This allows the admin to intelligently separate storage objects so that each workload has the resources it requires.

CloudIQ flags I/O performance anomalies and identifies LUN performance impacts such as increased LUN latency. It indicates which storage objects are the most likely source of the resource contention, which can help storage admins direct their troubleshooting efforts more effectively.

We tested these scenarios by running heavy I/O workloads on LUNs sharing a storage pool and on VMs sharing a LUN. We then recorded the time and steps required for an admin to become aware of the noisy neighbor situation and identify the problematic VMs or LUNs.

Figure 7: The CloudIQ dashboard showing a noisy neighbor LUN.
Source: Principled Technologies.

We found HPE InfoSight on Primera had no comparable feature to the noisy neighbor detection capabilities of CloudIQ. As with use case 3, an admin wanting to investigate noisy neighbor impacts would likely need to use the SSMC virtual volume overview to find congestion or abnormal traffic patterns. Using that data, the admin would then have to analyze the data to identify the noisy VM or LUN. With CloudIQ, identifying a noisy neighbor VM took 26 seconds and four steps and identifying a noisy neighbor LUN required 17 seconds and two steps. Once the admin had logged into SSMC, accessing the virtual volume overview to get this information for Primera required 43 seconds and six steps.

	Dell EMC CloudIQ	HPE SSMC	
Time	26.5s	Time 43.6s	**39% less time**
Steps	4	Steps 6	**33% fewer steps**

Figure 8: Time and steps to discover a noisy neighbor VM.
Source: Principled Technologies.

	Dell EMC CloudIQ	HPE SSMC	
Time	17.9s	Time 43.6s	**58% less time**
Steps	2	Steps 6	**66% fewer steps**

Figure 9: Time and steps to discover a noisy neighbor LUN.
Source: Principled Technologies.

Use case 5: Identifying reclaimable storage opportunities

Storage admins frequently allocate storage. In a busy environment, they can forget to reclaim it once it's no longer needed. CloudIQ makes it easy to locate such storage capacity and avoid wasting resources.

We tested this scenario using a single VM for each solution. We ran mixed I/O workloads for 2 hours on the VM, then paused the workload. Next, we disconnected the LUN from the server host and waited five days. Finally, we recorded the time and steps required for us to become aware of and locate the reclaimable storage.
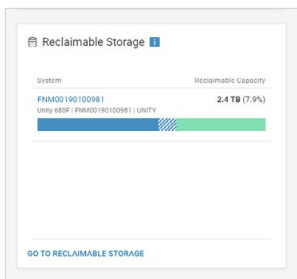
Figure 10: The section of the CloudIQ dashboard that showed reclaimable storage. Source: Principled Technologies.

We found HPE InfoSight offered no comparable feature to the reclaimable storage feature found in CloudIQ. As in use cases 3 and 4, an admin would likely need to abandon their InfoSight session and use SSMC to identify storage resources that are no longer needed and in use. CloudIQ displayed reclaimable storage information upon logging in. As with use cases 1 and 2, we've used one step and 1 second to account for our administrator getting oriented and locating the information. In contrast, accessing the virtual volume overview in SSMC required 43 seconds and six steps once the admin had logged into SSMC.

|	Dell EMC CloudIQ	HPE SSMC	
Time	1.0s	Time	43.6s
Steps	1	Steps	6

42X faster

83% fewer steps

Figure 11: Time and steps to identify reclaimable storage in the array. Source: Principled Technologies.
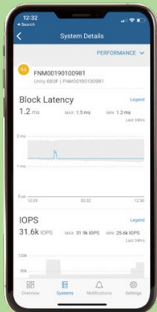
The CloudIQ mobile app interface

The Dell EMC CloudIQ mobile app, available for Apple iOS and Android devices, offers Proactive Health, capacity and performance monitoring, and push notifications to help admins monitor storage regardless of location.
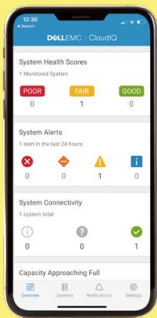
Similar to the browser version of CloudIQ, the main screen of the app provided a summary of health scores across the storage environment.

Figure 12: Main screen of the CloudIQ mobile app on Apple iOS 13.3.1.

It also provided detailed storage performance statistics to ensure optimal storage performance.

Figure 13: Performance screen of the CloudIQ mobile app on Apple iOS 13.3.1.

The app gives storage admins the ability to:

- Drill down to see the health, capacity, and performance details of any given system
- Send the recommended remediation procedure via text or email to another person
- View any connectivity issues in the environment
- Turn push notifications on or off
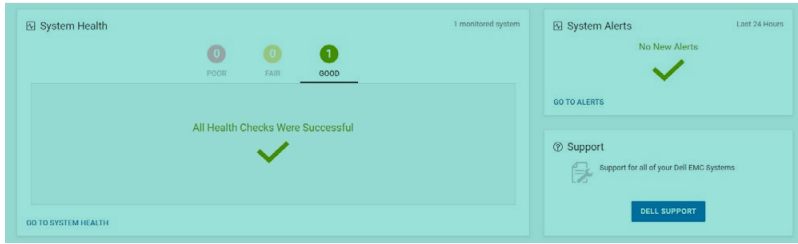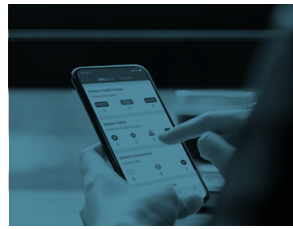
Conclusion

As the volume of data that companies contend with explodes, storage plays a more vital role than ever before in IT. The storage admins at your company work diligently to manage disparate storage solutions to keep the applications that access this storage running smoothly. Providing these employees with the best tools to do their jobs makes good business sense.

Our hands-on tests revealed that Dell EMC CloudIQ on a Dell EMC Unity array allowed us to carry out several proactive storage management tasks in a more streamlined fashion than HPE InfoSight on an HPE Primera array did. The Dell EMC solution enabled our admin to identify reclaimable storage 42 times faster, find the predicted storage capacity consumption 10 times faster, and easily discover VMs with high resource utilization, storage performance anomalies, and reclaimable storage. Spending less time on routine monitoring, analysis, and troubleshooting gives storage admins more time to innovate.

We also spent time using the CloudIQ mobile app and confirmed that its functionality could help storage admins learn about problems when they are away from the office and on call, which can reduce the time to problem resolution. Dell EMC CloudIQ, which is included at no additional charge with Dell EMC storage solutions, is a smart way to boost the efficiency of the valuable employees who manage the storage upon which your company's vital applications run.

1   Dell EMC, "CloudIQ Detailed Review," accessed March 23, 2020, https://www.dellemc.com/nb-no/collaterals/unauth/white-papers/products/storage-2/h15691-emc-cloudiq-overview.pdf.

2   Dell EMC, "CloudIQ Detailed Review," accessed March 23, 2020, https://www.dellemc.com/nb-no/collaterals/unauth/white-papers/products/storage-2/h15691-emc-cloudiq-overview.pdf.

3   VMware, "HCIBench," accessed March 23, 2020, https://flings.vmware.com/hcibench.

4   "HPE InfoSight for HPE 3PAR StoreServ," page 25, accessed April 28, 2020, https://assets.ext.hpe.com/is/content/hpedam/documents/a00053000-3999/a00053623/a00053623enw.pdf.

Read the science behind this report at http://facts.pt/jrxuu8j ▶

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