



PROPHETSTOR

DiskProphet™ for Cloud



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Summary

Data center technology has been evolving. Many software-only solutions, including open-source or home-built, give enterprises and service providers more choices when selecting the most cost-efficient hardware for private/hybrid/public cloud infrastructure. Many data centers implement solutions for business applications or services with commodity hardware instead of tightly integrated proprietary hardware from major vendors. These solutions generally require high standards of skills in their dev/ops team to efficiently manage both hardware and software stacks. By applying advanced analytics and patented AI technologies, ProphetStor DiskProphet™ optimizes cloud operations using commodity hardware and promotes strength against competition.

The following types of companies can benefit from the solution:

- Service providers that offer cloud backup services for medical records.
- Video streaming service providers for the entertainment industry and the military.
- Large cloud service providers for home, small business, and enterprise customers.

The Challenges

When designing the hardware infrastructure of cloud solution for competing with business rivals, a business must identify the hardware that is best suited for the business and then make sure to monitor hardware performance throughout its life cycle. The manufacturer of an integrated proprietary solution will no doubt select the right components from the market with well-established workforce and technologies. Manufacturers of these systems usually develop software capable of monitoring hardware components and proactively handling component errors to avoid disaster and extend hardware life. For example, many storage vendors incorporate proactive RAID protection and passive scrubbing in their arrays. Most home-grown software, open-source, and even key software vendors might not provide this kind of support for integrated hardware. Most companies lack the resources, time, and expertise to tackle this problem.

While most applications and advanced file systems can reliably handle hardware failures, application performance is rarely unaffected. Handling numerous failures can be a burden to a development/operations team that is already tight on resources.

Performance during hardware components can be easily addressed by increasing the failures to tolerance (FTT) factor, although raising the FTT number results in increased costs for both capital expenses and operations. Increasing the bottom line poses a threat to cost-sensitive service companies fighting against competitors.

Summary of key challenges

The key hardware challenges facing companies can be summarized as follows:

- Hardware maintenance, especially drive replacement, consumes considerable resource bandwidth.
- Procuring the right quality hardware at the right cost.
- Ensuring fluid performance of service during the entire hardware/software life cycle.

The Solution

ProphetStor DiskProphet™ is a software solution for data center resources analytics and utilization prediction, with an emphasis with specialty on disk failure prediction. The DiskProphet™ solution helps cloud operators efficiently manage the hardware life cycles and improve data center resource utilization.

While the cost of disks is always a significant factor in building a cloud solution, the cost of disk maintenance can be easily neglected. Some research indicates that disk errors add significant cost to data center budgets. Although disks continue to have low failure rates with the improvements of disk technology, the growth of partial disk failures still threatens a solution’s reliability and increases operation workloads, as the capacity of disks increase. By analyzing disks’ vital signs, DiskProphet discovers latent sector errors and accurately predicts their life spans.

In addition to producing disk error analytics, DiskProphet also monitors the metrics related to OS, IO activities, and the network, and present environment analytics in easy-to-read charts.

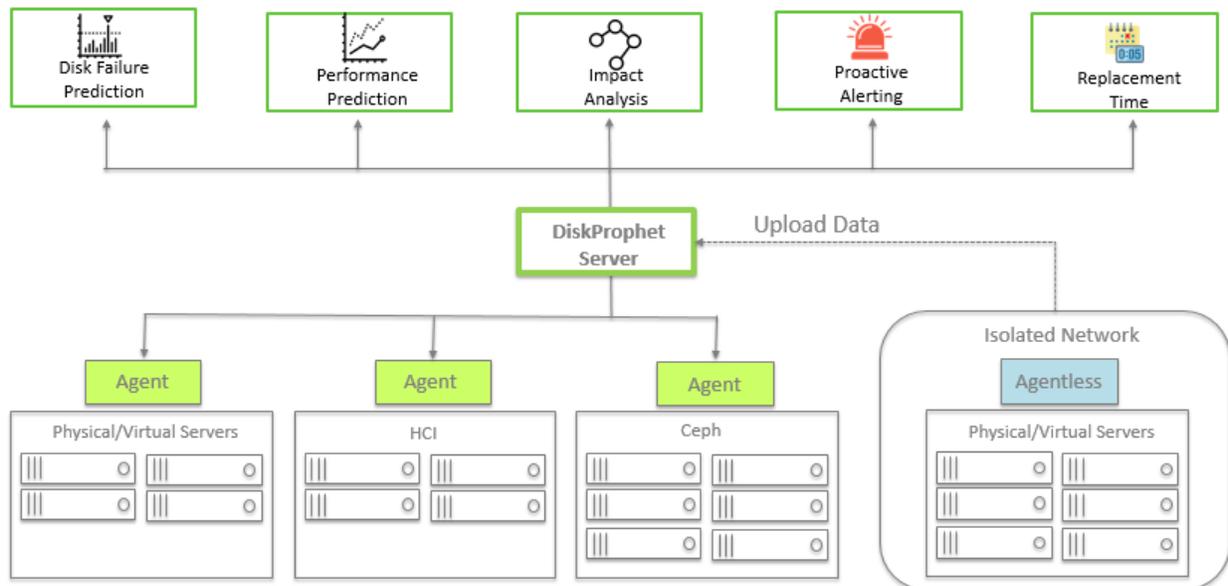


Figure 1: DiskProphet for Cloud Architecture

Disk Model Reliability Analysis

Holistic reliability analysis of disks by manufacturer and model at from various levels – disk, disk group, host, cluster, and the data center as a whole – provides complete snapshots of disks as they age.

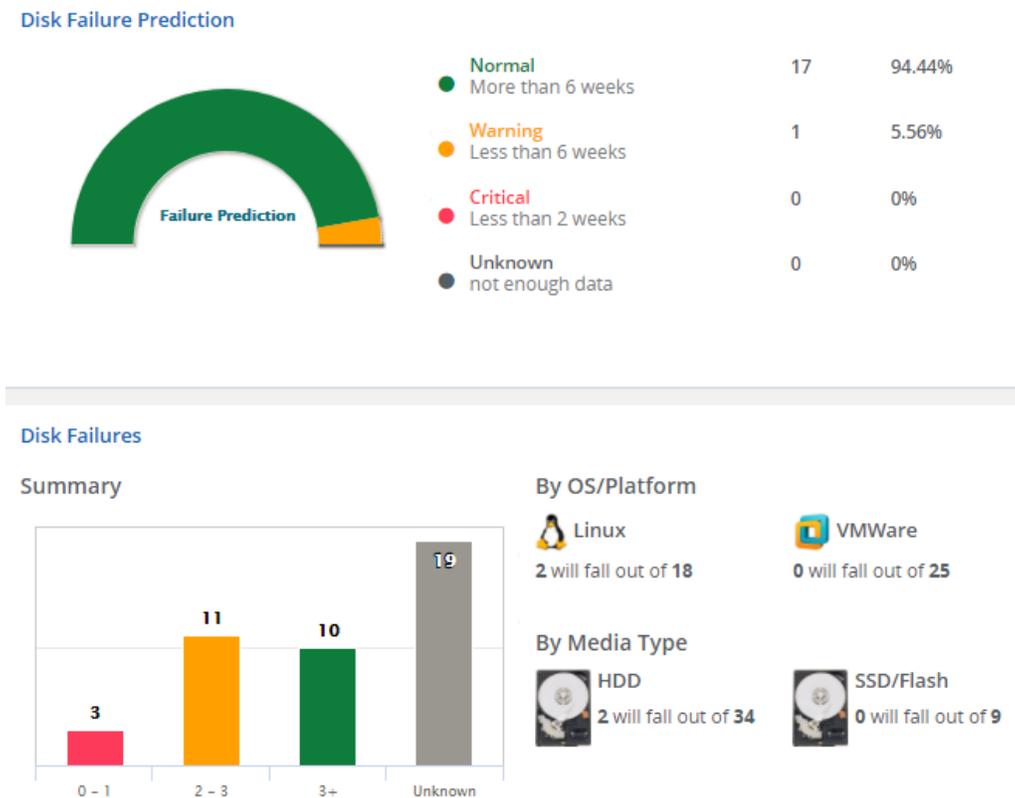


Figure 2: DiskProphet Dashboard – Disk Failure Prediction

Disk Degradation Prediction

The ability to predict the remaining lifetime of disks (HD, SSDs, and NVMEs) with greater than 95% accuracy gives operators the leeway to take appropriate action to protect data, avoiding three-drive-failures and maintenance such as scrubbing, and plan for maintenance that ensures application performance, such as smooth video streaming experiences and on-demand restores.

For example, in a company with Ceph implementation, solution performance suffers from automatic rebalancing due to unexpected disk failures. With DiskProphet prediction, a failing disk is proactively marked out-of-service and a new replacement disk is inserted, with little impact on operations.

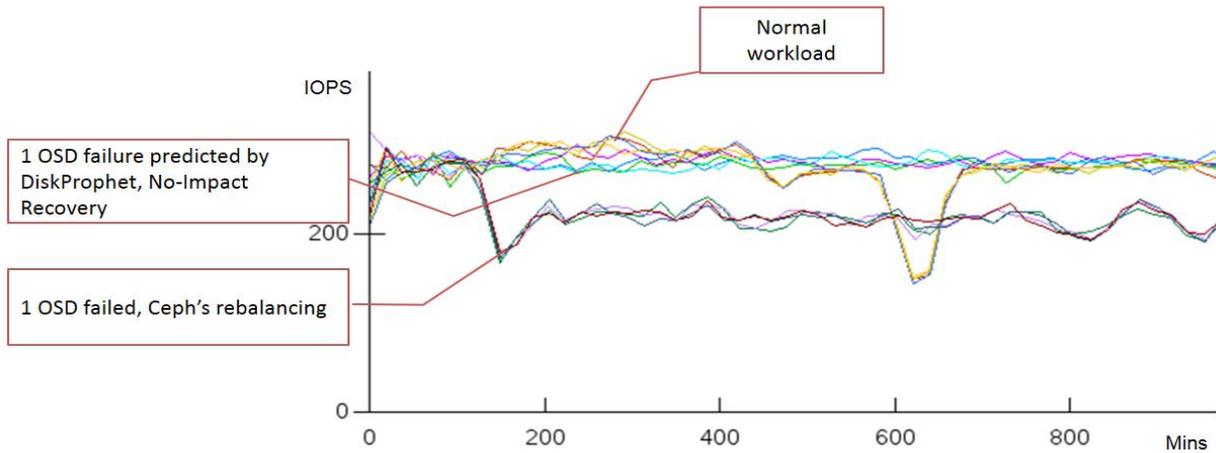


Figure 3: Comparison of Ceph Performance Over Unmanaged Disk Failures and Managed Disk Replacement with Prediction

Performance Analytics and Prediction

Beyond historical performance statistics, analytics and predictions for CPU and memory usage and IO activities offer guidance in operations planning and optimization and future resource needs.

The diagram below, from the DiskProphet interface, shows actual usage statistics (solid line) for the past 7 days and predicted usage for the next 7 days.

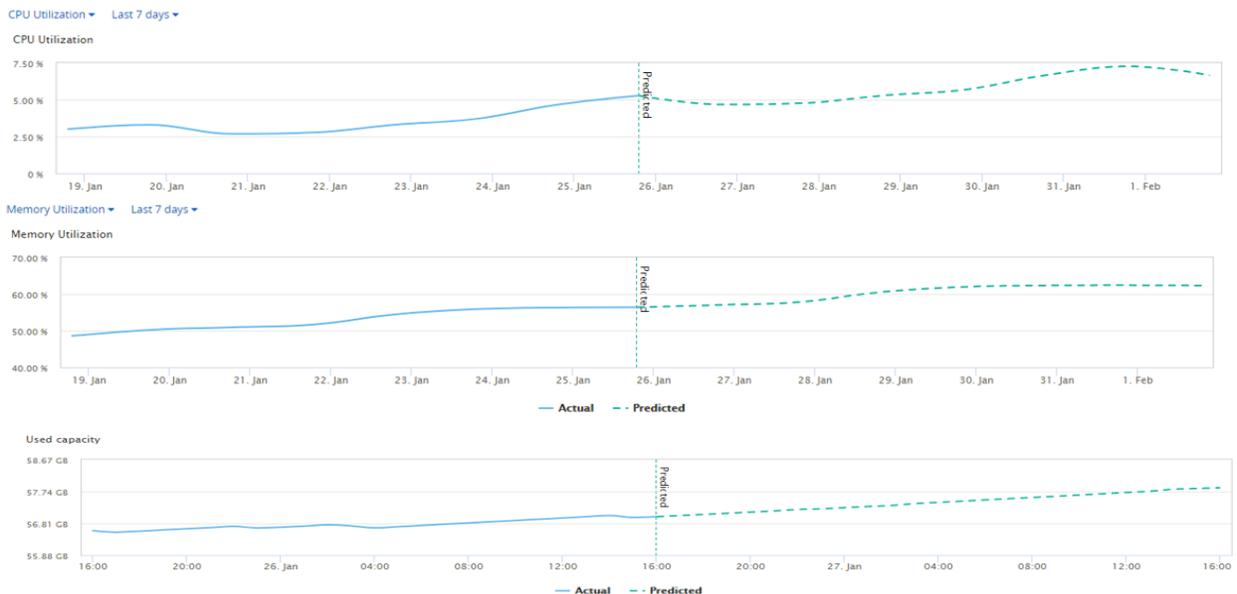


Figure 4: Using DiskProphet Resource Utilization Predictions

Impact Analysis

The impact of a potential risk is visualized by correlating the affected components.

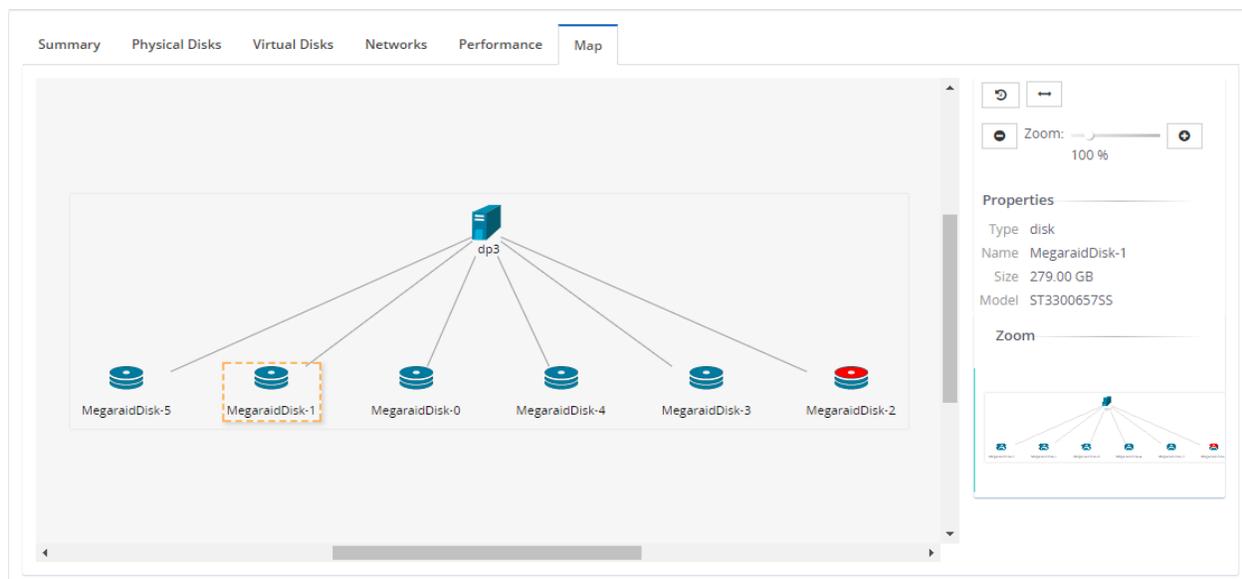


Figure 5: Physical host resource map with impact analysis

Replacement Time (Future)

A replacement plan is recommended by aggregating the predictions on multiple factors

Proactive Alerting (Future)

Notifications are delivered to administrators in SMS or emails when a hardware error or resource conflicts are predicted to occur.

Key Benefit Areas

The key benefits provided by DiskProphet can be summarized as follows:

- **Increases ROI on hardware:** With the ability to instantly compare all models, display live status, and project future needs, the company can select appropriate hardware components and plan for future operations more effectively.
- **Protects SLA performance against hardware failures:** With hardware error predictions, cloud operators can ensure data availability and plan for maintenance during off peak hours to minimize production impact.
- **Optimizes data center utilization:** with both historical resource analytics and future predictions, cloud operators can develop precise plans to allocate shares of the infrastructure with confidence.
- **Improves productivity and reduces operation errors:** With proactive indications on disk failures, DiskProphet turns individual random disk failure incidents into planned maintenance of multiple tasks.