Global File Locking

Nasuni enables collaboration among users of files no matter where users are located

Introduction

The Nasuni Service combines the availability and scale of cloud storage with the local performance found in traditional storage arrays. The Nasuni Service includes Global File Locking capabilities as a function of UniFS®. UniFS® is a scalable fully versioned file system that provides global access to corporate data across any number of geographic locations. The global lock extends an existing file server lock from one location to any number of sites connected to the same volume.

This brief discusses how Global File Locking functions. Global File Locking enables collaboration among users of files no matter where users are located. The most up to date copy of the data and its lock status is maintained in the cloud but served to the user locally. This enables global access and collaboration with a local storage user experience, while maintaining consistency of the data and avoiding conflicts.

The Nasuni Service Components

UniFS®

UniFS® is Nasuni's patented file system that bridges NAS and SAN access to the scalable object storage of the cloud. It is the only file system of its kind and can scale to billions of files, directories or snapshots without any performance degradation. Nasuni customers already store millions of snapshots in the cloud and billions of files representing petabytes of data.

This patented capability allows Nasuni to go beyond the limits of traditional snapshots and eliminate additional backup requirements. Unlike hardware-based file systems where i-nodes and snapshots are a limited resource, the Nasuni Service leverages cloud infrastructure to store an unlimited number of snapshots replicated to multiple offsite datacenters. Using Nasuni, files and blocks from previous snapshots can be recovered in a matter of minutes – regardless of whether the snapshot is from three days or three years ago.

Nasuni Filers use UniFS® to match the various performance workloads required across your organization. The Nasuni Filer provides read/write access to shared datasets, allowing each location and mobile employee access to a single global file share that makes teamwork and collaboration possible, regardless of geography. With Nasuni, the data center file share is now available anywhere in the world at local speeds. The Nasuni Service eliminates distance and puts everyone in your organization under the same roof.

www.nasuni.com
info@nasuni.com
United States: 1.800.208.3418
International: 1.508.433.6200

Nasuni Filers

The Nasuni Filer line provides various levels of performance levels to a unified storage platform for files and blocks. The Filers support standard protocols: NFS/CIFS for files and iSCSI for blocks while being fully compatible with Active Directory for access control. The Nasuni Filer is built to fit neatly into any situation that calls for a mid-range storage controller but unlike traditional arrays, the Filers connect to the Nasuni Service which means they never need to be backed up or replicated and they never run out of capacity. The Nasuni Filer allows administrators to create logical volumes. Each volume contains a complete instance of UniFS® that can be shared with other Nasuni Filers. The Filer is the on-premises component of the Nasuni Service. By combining the best aspects of cloud storage with the comfort of traditional infrastructure, the Nasuni Service delivers a whole new storage experience.

Filers are part of the Nasuni Service. Filers are leased with the service, and refreshed for you over time. This means that as the cloud storage infinitely scales with you data, the hardware Filers can scale with your distribution and workloads. You can ride both the cloud storage and commodity cost curves while spending only what you need to provide required file data storage service levels to your users.

The Nasuni Management Console

The Nasuni Management Console centralizes and simplifies control of every Nasuni Filer creating a single pane of glass for administrators. The Nasuni Management Console (NMC) leverages the power of cloud to deliver control over massively distributed systems without requiring point-to-point connections or in-network access. NMC is capable of scalable management of Filers located around the world.

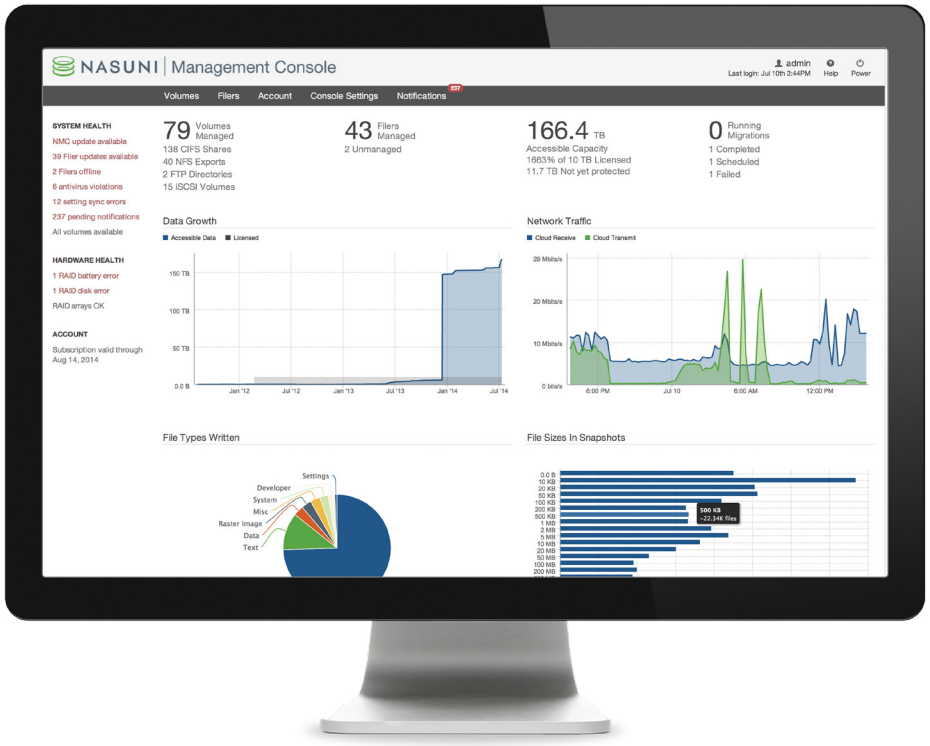

Figure 1: The Nasuni Management Console centralizes and simplifies control of every Filer and Volume, creating a single pane of glass for administrators.

Global File Locking with Nasuni

Nasuni provides file locking at the file system level via UniFS®. The approach is completely compatible with the way applications use traditional file locking today on any CIFS/SMB or NFS share – but UniFS® extends file locks across any number of geographic locations. When an application opens a file with a lock, it will appear to the application exactly as it does on any other NAS device or Windows File Server. Therefore the application will behave the same way it always does, and there is no change to the user's experience whether collaborating with someone in the next office or across the globe. This also ensures that file locking with Nasuni is compatible with every application and requires no special integration or management.

Locking Use Cases

Local File Locking: When users are located at the same site using the same Nasuni Filer, locking can happen locally on that filer and Global Locking is unnecessary.

Read Only Remote File Locking: When all the users who will write the data are in one location, and consumers of the data who will not change it are remote, the volume can be permissioned to be 'Read Only' on remote Filers, and Global Locking is not required.

Remote Collaboration Global File Locking: When users who will write data are distributed at multiple sites Global Locking will allow them to collaborate using the data wherever they are without risk of losing or corrupting any data while preserving all data changes.

Nasuni Global Locking

Configuring Global Locking

Global Locking can be configured at the folder level on any Nasuni Volume. When configured on a folder, Global Locking is enabled for all files in that folder and all subfolders to it. This allows granular control, pinpointing where locking is required, and excluding it where it is not. Which folders have global locking is configured centrally through the NMC, so locking can be easily and simply managed from one interface.

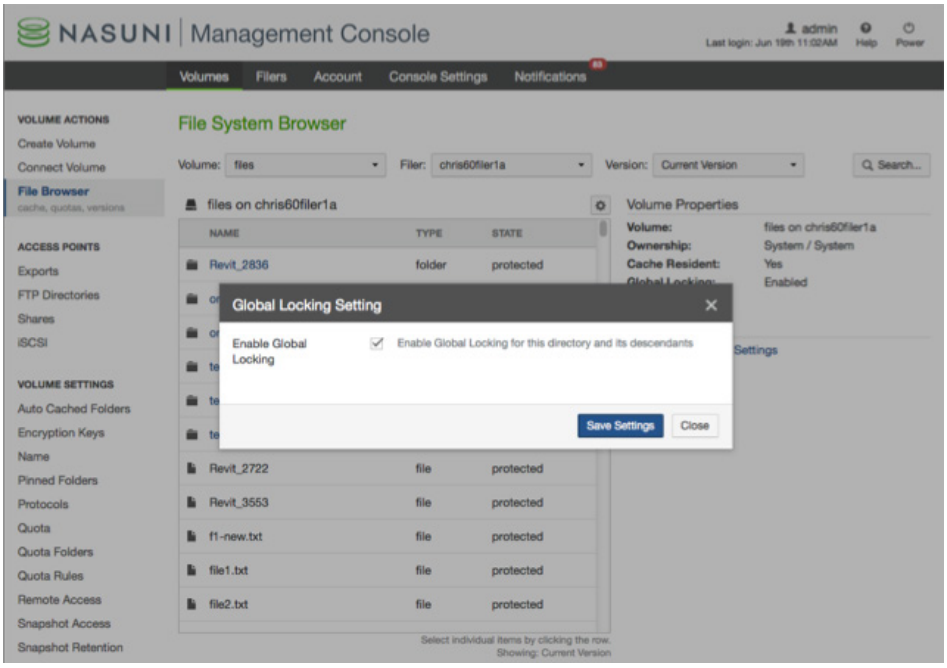

Figure 2: Configuring Global Locking

How Global Locking Works

When an application opens a file and requests a lock in a folder that has Global Locking enabled, the following steps automatically occur:

1. The local cache is checked to see if the lock has already been granted or denied.
2. If not found, a lock is requested from the Nasuni Global Locking Service (GLS) in the cloud.
3. If the file is not already locked by someone else, GLS grants the lock, and UniFS® locks the file.
4. UniFS® checks to see if the latest version of the file is in the local Filer and merges changes from the cloud if not.
5. The open file handle and lock are granted to the application.

With the Nasuni Global Locking Service running in the cloud at web scale, this process can take place with no user perceptible delay.

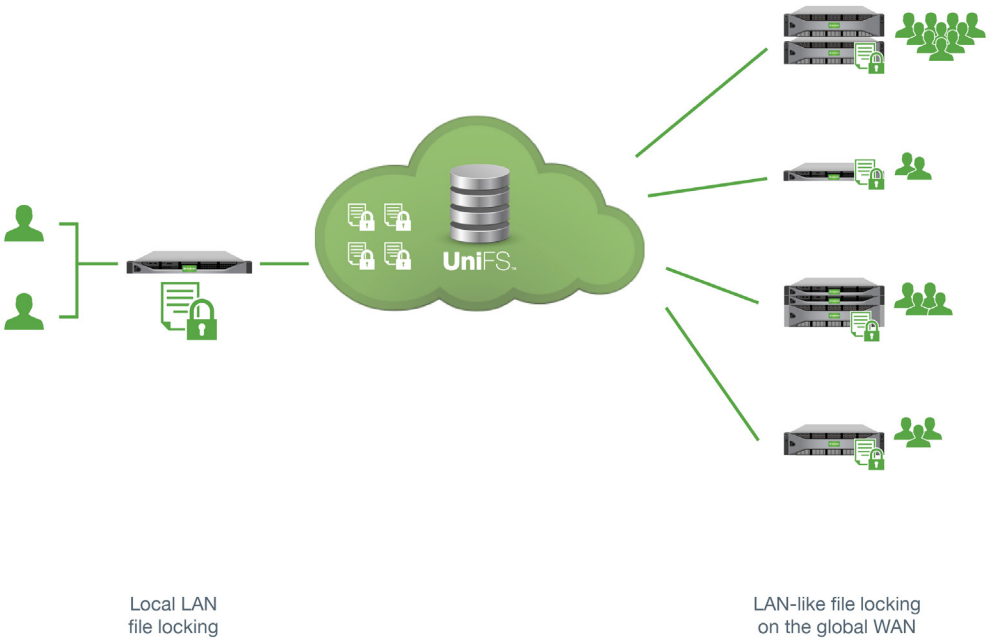

Figure 3: Cloud Scale Global Locking

This process also ensures that the when a file is open and locked for writing, it will always be the consistent, latest version of the file. If someone else attempts to open the file with a write lock, GLS will deny it until the previous lock is released. Depending on the application's behavior when it attempts to open a locked file, it may allow the user to open a read only copy.

Global Locking Scalability

Global Locking is supported by the Nasuni Service with a cloud-scale infrastructure in order to ensure performance and high availability. Requests from all Nasuni Filers are distributed using an elastic load balancing architecture that automatically increases resources as the file system workload increases. High availability is ensured by having the Nasuni Service operate in multiple cloud availability zones.

Breaking a Lock

If it becomes necessary to break a file lock, for example due to an application hang or someone who leaves the office with a file open, this can be done centrally from the NMC.

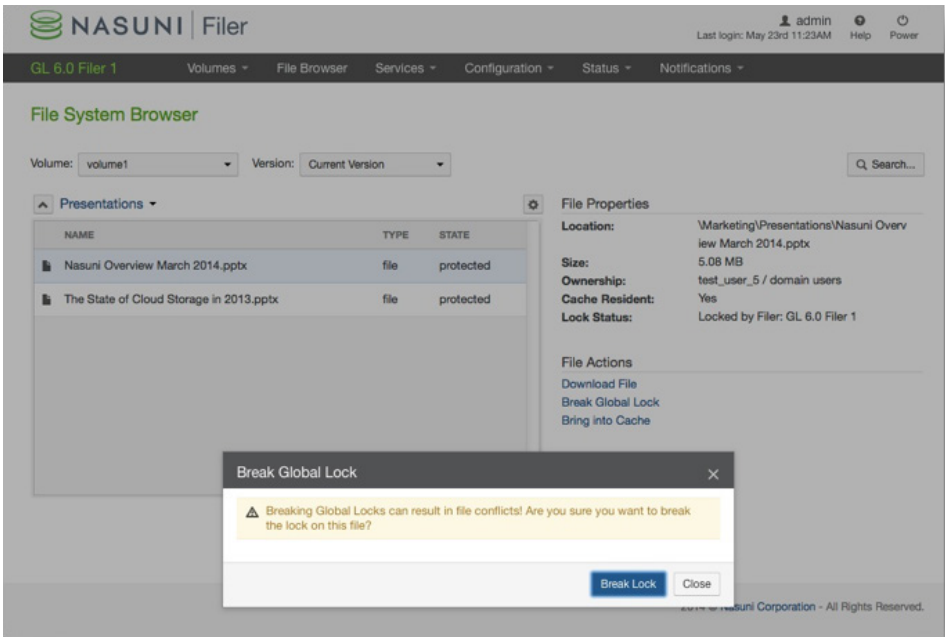

Figure 4: Breaking A Lock

When the lock is broken the file immediately becomes available for the next user to open it with a lock. In the unlikely event of a conflicting change between the user that held the original broken lock, and the new user of the file, no data is ever lost or corrupted. Nasuni's proven conflict management process takes over creating two copies of the file with a clear indication in the file name of which user's data in is which file for later reconciliation.

Global Locking Considerations

UniFS® efficient snapshot capabilities allow it to store and synchronize large amounts of data though the cloud while conserving precious bandwidth resources. Global Locking requires that any changes in the cloud be immediately downloaded before a lock is obtained, and that the data be synchronized back up to the cloud storage frequently as the data is being changed. For an optimal user experience it is important that any location for which the global lock is enabled have a stable network connection. Using NMC to centrally manage where Global Locking is required allows Nasuni administrators to efficiently manage any trade-offs.

In addition, to further improve utilization, NMC allows the administrator to configure snapshot frequency. Since files under Global Locking are synchronized more frequently as they are changed, and thus have their changes protected in the cloud, snapshot frequency can be reduced for these volumes while still maintaining Recovery Point Objectives (RPO).

Traditional Approaches To Global Locking

Past approaches to global locking have used gateway devices to support the locks. This creates performance and reliability problems as the number of sites attached to the lock manager node or the workload increases. Ultimately any one device becomes a bottleneck and a point of failure for the entire system forcing organizations to carve out small collaborations sets. Only a service-level global lock can support the scale and high availability requirements of global organizations.

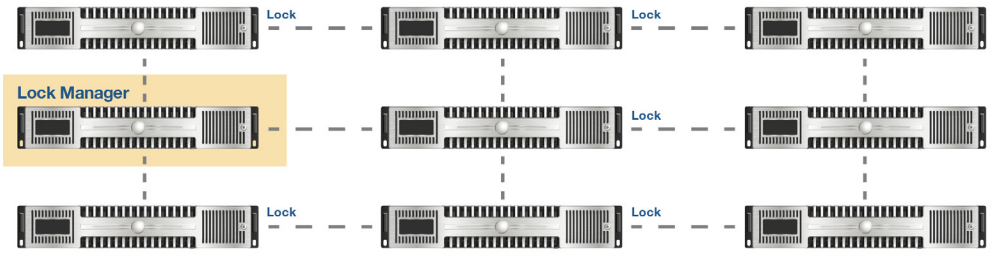

Figure 5: Device Centric Global Locking

The Nasuni approach to Global Locking is different and unique. By using a Global Locking Service (GLS) integrated with UniFS® in the cloud, locking is truly global with one authoritative lock and up to date master copy of the data accessible to all Filers. This provides the highest levels of consistency and scalability. Each Filer communicates directly with the GLS in the cloud, eliminating scalability issues. In the Nasuni approach, 100 Filers each require one connection to the cloud hosted GLS.

Conclusion

The Nasuni Service provides an infinitely scalable, globally accessible file data storage environment that allows for collaboration on data across the office or across the globe. With UniFS® at their core, Nasuni Filers give users the experience and performance of local storage anywhere in the world. Nasuni's Global File Locking prevents data inconsistency or loss when users in remote locations need to access and change the same files whether these are large engineering or video files, or simple office documents. It achieves this while reducing IT's costs and burden with the economic advantage of cloud storage, eliminating the needs for backup and archive, and by providing a central management console for ease of administration. The Nasuni Service improves the agility of IT organizations that must support infrastructure across geographic locations. It is storage for the global enterprise.

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