This page is intentionally left blank.
This page is intentionally left blank.
# Table of Contents

## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER 1</th>
<th>OVERVIEW</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>INTRODUCTION</td>
<td>6</td>
</tr>
<tr>
<td>1.2</td>
<td>CONVENTIONS</td>
<td>7</td>
</tr>
<tr>
<td>1.2.1</td>
<td>Icons</td>
<td>7</td>
</tr>
<tr>
<td>1.2.2</td>
<td>Text Conventions</td>
<td>7</td>
</tr>
<tr>
<td>1.3</td>
<td>STORAGE TECHNOLOGIES</td>
<td>8</td>
</tr>
<tr>
<td>1.3.1</td>
<td>Storage Area Network (SAN)</td>
<td>8</td>
</tr>
<tr>
<td>1.3.2</td>
<td>iSCSI</td>
<td>8</td>
</tr>
<tr>
<td>1.3.3</td>
<td>Network Attached Storage (NAS)</td>
<td>8</td>
</tr>
<tr>
<td>1.3.4</td>
<td>Storage Provisioning</td>
<td>8</td>
</tr>
<tr>
<td>1.4</td>
<td>STONEFLY STORAGE APPLIANCES</td>
<td>9</td>
</tr>
<tr>
<td>1.4.1</td>
<td>Current Families of StoneFly Appliances:</td>
<td>9</td>
</tr>
<tr>
<td>1.4.2</td>
<td>Storage Concentrator</td>
<td>9</td>
</tr>
<tr>
<td>1.4.3</td>
<td>StoneFusion</td>
<td>10</td>
</tr>
<tr>
<td>1.4.4</td>
<td>Administrative Interface</td>
<td>10</td>
</tr>
</tbody>
</table>

## CHAPTER 2 | ADMINISTRATIVE INTERFACE | 11

| 2.1       | LAUNCHING THE ADMINISTRATIVE INTERFACE | 12 |
| 2.1.1     | Accessing System Management Functions | 13 |
| 2.2       | HOME PAGE | 14 |
| 2.2.1     | Home Page Images | 15 |
| 2.2.2     | Master Storage Concentrator Menu | 15 |
| 2.3       | RESOURCES | 16 |
| 2.3.1     | Discovering Resources | 17 |
| 2.3.2     | “Use” Types for Resources | 17 |
| 2.3.3     | Adding Resources | 19 |
| 2.3.4     | Editing Resources | 20 |
| 2.3.5     | Removing Resources | 22 |
| 2.4       | VOLUMES, HOSTS & SESSIONS | 23 |
| 2.5       | SYSTEM | 24 |
| 2.5.1     | System Information | 24 |
| 2.5.2     | Local iSCSI Data Port Settings | 25 |
| 2.5.3     | Network and Broadcast IP Settings | 27 |
| 2.5.4     | Routing | 28 |
| 2.5.5     | Administrative Functions | 28 |
| 2.5.6     | Shutting Down the Storage Concentrator | 30 |
| 2.5.7     | Using DNS | 30 |
| 2.5.8     | Storage Concentrator Discovery | 30 |
| 2.5.9     | CIFS User Policies | 30 |
| 2.5.10    | Console Password | 31 |
| 2.5.11    | Only Allow GUI Logins from the Management Network | 31 |
| 2.5.12    | Setting the Time and Using NTP Services | 31 |
| 2.5.13    | iSNS | 32 |
| 2.5.14    | Auto Save | 32 |
| 2.5.15    | Restore | 34 |
| 2.5.16    | Feature Licensing | 35 |
| 2.5.17    | Target Portals | 35 |
| 2.5.18    | Diagnostics | 35 |
This page is intentionally left blank.
Chapter 1

Overview
1.1 Introduction

All StoneFly appliances use a common Operating System called **StoneFusion™** which is StoneFly’s state of the art software that powers all StoneFly storage appliances. A physical or virtual storage appliance running the StoneFly StoneFusion OS is referred to as a StoneFly **Storage Concentrator™**.

The **StoneFly Scale Out NAS Enterprise Cloud Drive** Virtual Machine in the Microsoft Azure Cloud is a Software-Defined Unified Storage (SDUS™) solution powered by StoneFly’s StoneFusion appliance software. Therefore, StoneFly Cloud Drives are virtual StoneFly Storage Concentrator appliances that run in the cloud.

This User’s Guide provides detailed instructions on how to configure, manage and monitor the StoneFly Cloud Drive using the Storage Concentrator’s GUI interface.

A system administrator can configure and monitor the following:

- Logical volume management of all connected storage
- Upper level applications that provide an extensive suite of storage management functionality
- System operation and status
- Creating and managing NAS volumes that can be exported to NFS and CIFS clients

The following sections provide an overview of the StoneFly Cloud Drive.
1.2 Conventions

The tables that follow list the conventions used throughout this User’s Guide.

1.2.1 Icons

<table>
<thead>
<tr>
<th>Icon</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Note Icon]</td>
<td>Note</td>
<td>Special instructions or information</td>
</tr>
<tr>
<td>![Warning Icon]</td>
<td>Warning</td>
<td>Risk of system damage or a loss of data</td>
</tr>
</tbody>
</table>

1.2.2 Text Conventions

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boldface word</td>
<td>An action is required.</td>
</tr>
<tr>
<td>“Type” or “Enter”</td>
<td>Input the requested information</td>
</tr>
</tbody>
</table>
1.3 Storage Technologies

1.3.1 Storage Area Network (SAN)

Storage Area Network (SAN) is a separate and specialized network whose primary purpose is to transfer data between computer systems and storage elements. A SAN consists primarily of a communication infrastructure and a management layer. The communication infrastructure provides physical connections and the management layer organizes the connections, storage elements, and computer systems so that data transfer is secure and robust.

1.3.2 iSCSI

iSCSI is a protocol that enables the transmission of block-level SCSI data between storage resources and computers over a standard IP network. iSCSI combines Ethernet-based IP networking with the SCSI command set.

1.3.3 Network Attached Storage (NAS)

Network Attached Storage (NAS) is a storage technology that allows users to create shared volumes that can be accessed by one or more users. The difference between iSCSI volumes and NAS volumes are that NAS volumes (NAS shares) can be accessed by more than one user/server, but iSCSI volumes in general can only be accessed by one server.

1.3.4 Storage Provisioning

Storage Provisioning is the process of presenting a transparent, uniform, and logical representation of physical storage resources to storage clients (applications and users). Storage provisioning is not restricted by the type of storage device or medium, server platform, or connection methodology. Storage provisioning dynamically maps data from the logical storage space required by applications to the actual physical storage space.
1.4 StoneFly Storage Appliances

1.4.1 Current Families of StoneFly Appliances:

Hardware Appliances – Cluster Solutions:

- Voyager DX IP SAN Appliance
- Voyager FC IP SAN Appliance
- USO-HA Unified Scale Out IP SAN + NAS Appliance
- USO-FC Unified Scale Out IP SAN + NAS Appliance
- USS-HA Unified Storage & Server Appliance
- USC-HA Unified Storage Concentrator SAN Gateway
- UES-HA Unified Encryption SAN Gateway
- UDS-HA Unified Deduplication SAN Gateway
- DR365-HA Backup & Disaster Recovery Appliance

Hardware Appliances – Standalone Solutions:

- ISC Integrated Storage Concentrator IP SAN Appliance
- USO Unified Scale Out IP SAN + NAS Appliance
- SSO Super Scale Out NAS Appliance
- TSO Twin Scale Out NAS Appliances
- USS Unified Storage & Server Hyper-Converged Appliance
- USC Unified Storage Concentrator SAN Gateway Appliance
- DR365 Backup & Disaster Recovery Appliance

SDUS - Software-Defined Unified Storage Solutions:

- SCVM – Storage Concentrator Virtual Machine (Virtual Storage Appliance)
- StoneFly Cloud Drive

Note: There are older generations of StoneFly appliances that are still supported with the latest StoneFusion software.

For description of each family and related datasheets, please refer to www.stonefly.com

1.4.2 Storage Concentrator

The term Storage Concentrator is used throughout this document and is mainly the engine that delivers iSCSI, Fibre Channel and/or NAS storage volumes. Configuring and managing these volumes is accomplished using a browser-based graphical user interface (GUI) resident in the Storage Concentrator. The system administrator uses the graphical user interface to allocate storage to create iSCSI, Fibre Channel and/or NAS volumes and authorizes their use by individual host systems.
1.4.3 StoneFusion

The Storage Concentrator uses the proprietary StoneFusion™ Network Storage Platform that intelligently optimizes storage assets, offering the functionality traditionally associated with expensive midrange and high-end storage systems, and host-based volume management software. The StoneFusion architecture includes:

- An extensible in-band metadata storage-mapping layer
- Intelligent iSCSI storage packet routing software, providing aggregation and bidirectional data transfer for increased throughput
- A metadata database that tracks physical data locations to ensure data integrity
- Online storage management to easily consolidate free storage space maximizing storage resources

1.4.4 Administrative Interface

The administrative interface is accessed from a computer on the network via a web browser. The following management functions are available through the interface:

- **Volumes:** Create, manage, and delete storage volumes from any available resource.
- **Hosts:** Create, edit, and delete hosts.
- **Sessions:** Monitor the number of connections between hosts and volumes.
- **Resources:** Discover resources (devices) that provide the space for storage volumes.
- **NAS:** Create, manage, and delete NAS volumes.
- **System:** The System Management screen provides information regarding the system setup, and the configuration of the Storage Concentrator network settings.
- **Users:** Add, edit, delete, or view user information.
- **Reports:** The reporting function provides statistical information on the Storage Concentrator device, resources, volumes, and sessions. System logs provide a system-level sequence of events.
Chapter 2

Administrative Interface
2.1 Launching the Administrative Interface

The administrative interface resides on the Storage Concentrator. It is run from a network computer via a browser which can access the network where the Storage Concentrator is located.

Supported browsers include:
- Google Chrome
- Internet Explorer (5.0 or later)
- Mozilla Firefox
- Apple Safari

To access the administrative interface, use the steps that follow:

1. Launch your web browser.
2. Enter https://<DNS Name> for the Management Port of the Storage Concentrator in the address field of the browser. For more information, refer to the Setup Guide, “Configuring the Network Settings.”

The address field in the browser must include https:// to access the administrative interface.

The following login screen appears.

![Figure 2-1 Storage Concentrator Login Screen](image-url)
2.1.1 Accessing System Management Functions

To perform system management functions, you must log in with a user ID and password that is configured with administrative privileges.

Passwords must be between 6 to 15 alphanumeric characters with one character being a numeric character. Passwords cannot be the same as the corresponding username. StoneFly only validates the first eight characters during login. Characters after the first 8 are ignored, but are supported for user convenience. For more information on creating users, see "Adding Users".

When logging in for the first time, the administrator can use the following:

User ID: stonefly

Password: stonefly

It is strongly recommended that the “stonefly” password be changed at the initial configuration. It is also recommended that each system administrator have an individual user ID and password. For more information on creating users, see "Adding Users".

Proceed with logging into the Storage Concentrator:

1. Enter your User ID.
2. Enter your Password.
3. Press Enter or click Submit. The Storage Concentrator home screen appears.

If you attempt to log in with an administrator user ID and password that are already in use (someone else is already logged in with those credentials), then a warning message dialog box appears:

![Figure 2-2 The "current session exists" Warning Dialog Box](image)

If this screen appears, choose one of the following options:

1. Click OK - This logs you in and logs off the other user that was logged in with the same user ID that you had entered.
2. Click Cancel - The initial login screen appears. Repeat steps 1-3 using a different user ID and password.
2.2 Home Page

After successfully logging into the Storage Concentrator, the home page will appear.

![Figure 2-3 Storage Concentrator Home Page](image)

The bar across the top of the administrative interface allows the system administrator to access information regarding system information, support, and system status.

- **Home**: Displays this home page with a summary of all system information.
- **Support**: Displays StoneFly support information.
- **Logout**: Logs out of the current session.
- **Status**: Displays the status of the Storage Concentrator:
  - **Good**: Indicates normal operation.
  - **Down**: Indicates that the Storage Concentrator is not running correctly and must be power cycled in order to recover.
  - **Alert**: Indicates that unacknowledged critical messages have been detected and have been written to the system log.

The Storage Concentrator can be configured to notify the system administrator when Alerts occur. For more information on acknowledging Alerts in the system log, see “Logs”. For more information on Alert notification, see “Notifications”.
### 2.2.1 Home Page Images

**Primary** — The Primary Storage Concentrator is currently managing the storage volumes. Clicking on the photo image of the unit takes you to the Diagnostics Page. The Management IP is the address of the management port. The iSCSI IP is the address of the IP SAN port(s).

**Resources** — The list of available Storage Concentrator Resources. Clicking on the icon of the unit takes you to the Resources → Summary page.

### 2.2.2 Master Storage Concentrator Menu

The main menu for the Storage Concentrator is displayed on the top of the screen with the following categories:

- **Volumes** — Click to access volume management functions.*
- **Hosts** — Click to access host management functions.*
- **Sessions** — Click to access session management functions.*
- **Resources** — Click to access resource management functions.
- **NAS** — Click to access NAS volume management functions.
- **System** — Click to access system management functions.
- **Users** — Click to access user management functions.
- **Reports** — Click to access reporting functions.
- **Help** — Click to access help text for the current page.

"Volumes", "Hosts" and "Sessions" only apply to StoneFly Cloud Drives licensed for iSCSI. NAS Only StoneFly Cloud Drives do not use these sections of the menu.
2.3 Resources

After the initial configuration is completed, the next step is to discover the resources attached to the StoneFly Cloud Drive. Resources are the Azure disks that have been added to the StoneFly Cloud Drive. Each Azure disk will appear as a separate 1023GB resource. We will be able to combine these resources in the upcoming steps.

If possible, have all storage resources configured prior to allocating volumes.
2.3.1 Discovering Resources

Discovering resources is the process in which the Storage Concentrator queries the resource device(s) for information. On the initial login, no resources will be displayed until they have been discovered. A discovery will need to be performed any time new resources (Azure disks) are added to the StoneFly Cloud Drive.

To add resources, navigate to the Resources → Summary page using the menu bar. Any previously discovered resources will be displayed.

1. Click Discover. The following dialog box appears:

![Discovery dialog box]

2. Click OK.

2.3.2 “Use” Types for Resources

When discovery is complete, all available Azure disk resources will appear for the Primary Unit. Once discovered, each resource must be assigned a use type. Storage Concentrators support four use types:

- **None**: The resource is not currently managed by the Storage Concentrator.
- **Pass Thru**: The resource will accept SCSI commands from a host without any intervention from the Storage Concentrator except Reservation and Persistent Reservation SCSI commands. For Pass Thru volumes, these commands are handled by the Storage Concentrator. This resource is not added to the storage pool.
- **Managed**: The resource will be managed by the Storage Concentrator.
- **NAS Managed**: This resource is for use in a direct NAS Segment for NAS Volumes.

The Storage Concentrators use a “Managed” resource space to keep metadata so that the resource size available for volume provision is less than the total size of the resource.
To select the use type for a resource, use the steps that follow:

1. Click the **Managed** radio button.
2. Click **Submit**. The managed resources are now available and NAS segments and storage volumes can now be created.

Resource summary information includes:

- **Use Type**: Indicates how the resource is being managed.
- **Resource Name**: A default name assigned to the resource by the Storage Concentrator. The resource name can be edited later. For more information, see “Editing Resources”.
- **Path**: The SCSI address for the resource in the format of HBA: bus: Target ID: LUN.
- **Type**: Type of SCSI storage device. Azure Disks appear as Direct Access.
- **Total Size (GB)**: Total number of GigaBytes on the resource. Each Azure Disk appears as 1023GB.
- **Available Size (GB)**: Number of GigaBytes of space available for new volumes.
- **Status**: A resource can have one of the following statuses:
  - **Active**: Discovered and selected to be managed.
  - **Not managed**: Discovered but not selected to be managed by the Storage Concentrator.
  - **Non-active**: Has been discovered in the past, but was not found with the most recent discovery attempt.
  - **Off-line**: The Storage Concentrator is not able to successfully initiate a session with this resource.

A resource can be removed from the Storage Concentrator at any time by clicking the **Delete** checkbox next to the resource to be removed. For more information, see “Removing Resources”.

A red asterisk indicates that the resource status is in question and needs to be investigated by the system administrator.
2.3.3 Adding Resources

As storage needs change and grow, additional storage resources may be added to accommodate your storage requirements. Azure A3 Standard machines can supply up to 8 resources, and Azure A4 Standard machines can supply up to 16 resources to each Storage Concentrator. Discovering resources is the process the Storage Concentrator uses to query the resource device for information.

You can use the Discover button on the Resource Management Summary screen to add storage resources without rebooting the Storage Concentrator. Existing resources may not be modified.

To add resources, navigate to the Resources → Summary page using the menu bar and use the steps that follow:

1. Click Discover. The following dialog box appears.

2. Click OK.

3. When discovery is complete, all available resources will appear for the Primary Unit regardless of which radio button has been selected. Click Managed for each resource you want the Storage Concentrator to manage.

4. When all resources to be managed by the Storage Concentrator have been selected, click Submit.

These resources are now available and NAS segments and storage volumes can be created.
2.3.4 Editing Resources

The resource name is the only setting that can be modified after initial discovery.

1. To edit the resource name, either navigate to the Resources → Summary page using the menu bar and click on the Resource Name to be edited, or navigate to the Resources → Detail page.

2. Edit the Resource Name. Click Undo if you need to revert to the saved settings.

3. Click Submit to save the changes.

The database tables in the Storage Concentrator are updated with the new resource name.

Figure 2-5 Resource Management Detail
Resource management detail information includes:

**Unit Serial Number:** Serial number assigned by the manufacturer.

**Extended Unit Identifier:** A unique ID number provided by the manufacturer. There are many ways that this number is generated, including the MAC address, serial number, model number, etc. StoneFly merely displays the EUI number.

**HBA:** SCSI information.

**Bus:** SCSI information.

**Target ID:** SCSI information.

**LUN #:** Logical unit number assigned to the device.

**Type:** Type of SCSI storage device.

**Target Portal:** Target portal address (if applicable).

If the resource has a target portal address, then it does not display HBA, BUS, or LUN and instead displays the target portal address.

**Manufacturer:** Name of the manufacturer of the resource device.

**Model:** Model number assigned by the manufacturer.

**Firmware Version:** Current version of the firmware running on the resource.

**Block Size:** Number of bytes in each block.

**Block Count:** Number of blocks on the resource.

**Storage Size (GB):** Total number of GigaBytes of storage space on the resource.

**Unallocated Space (GB):** Number of GigaBytes of space available for new volumes.
**NAS Functions**

**Unit Test:** Reflects the manufacturer specific SCSI test unit ready information.

**Use Type:** Type can be Managed, Pass Thru, NAS Managed or None.

**Target Port Group:** This field is not used for StoneFly Cloud Drives in Azure.

**Operational State:** A resource can have one of the following states:
- **OK:** The Storage Concentrator and the resource have initiated a session.
- **Off-Line:** The Storage Concentrator is not able to successfully initiate a session with this resource.
- **Ready:** On pass thru resources only, this state displays if there are currently no active front-end sessions between this resource and a host.

**Mappings for the selected resource:** Refers to the physical locations (blocks) of the volumes on the resource. Resources that have a "Pass Thru" use type display the volume name only when a volume is associated with the pass thru resource.

**Segment number:** A location on the resource.

**Volume Name:** Name assigned to the resource.

**Segment Size (GB):** Total number of GigaBytes allocated to this segment from this particular resource.

**Start Block:** Block number where the volume segment starts on the resource.

**End Block:** Block number where the volume segment ends on the resource.

**Chart of allocated space and free space within the resource:** A pie chart that identifies the name of the volume, free space and the resource’s segment number. Each segment is assigned a different color.

### 2.3.5 Removing Resources

A resource device will need to be removed when the device is no longer available as a source for storage volume allocation.

To remove a resource, use the steps that follow:

1. Click **Resources**. The “Resource Summary” screen appears.
2. Click the check box under **Delete** for the resource to be removed.
3. Click **Submit** to remove the resource. The database tables in the Storage Concentrator are updated with the new status.

A resource that has a volume associated with it cannot be removed. If a volume is associated with the resource selected for removal, then a warning dialog box appears and will prevent the resource from being deleted.

Click **Select All** if you wish to select all of the resources that are listed. Click **Clear All** to deselect any selected resources.
2.4 Volumes, Hosts & Sessions

The “Volumes”, “Hosts” and “Sessions” buttons in the top menu are used solely for StoneFly Cloud Drives that are licensed for iSCSI. NAS-only configurations do not use these sections of the GUI.

To learn about creating and managing NAS Volumes, visit section 3.2.
2.5 **System**

The System Management screen provides information regarding the system setup, routing network settings, and the configuration of the Storage Concentrator network settings for the iSCSI Host Ethernet port, Management Ethernet port, target portals, and default gateway. System configuration typically occurs at installation; the System Management screen allows these settings to be edited at a later time.

### 2.5.1 System Information

The Storage Concentrator can be rebooted or shut down from the System Management screen.

The System Information screen is a view-only screen that displays the current settings of the Storage Concentrator.

To access the System Information screen, click **System**. The System Management Information screen appears.

![System Management Information](image)

**Figure 2-7 System Management Information**

System Management information includes:

- System Name
- iSCSI Initiator Name
- Status
- Cluster Status (not used for Azure implementations)
- iSCSI Host IP Address
- Software Version
- System Type
NAS Functions

- Vendor Serial Number
- Default Gateway
- Free Memory, Disk and CPU Utilization Percentages
- Equipped Memory, Boot disk and Number of CPU Cores
- Uptime (in days, hours, and minutes)
- CD Inserted (not used for Azure implementations)
- Local iSCSI Data Port (IP Address, Listening Port, Net Mask, MTU)
- Management Port (IP Address, Listening Port, Net Mask, MTU)

These settings can be modified after initial set up if there are changes to the network configuration.

2.5.2 Local iSCSI Data Port Settings

To edit the Local iSCSI Data Port settings, use the steps that follow:

1. Click System.
2. Click Network.
3. Click Local iSCSI Data Port Settings. The Local iSCSI Data Port Settings screen appears.

![Figure 2-8 Network Local iSCSI Data Port Settings]
2.5.2.1 **iSCSI Listening Port**

The iSCSI Listening Port is set to the industry standard of 3260. If an iSCSI initiator is configured with the incorrect port number in the initiator’s configuration software, it will not log onto the Storage Concentrator.

2.5.2.2 **Ping**

Ping is available on the Local iSCSI Data Port screen, the Management Port screen and the Routing screen. The feature works the same on all three pages. To ping a network IP address:

1. Enter the IP address in the **Ping Address** box.
2. Enter the number of times you would like the ping to attempt in the **Count** drop-down box.
3. Click **Ping** to execute a ping. The Storage Concentrator will report back whether the ping was successful.

2.5.2.3 **Private Internal IP Address**

The Private Internal IP Address setting is the constant IP address that the NAT or Firewall function provides to the Storage Concentrator as the address of the initiator. Most such equipment does not provide a constant internal address for the firewall, but when it does, this can be used to differentiate between internal and external iSCSI initiating hosts.

When a Private Internal IP Address is set, address translation only occurs when the host’s IP address that the Storage Concentrator sees matches this as the host’s address.

By default, this field is initialized to 255.255.255.255 which is a special address meaning translate all discovery responses to the external addresses. In most cases, this default value should be used.

2.5.2.4 **Public External IP Address**

The Public External IP Address setting is the IP address that external hosts must use when contacting the Storage Concentrator. The Storage Concentrator’s internal IP address will be converted to this external IP address in iSCSI discovery responses. This setting should be configured to the DNS Name assigned to the System.

2.5.2.5 **Public External TCP Port Number**

The Public External TCP Port Number setting is the TCP port number that external hosts must use when contacting the Storage Concentrator. The Storage Concentrator’s internal TCP port number will be converted to this external port number during iSCSI discovery responses.

By default, this field is initialized to the Storage Concentrator’s internal iSCSI TCP port number, but should be changed as needed based on the NAT or Firewall configuration.
2.5.3 Network and Broadcast IP Settings

The Storage Concentrator automatically configures the network and broadcast IP settings based on the IP address and netmask settings. These settings are configured to use DHCP.

Figure 2-9 System Management, Network and Broadcast IP Settings
2.5.4 Routing

Routing settings are configured based on the DHCP settings.

2.5.5 Administrative Functions

Administrative functions that are available from the System Management screen include assigning the Storage Concentrator a new system name, changing the default number of log records for the database, rebooting and shutting down the system, setting the date and time, performing software upgrades, and saving and restoring user configuration information.
To change the system name and the number of log records, use the steps that follow:

1. Click **System**.
2. Click **Admin**. The System Management Admin screen appears.
3. Edit the **System Name** for the Storage Concentrator, if desired.
4. Change the number of records for the database in the **Max number of logs** field, if desired.

The maximum number of logs is the total number of log records kept in the database. When this number is reached, the oldest record is overwritten when a new record is added to prevent the log table from using up too much disk space.

5. Click **Reboot**.

The Storage Concentrator must be rebooted for the new log settings to be recognized.
2.5.6 Shutting Down the Storage Concentrator

The Storage Concentrator must be shut down when adding or reconfiguring resources.

To shut down the system, use the steps that follow:

1. Click System.
2. Click Admin. The System Management Admin screen appears as above.
3. Click Shutdown.

2.5.7 Using DNS

The Storage Concentrator supports DNS (short for Domain Name System or Service or Server), an Internet service that translates domain names into IP addresses. Because domain names are alphabetic, they’re easier to remember. However, the Internet is really based on IP addresses. Every time you use a domain name, a DNS service must translate the name into the corresponding IP address.

The Storage Concentrator supports DNS only for NTP and SMTP services. DNS for data or management traffic is not supported.

This service is configured automatically based on DHCP information and cannot be changed.

2.5.8 Storage Concentrator Discovery

This section does not apply to StoneFly Cloud Drives for Microsoft Azure.

2.5.9 CIFS User Policies

2.5.9.1 CIFS User Bad Password Lockout Count

For NAS Volumes using the CIFS protocol, the CIFS account can be automatically locked out after a specified number of failed login attempts with an invalid password. Once the account is locked out, further attempts to login will fail until the lockout duration period has expired, or the administrator manually unlocks the account. Use ‘0’ to never lockout the account.

Changing this setting takes effect immediately and a Storage Concentrator reboot is not required.

Locked out accounts are indicated on the “NAS Volume Management Configure Volume” GUI page, and can be unlocked by the administrator there.
2.5.9.2  CIFS User Bad Password Lockout Duration in Minutes

For NAS Volumes using the CIFS protocol, the CIFS account can be automatically locked out for a specified number of minutes after a number of failed login attempts with an invalid password.

Once the account is locked out, further attempts to login will fail until the specified lockout duration period has expired, or the administrator manually unlocks the account. Use '-1' to never reset the lockout, which will require an administrator to manually reset locked out accounts.

Changing this setting takes effect immediately and a Storage Concentrator reboot is not required.

Locked out accounts are indicated on the "NAS Volume Management Configure Volume" GUI page, and can be unlocked by the administrator there.

2.5.10  Console Password

The password used for the Storage Concentrator system console and serial port CLI menu login can be updated in this field. If the password is not changed here, then it will remain as the default value.

Changing this setting takes effect immediately and a Storage Concentrator reboot is not required.

2.5.11  Only Allow GUI Logins from the Management Network

Restrict GUI Logins to Mgmt Network -- By default, the Storage Concentrator allows GUI login sessions over both the Management and the SAN networks.

There are cases where an installation may need to restrict the GUI logins to only be allowed from the Management network.

Changing this setting takes effect immediately and a Storage Concentrator reboot is not required. However, the browser session will be reset, and a GUI page refresh or a login may be required.

2.5.12  Setting the Time and Using NTP Services

To change the date and time settings, use the steps that follow:

1. Click System.
2. Click Admin. The System Management Admin screen appears.
3. In the Set Time area of the screen, change the month, day, year, hour, minutes, and time zone settings as needed.
4. Click Submit.
2.5.12. Using an NTP Server:

The Storage Concentrator can utilize an NTP (Network Time Protocol) server to set its internal clock. NTP is an Internet standard protocol that assures accurate synchronization to the millisecond of computer clock times in a network of computers. An NTP Server synchronizes client workstation clocks to the U.S. Naval Observatory Master Clocks. The NTP service runs continuously in the background on the Storage Concentrator. NTP sends periodic time requests to the NTP server, obtains time stamps and uses them to adjust its clock.

Enter the address of the NTP server. If you have specified a DNS server, you may enter the name of the DNS server rather than an IP address.

The Storage Concentrator can’t be used as an NTP server. It only accesses the specified NTP server on the network to set its internal clock.

Be sure to use the 24 hour clock when setting the hour. For example, 12:00 p.m. is hour 12, 1:00 p.m. is hour 13, and 2:00 p.m. is hour 14, and so on.

NTP service is required for NAS Volumes. If using a Scale Out NAS configuration, then all Nodes should use the same NTP Server.

2.5.13 iSNS

This section does not apply to NAS only configurations.

2.5.14 Auto Save

The Auto Save feature provides a backup of user configuration data in the unlikely event that the Storage Concentrator goes down. Once Auto Save is set up, any configuration changes will automatically copy the information to a FTP site.

To Auto Save to an FTP site, use the steps that follow:

1. From the System screen, click Admin.
2. Click Auto Save. The System Management Auto Save screen appears.
3. Click the check box for Enable Auto Save to Remote FTP Server and then enter the appropriate information into these fields:
   - **IP Address**: IP address of the remote FTP server that the backup files will be sent to.
   - **User Name**: The user name for the FTP login credentials.
   - **Password**: The password for the FTP login credentials.
   - **Directory**: The FTP directory path to the location where the configuration data is going to be saved. The data will be saved to the filename “StoneFlyDB.tar.gz”. The data is encrypted during backup and decrypted during restore.
This file should be saved to a secure location, and made accessible only by the user dedicated for backup.

In an environment where there is more than one StoneFly Cloud Drive VM such as in a Scale Out configuration, it is imperative that each Storage Concentrator have its own directory path to store the FTP information.

4 Click **Submit** to initiate the Auto Save process to an FTP site.

The Auto Save process is initiated immediately upon clicking the Submit button.

The “Status” field shows the current status of the FTP server. It will display all FTP messages, including Alert messages in case of failure.

The “Auto Save to Local Device” option is not available for StoneFly Cloud Drives for Microsoft Azure.
2.5.15 Restore

Restore allows the user configuration data that was saved with the Auto Save function to be retrieved.

To retrieve user configuration data from the FTP server, use the steps that follow:

1. From the System screen, click Admin.
2. Click Restore. The System Management Restore screen appears.

3. Enter the appropriate information into the Restore from Remote FTP Server fields:
   - **IP Address:** IP address of the remote FTP server where the backup files were stored.
   - **User Name:** The FTP user name.
   - **Password:** The FTP password.
   - **Directory:** The FTP directory path of the location where the configuration data was saved. The filename is StoneFlyDB.tar.gz

   The status field shows the current status of the FTP server.

4. Click Submit to initiate the restore process. Following the restore process, the Storage Concentrator will automatically reboot.
2.5.16 Feature Licensing

Some features are individually licensed. The process requires a System Serial Number to create the keys. A license key is specific to only one feature on one Storage Concentrator. The keys are not transferable to any other system. Any change to the Serial Number requires a new license key.

StoneFly Cloud Drives for Microsoft Azure are already pre-licensed for the specific features included with that SKU.

The Max Provisioned Space license limits total size of resource space that is used to allocate:

- NAS volume segments;
- NAS metadata segments.

and it does not include the size of:

- NAS volumes;
- NAS metadata volume;

2.5.17 Target Portals

Target Portals are not used with NAS Only Systems.

2.5.18 Diagnostics

Diagnostics are unavailable on Azure systems.

2.5.19 Notifications

The notifications feature provides the system manager with an immediate notification of critical alerts and warnings via e-mail.

To configure notifications, use the steps that follow:

1. Click System.
2. Click Notifications. The System Management Notifications screen appears.
3. Enter the IP address in the SMTP Server field (or domain name if using DNS).

The SMTP Server must be able to accept requests from the Storage Concentrator.

4. Enter the SMTP Server Port.
Enter the email address for the **SMTP Mail From** portion of the email notifications. The Storage Concentrator supplies a default based on its own IP Address. Some email systems are more restrictive with the "MAIL FROM" field for SMTP email to be accepted. If desired, you may enter a valid email address value that will be used instead of the default value.

**SMTP Auth User** — Many SMTP email servers require user name and password authentication in order to accept messages for transmission. If your server requires authentication, enter the user’s login name here. Note that if authentication is not required, both the SMTP Auth User and SMTP Auth Password fields should be left blank.

**SMTP Auth Password** — Many SMTP email servers require user name and password authentication in order to accept messages for transmission. If your server requires authentication, enter the user’s password here. Note that if authentication is not required, both the SMTP Auth User and SMTP Auth Password fields should be left blank.

Enter the e-mail address that the notifications will be sent to. Enter multiple addresses by using a semicolon between each email address.

Select the notification type:
- **None**: Select to temporarily turn off notifications.
- **Warnings and Alerts**: Select to receive warning and critical level alerts.
- **Alerts Only**: Select to receive only critical level alerts.

Click **Submit**.

A list of the warning and critical level notification messages can be found in the "System Event Messages" section of Appendix 1.

### 2.5.20 UPS Management

UPS Management is not available for virtual systems like the StoneFly Cloud Drive.
2.5.21 System Monitoring

The Storage Concentrator can be configured for centralized monitoring by the Nagios Monitoring System (http://www.nagios.org/). The System → Admin → Monitoring page is where this is done.

StoneFly can provide a service to remotely monitor Storage Concentrator systems to assist in managing them, and proactively respond to any issues that may arise. Contact StoneFly for details.

Alternatively, the customer may setup and operate their own Nagios Monitoring System internally.

In order for System Monitoring to work, the Nagios NRPE service running on the Storage Concentrator must be enabled and configured. It is disabled by default.

The only information offered to the monitoring system is system status and version information such as disk and memory utilization, uptime, Storage Concentrator software version, etc. No customer sensitive information is exchanged with the monitoring system. Also, there is no ability to remotely control or reconfigure the Storage Concentrator system -- only monitoring functions are provided.

In order for StoneFly to be able to remotely monitor a Storage Concentrator, Internet access to the Nagios NRPE service must be provided by adding firewall access and forwarding rules to allow it.

Note: The Storage Concentrator must never be placed directly on the Internet -- a network firewall must always be present. The firewall rules should only allow access to the Nagios NRPE service listening port.

When configuring the Nagios NRPE network service on the Storage Concentrator, StoneFly customer support must be contacted so they can add the necessary configuration settings to their Nagios Monitoring Systems so that the monitoring can occur.

For each Storage Concentrator being monitored, this will include the firewall's external Internet facing IP address for the Storage Concentrator, and the TCP port that the Nagios NRPE service is listening on. Note that the external IP address provided to StoneFly may not be the Storage Concentrator Management IP address when the firewall is using Network Address Translation (NAT). Likewise, the TCP port provided may not be the Nagios NRPE listening port configured on the Storage Concentrator when the firewall or other network systems are performing port forwarding.

When StoneFly centralized monitoring is arranged, the Storage Concentrator E-Mail Notifications should also be configured so that these will also be received by StoneFly. StoneFly customer support will provide the correct email address to use in the notifications.
### 2.5.21.1 System Monitoring Fields

**Allow System Monitoring** — Select this check-box to enable the Nagios NRPE network service and click **Submit**.

**Monitoring System IP Address** — This is the IP Address from which the Nagios Monitoring System accesses the Storage Concentrator.

For security, this is the only IP Address that will be allowed by the Storage Concentrator Nagios NRPE network service. All other source addresses are rejected.

Note that in some cases, when port forwarding is used, the IP Address would be that of the network device performing the forwarding and is not the external Internet IP address.

**Listen TCP Port** — This is the TCP Port that the Nagios monitoring network NRPE service on the Storage Concentrator listens on.

The default TCP Port is the Nagios NRPE default 5666.

Note that in some cases the TCP Port would need to be changed, based upon the firewall and port forwarding systems being used.

Note that when port forwarding is used, the TCP Port number used here is not the same port number that would be provided to StoneFly for external access.
2.5.21.2 **System Monitoring Buttons**

**View Activity Log** — This button reports recent access attempts and failures by the Nagios Monitoring System to communicate with the NRPE service on the Storage Concentrator.

Attempts are indicated by 'START' lines, and failed attempts are indicated by 'FAIL' lines.

![Figure 2-17 System Monitoring Activity Log](image)

**Get Cmd Results** — This button will list all of the Nagios NRPE commands supported by the Storage Concentrator, along with the command options used, and the output that is returned when the command is run.

This can be used to show the information that the Nagios Monitoring System will receive and the command names needed to implement an internal Nagios system.

![Figure 2-18 System Monitoring Supported Commands and Results](image)

**Default** — This button resets the configuration to the default settings and takes immediate effect.

**Undo** — Click to revert to the last saved settings.

**Submit** — Click to commit changes made to the input fields.

Note that any changes made to System Monitoring take effect immediately and do not require a Storage Concentrator reboot to take effect.
2.5.22 NAS Server

NAS volume CIFS user name and password authentication can operate in two modes. The default is the "Workgroup" mode where the Storage Concentrator system(s) manage the CIFS user accounts and passwords.

The other CIFS authentication mode is the use of a centralized Windows Active Directory Server (ADS), also known as a Windows Domain Controller. Workgroup users may continue to be used even when the ADS authentication mode is configured.

In a Scale Out NAS configuration, the NAS Server CIFS User Authentication configuration is the same for all of the Scale Out nodes. Changes made to CIFS User Authentication are automatically applied to all Scale Out nodes and the status can be viewed from any node.

The NAS Server CIFS User Authentication management page located at System → Admin → NAS Server has the following sections:

1. **NAS Server User Authentication Configuration**
   This section configures the CIFS user authentication mode and settings. Configuration settings can be created, modified, and displayed. The configuration generally only needs to be set up once. The fields displayed in this section vary based on the CIFS Authentication Mode in use, either Workgroup or Active Directory.

2. **Active Directory Status**
   This section shows the current status of the Storage Concentrator’s access to the Active Directory server. All Scale Out nodes are shown. The status is updated each time the GUI page is refreshed. *This section is only shown when the CIFS Authentication Mode is set to Active Directory.*

3. **NAS Server Active Directory Command**
   This section allows Active Directory management commands to be submitted to the Active Directory Server. These commands generally only need be performed once during the initial setup. The Active Directory command is performed on all nodes in a Scale Out configuration. *This section is only shown when the CIFS Authentication Mode is set to Active Directory.*

4. **Active Directory Domain Command Results**
   This section shows the results of the submitted Active Directory command. *This section is only shown when the CIFS Authentication Mode is set to Active Directory, and only immediately after a command was submitted.*

CIFS services are restarted when settings are changed on this page. This causes a disconnection of all client sessions. If user authentication settings were changed, manual intervention may be needed in order for the clients to reconnect.

Note that each section operates independently. Only make changes to one section at a time and submit those changes before moving on to the next section. Otherwise changes made to other sections will be lost and will have to be reentered.
2.5.22.1 NAS Server Fields

**Active Directory Domain Name** — The Active Directory Domain Name field is the name of the Windows Active Directory domain that the Storage Concentrator will be joining. This should not be a fully qualified domain name, but only the short name; the DNS domain that the Storage Concentrator belongs to is then appended to this value. *This field is only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.*

**Active Directory Domain Servers** — The Active Directory Domain Servers is an optional list of one or more space separated IP addresses or DNS names for the Windows Active Directory servers. This field is optional, and is seldom needed. *This field is only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.*

**Active Directory Kerberos Realm** — The Active Directory Kerberos Realm is the fully qualified Kerberos Realm name. This value is similar, but not necessarily identical to the Active Directory domain controller’s fully qualified DNS name. It should always be entered entirely with upper case letters. For example: MYDC.MYDOMAIN.COM. *This field is only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.*

**Active Directory Kerberos Servers** — The Active Directory Kerberos Servers is an optional list of one or more space separated IP addresses or DNS names for the Windows Active Directory Kerberos servers. This field is optional, and is seldom needed. *This field is only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.*
Active Directory Storage Node Name — The Active Directory Storage Node Name is the machine name that the Storage Concentrator will be known as in the Windows Active Directory domain. *This field is only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.*

CIFS User Authentication Mode — The CIFS User Authentication Mode can be set to either WORKGROUP or ACTIVE DIRECTORY. In the WORKGROUP mode, CIFS users are authenticated using credentials configured directly on the Storage Concentrator. In ACTIVE DIRECTORY mode, the Storage Concentrator uses the configured Windows Active Directory server to authenticate CIFS users. CIFS users will only successfully authenticate after the Storage Concentrator has joined the domain, and when the communication with the Active Directory server is successful. The setting of this field governs the visibility of many other fields on this GUI page. While in ACTIVE DIRECTORY mode, WORKGROUP CIFS users defined on the Storage Concentrator may also be used.

DNS Client Primary IP and DNS Client Secondary IP — The DNS Client Primary and Secondary IP fields display the IP addresses of the primary and secondary DNS servers that the Storage Concentrator is using to resolve DNS names into IP addresses. When in ACTIVE DIRECTORY mode, the Windows Active Directory domain controller should be used as the DNS server. Either one or both of the primary and secondary IP addresses must be configured and functioning. Click on DNS Client Primary IP to navigate to the page that allows you to update the IP address for the first field. Then click on DNS Client Secondary IP to navigate to the page that allows you to update the IP address for the second field. *These fields are only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.*

Storage Concentrator Host Name — The Storage Concentrator Host Name is the host name of the Storage Concentrator. Every Storage Concentrator should have a different host name. Click on Storage Concentrator Host Name to navigate to the page that allows you to update this field. *This field is only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.*

DNS Domain Name — The DNS Domain Name field shows the current setting of the Storage Concentrator’s DNS domain name, for example stonefly.com. This value is appended to the Active Directory Domain Name to form a fully qualified DNS name for the Active Directory server. When in ACTIVE DIRECTORY mode, the Windows Active Directory domain should be used as the DNS Domain Name. Click on DNS Domain Name to navigate to the page that allows you to update this field. *This field is only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.*

NTP Client Primary and NTP Client Secondary — The NTP Client fields show the current setting of the primary and secondary DNS names or IP addresses for the NTP servers that the Storage Concentrator uses to maintain time of day clock synchronization using the Network Time Protocol. When in ACTIVE DIRECTORY mode, the Windows Active Directory domain controller should be used as the NTP server. Either one or both of the primary and secondary values must be configured and functioning. Click on NTP Client Primary to navigate to the page that allows you to update the settings for the first field. Then click on NTP Client Secondary to navigate to the page that allows you to update the settings of the second field. *These fields are only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.*
User ID and Password  — The User ID and Password fields are for the login credentials of the Active Directory Domain’s administrative user account and is necessary for when Active Directory Commands are used. This account is not used during CIFS user authentication, but only when the Storage Concentrator’s machine account is being configured in the domain. By default, the Active Directory administrative user account is stored in the Storage Concentrator database, which is indicated by the field being pre-populated. This information can be removed from the Storage Concentrator if desired by deleting the values from the field and then using one of the Active Directory Commands. These fields are only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.

2.5.22.2 NAS Server Buttons

Default  — Clicking the Default button resets all of the NAS Server User Authentication Configuration fields to the system default values. The changes will automatically apply to all nodes in a Scale Out configuration.

Undo  — Clicking the Undo button resets any changes that have been made to the NAS Server User Authentication Configuration field values since the last submission and restores them to their previously committed values.

Submit  — Clicking the Submit button will submit any changes you have made to the NAS Server User Authentication Configuration fields. If the values are accepted, then they are committed to the Storage Concentrator’s database. The changes will apply to all nodes in the Scale Out configuration.

Join Domain  — Clicking the Join Domain button will register (or reregister) the Storage Concentrator with the Windows Active Directory domain controller. The correct User ID and Password for an administrative account for the ADS server must be provided, or have been provided previously. All nodes in the Scale Out configuration will be registered. The results of the command are shown in the Active Directory Domain Command Results section of the page. This field is only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.

Test Domain  — Clicking the Test Domain button will test the ability of the Storage Concentrator to submit commands to the Windows Active Directory domain controller. The correct User ID and Password for an administrative account for the ADS server must be provided, or have been provided previously. The command will be performed on all Scale Out nodes in a Scale Out configuration. The results of the command are shown in the Active Directory Domain Command Results section of the page. This field is only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.

Leave Domain  — Clicking the Leave Domain button will deregister the Storage Concentrator from the Windows Active Directory domain controller. The correct User ID and Password for an administrative account for the ADS server must be provided, or have been provided previously. All nodes in the Scale Out configuration will be registered. The results of the command are shown in the Active Directory Domain Command Results section of the page. Once the Storage Concentrator leaves the domain, all CIFS User authentications made via Active Directory will fail. This field is only shown when the CIFS User Authentication Mode is set to ACTIVE DIRECTORY.
2.5.23 DNS Server

The Storage Concentrator provides a Domain Name Service (DNS) server that can be used to access the Storage Concentrator with a DNS name instead of directly with an IP address.

It is highly recommended to use a DNS name instead of an IP address in Scale Out NAS configurations as it provides a way for the NAS client load to be easily distributed amongst the many Scale Out nodes. In these Scale Out configurations, the DNS Server names used to address records are synchronized so that all of the Storage Concentrators return the same name for look-up responses.

There are two ways that the Storage Concentrator’s DNS server can be used:

1. The first way the Storage Concentrator’s DNS server can be used is as a subdomain of an existing corporate DNS server. The corporate DNS would then either refer or forward requests to the Storage Concentrator’s DNS server, while continuing to serve all other requests itself. The advantages here are that existing clients do not need to update their DNS server IP addresses, and the majority of the DNS lookup requests are kept off of the Storage Concentrator systems.

   To configure the Storage Concentrator’s DNS server so that it is downstream from the corporate DNS server, the corporate DNS server should be configured to forward to a Storage Concentrator, a Storage Concentrator specific DNS subdomain, or a defined set of names that are also known to the Storage Concentrator’s DNS server. In this case, the Storage Concentrator’s DNS server configuration settings for the Primary and Secondary Upstream DNS Server IP fields should be left blank. Always configure both primary and secondary DNS IP addresses on the corporate DNS server so that they point to two different Storage Concentrators in the deployment to ensure redundancy. If one is down, then the other can still provide the necessary DNS services.

2. The second way to use the Storage Concentrator’s DNS server is to set it up as the main DNS server that clients point to for their DNS services. The Storage Concentrator then forwards any unrelated name lookup requests to a corporate DNS server. In this case, both the Primary and Secondary Upstream DNS Server IP address settings must be set, and point to the primary and secondary corporate DNS servers. The Storage Concentrator’s DNS server caches results from the upstream server to lessen the load and improve response times.

Although recommended, the Storage Concentrator client’s use of DNS instead of direct IP addresses is entirely optional, even in Scale Out NAS configurations. A configuration may not have enough clients to bother with DNS, or may choose to statically assign clients to individual Scale Out nodes instead of relying on their dynamic distribution. Alternatively, an existing corporate DNS could be populated with Storage Concentrator names and IP addresses by its administrator.

Note that Storage Concentrator SAN MPath network interface addresses are not currently supported and there is no way to assign unique DNS names for them.
2.5.23.1 **DNS Server Fields**

**Section - DNS Server Names:**

**DNS Domain Name** — The DNS Domain Name is the suffix that will be added to all short DNS host names to form a fully qualified DNS name, without the leading '.', e.g. "stonefly.com".

**Management LAN DNS Name** — The Management LAN DNS Name is the DNS form of the System Name and maps to the Storage Concentrator’s Management IP address on the LAN network. This DNS name is used to access the Storage Concentrator’s GUI.

The Management LAN DNS Name always uniquely addresses a single Storage Concentrator, and will map to a single constant IP address.

The Management LAN DNS Name cannot be changed on the DNS Server GUI page, but it can be set on the **System** → **Admin** → **General** GUI page.

**iSCSI SAN DNS Name** — This field is not used for NAS-only Cloud Drives.

**NAS SAN DNS Name** — The NAS SAN DNS Name is the DNS name that CIFS/SMB and NFS NAS clients should use in order to access the Storage Concentrator over the SAN network.

The NAS SAN DNS Name addresses all Storage Concentrator nodes in the same Scale Out NAS configuration, and will typically resolve to multiple IP addresses.

**NAS LAN DNS Name** — The NAS LAN DNS Name is the DNS name that CIFS/SMB and NFS NAS clients should use to access the Storage Concentrator over the LAN network.

The NAS LAN DNS Name addresses all Storage Concentrator nodes in the same Scale Out NAS configuration, and will typically resolve to multiple IP addresses.
Primary and Secondary Upstream DNS Server IP — If the Storage Concentrator's DNS server receives a name lookup request that it does not have knowledge about or is not already in its cache, then the Storage Concentrator will forward that request to the DNS server listed in the Primary and Secondary Upstream DNS Server IP fields.

If the Upstream DNS Server IP address fields are not configured, then name lookups that cannot be resolved will fail.

Section – DNS Server Addresses:

Management LAN IP — The Management LAN IP field shows the IP address that the Management LAN DNS Name resolves to.

iSCSI SAN IP — This field is not used for NAS-only Cloud Drives.

NAS SAN IP — The NAS SAN IP field shows the IP address that the NAS SAN DNS Name resolves to. In a Scale Out NAS configuration with multiple nodes, there will be multiple IP addresses listed here.

NAS LAN IP — The NAS LAN IP field shows the IP address that the NAS LAN DNS Name resolves to. In a Scale Out NAS configuration with multiple nodes, there will be multiple IP addresses listed here.

2.5.23.2 DNS Server Buttons

Default — Click the Default button to reset all of the DNS Server settings to their system default values.

Undo — Click the Undo button to revert to the last saved settings.

Submit — Click the Submit button to commit all changes made to the DNS Server configuration input fields.

Note that any changes made on this page do not require a Storage Concentrator reboot in order to take effect. As soon as the Submit button is clicked the changes will take effect immediately.
2.6 Users

Click on Users in the main menu to access the pages that will allow you to add, edit, delete and view user information. There are two types of users on the Storage Concentrator system: “administrator” and “observer”. An administrator of the Storage Concentrator manages the hardware setup, the configuration of the storage management system, and the setup of users. An observer can only view system information; he or she cannot make any changes to the system’s configuration.

Only one administrator can be logged into the interface at any time. There is no limit to the number of observers that can be logged in simultaneously.

When logging in for the first time, the administrator can use the following:

User ID: stonefly
Password: stonefly

It is strongly recommended that the default password for the “stonefly” administrator account be changed immediately during the initial configuration. It is also recommended that each system administrator be assigned an individual user ID and password.

2.6.1 Adding Users

For security purposes, each user should have a unique user ID and password. New users can only be added by a user account that has “Administrative (All)” privileges.

To add a new user, follow these steps:

1. Log in with your Administrator-level user ID and password.
2. Click Users. The User Management Summary screen displays the current settings for any existing users.
3. Click Add User. The Add New User screen appears.
4 Enter a user ID for the new user in the **Log In** field.

5 Choose a privilege level for the new user in the **Administration Level** area:
   - Select **Administrative (All)** to give this user administrator-level privileges.
   - Select **Observer** to give this user view-only privileges.

6 Enter a password for the new user in the **Password** field.

   The password cannot include the login name. The password must be between 6 and 15 characters long including at least one non-alphabetic character. However, StoneFly only validates the first eight characters of the password. Characters after the first 8 are ignored but supported for user convenience.

7 Retype the password for the new user in the **Confirm Password** field.

8 Click **Submit** to add the new user to the Storage Concentrator.

---

### 2.6.2 Editing Users

If a user’s assigned privilege level or password needs to be changed, then navigate to the **Users → User Management → Detail** screen while logged in with an administrator account.

---

**Figure 2-22 Add New User**

**Figure 2-23 User Management, Detail**
To edit a user, follow these steps:

1. Select the name of the user you want to edit from the **Select User** list.
2. Change any of the following information:
   - **Log In**: Changes the login name of this user.
   - **Administration Level**: Changes this user’s privileges.
   - **Password**: Changes this user’s password.
   - **Confirm Password**: Confirms the password change.
3. Click **Submit** to save the changes made to the user’s account.

### 2.6.3 Removing Users

To maintain system security, please delete any user accounts for individuals that should no longer have access to the system. To remove a user, navigate to the **Users → User Management → Summary** screen while logged in with an administrator account.

1. The User Management Summary screen appears listing all existing users.
2. Click the checkbox in the **Delete User** column next to the name of the user(s) you want to remove.
3. Click **Submit** to delete the user(s).

### 2.6.4 Viewing User Information

The Storage Concentrator provides user information for viewing only purposes.

To simply view existing user accounts, navigate to the **Users → User Management → Summary** screen with either an Administrator or Observer account.
2.7 Reports

The reporting function provides session information, logs of system events, system configuration details and I/O statistics.

- The session information reports statistical data about the Storage Concentrator device, resources, volumes, and sessions.
- The system event log tracks system-level sequences of events. This information can be used for troubleshooting.
- The configuration report provides detailed information regarding the configuration.
- The statistics reports display graphical representations of the I/O flow to and from each volume in the system.

2.7.1 Logs

The Log screen provides a sequential display of all system events. This information can be used when troubleshooting system problems. Multiple copies of identical log entries may be suppressed to conserve log space.

The maximum number of log records kept in the database is set up in the System Management Admin screen (see “Administrative Functions”). When this number is reached, the oldest record is overwritten when a new record is added. This prevents the log table from using up too much disk space.

To view log files, use the steps that follow:

1. Click Reports. The Reports Log screen appears.

![Figure 2-25 Report Logs](image)

2. Select Now (the current time) or a specific date and time. This is the starting point for the system events log that will be displayed.

3. In the Duration area, select how many hours of historical log information you want to display.

4. Click Submit to display the historical system events log information. All logs with data gathered within the selected parameters will display on the screen.
NAS Functions

The Log information includes:

**Time:** Time that the log record was recorded in UTC or local time (as selected).

**Message:** The detailed text of the log’s record.

**Acknowledgement:** Indicates that a system-critical message has been generated and requires an acknowledgement by the system administrator. System critical warnings generate the status “Alert” on each page. Once the warning has been acknowledged then the Alert status will be cleared.

**Delete:** Click the checkbox to delete the message from the log report.

---

2.7.2 Managing Logs

Logs should be periodically viewed to monitor the system status. If a system-critical message is generated, then a check box will appear in the Acknowledge column of the Log Report screen. You may also wish to manually delete superfluous log records to view messages more easily.

To acknowledge system-critical messages, use the steps that follow:

1. Click the check box under the **Acknowledgement** column in the Log Summary.
2. Click **Submit**. The system is updated with the acknowledgement.

![Figure 2-26 Log Management](image)

To manually delete log records, use the steps that follow:

1. Click the check box under the **Delete** column in the Log Summary.
2. Click **Submit**. The selected logs will be deleted and the screen will refresh to show the updated information.

Log entries can be sorted using the column indicator at the top.
The configuration report provides an onscreen and printable version of all system configuration information. To print a configuration report, navigate to Reports → Configuration Report. Complete system configuration information appears on the screen. Use the steps that follow:
Click **Printable Version**. A printable copy of the system configuration information is generated. The configuration report information includes:

**Storage Concentrator Configuration information:**
- **System Name:** Name assigned to the Storage Concentrator.
- **iSCSI IP Address:** Network setting for the data port.
- **iSCSI Listening Port:** Network setting for the iSCSI listening port.
- **Management IP Address:** Network setting for the management port.
- **Default Gateway:** Network setting for the default gateway.

**Volume Configurations information for all volumes:**
- **Volume Name:** Name assigned to the volume.
- **Notes:** Descriptive information about the volume.
- **Block Size:** Block size in bytes.
- **iSCSI Target Name:** Name assigned to the resource during configuration.
- **Type:**
  - **Span** is a volume type for a managed volume.
  - **Pass Thru** is the volume type for volumes on resources designated as pass thru.
  - **Mirror** is a volume type for a volume with mirror images.
- **Segment Number:** Location on the resource where the volume resides.
- **Resource Name (Block Size):** Name assigned to the resource where the volume resides and the block size in bytes shown in parenthesis.
- **Segment Size GB:** Total number of GigaBytes allocated to this segment from this particular resource.
- **Start Block:** Block number where the volume segment starts on the resource.
- **End Block:** Block number where the volume segment ends on the resource.

**Resource Configurations information for all resources:**
- **Vendor Serial Number:** Serial number assigned by the manufacturer.
- **HBA:** SCSI information provided by the resource.
- **BUS:** SCSI information provided by the resource.
- **Target ID:** SCSI information provided by the resource.
- **LUN #:** SCSI information provided by the resource.
- **Type:** Type of SCSI storage device. This information is provided by the resource.
- **Manufacturer:** Name of the manufacturer of the resource device.
- **Model:** Model number assigned by the manufacturer.
- **Firmware Version:** Current version of the firmware running on the resource.
NAS Functions

**Block Size**: Number of bytes in each block.
**Block Count**: Number of blocks on the resource.
**Storage Size (GB)**: Total number of GigaBytes of storage space on the resource.
**Unallocated Space (GB)**: Number of GigaBytes of space available for new volumes.
**Use Type**: Managed, Pass Thru, or None.
**Flash Cache**: Not used for StoneFly Cloud Drives.
**Target Port Group**: Address for the target portal.

If the resource has a target portal address, then it does not display HBA, BUS, or LUN and instead displays the target portal address.

---

### 2.7.4 Statistics

The Storage Concentrator monitors the number of reads and writes made across all volumes. The counts are periodically reported to the Administrative Interface. The Statistics feature of the Administrative Interface analyzes the data between two of the sample periods and produces a graphical representation of the data.

For example, a chart of the number of Read I/Os for a particular volume between 8:00 AM and 12:00 PM (noon) can be graphed. The graph can be saved as an HTML image or the data points can be exported to a comma separate value file in a tabularized format. The file may be examined using a program such as Microsoft Excel to further analyze the data.

---

### 2.7.5 Debug Logs

The Reports Debug Log screen allows administrators to collect system debug logs for submission to StoneFly Customer Support for analysis. It also provides generation of debug log data and maintenance. To collect debug logs, navigate to **Reports → Debug Logs**. Select the appropriate options and then click **Submit**.

![Debug Logs](image$url)

*Figure 2-28  Debug Logs*
NAS Functions

User ID and Password — The "User ID" and "Password" fields only appear when the "Debug" page is used and the user has not already logged into the Storage Concentrator. An administrator level user account must be used to perform any of the operations on this page.

If the "User ID" and "Password" fields are displayed and are empty, then they need to be filled in before Submit is clicked. To logout, click Log Out on the top toolbar.

Get Logs — Debug logs are often requested by StoneFly Customer Support to help resolve technical issues. A single password protected compressed archive file is generated and saved on the host running the browser. The file can then be uploaded to the StoneFly support FTP site.

To collect Storage Concentrator debug logs, select the Get Logs checkbox. Default checkmarks will also appear in a few other boxes. Click Submit.

Because the debug logs can be large, it may take some time to collect, archive, and compress them. Once the Submit button is clicked, a pop-up window will appear noting the estimated size of the log file. Click OK to proceed or Cancel to terminate the log generation request.

Clear Logs — Debug logs can be deleted. This is sometimes done after a set of logs has already been collected and the user wishes to reduce the size of the log file for the next time those logs will be collected.

An estimate of the total disk space consumed by debug logs is displayed.

To delete the debug logs, select the Clear Logs checkbox and click Submit.

Because the system is not restarted as part of the log deletion process, some of the opened log files cannot be deleted. The total disk space consumed should not be expected to reach 0 MB. Once the Submit button is clicked, a pop-up window will appear asking if you wish to proceed. Click OK to proceed or Cancel to terminate the log deletion request.

FF1000 Signals, SFCMD Signals, SIGUSR1 or SIGUSR2 — The "SIGUSR1" and "SIGUSR2" checkboxes direct the system to send a signal to the "FF1000" or "SFCMD" Storage Concentrator process to flush stored debug log information to disk memory prior to collecting the debug logs.

Unless otherwise instructed by StoneFly Customer Support, the default settings that are made when "Get Logs" is checked are adequate.

The enabled signals are not sent until Submit is clicked.

Service Restart — Select the Service Restart checkbox and then click on Submit to direct the system to perform a Storage Concentrator software restart instead of the hardware reset that is normally performed. Functionally, the system will appear as if it had not been rebooted.

The "Service Restart" option should not be used unless directed to do so by StoneFly Customer Support.

Clear Logs and Reboot — To delete all of the Storage Concentrator debug logs and then automatically reboot the system, select the Clear Logs and Reboot checkbox, click on Submit, and then click on OK. The system reboots to allow the deletion of currently opened files. If an interruption in Storage Concentrator operation is not desired, consider using the "Clear Logs" function instead.
This page is intentionally left blank.
Chapter 3

NAS Functions
3.1 Introduction to StoneFly NAS Implementation

NAS which stands for "Network Attached Storage" is a storage technology that allows users to create shares/volumes that can be accessed by one or more users. The difference between iSCSI volumes and NAS volumes are that NAS volumes can be accessed by more than one user/server, and iSCSI volumes in general can only be accessed by one server.

StoneFly NAS is an integrated part of StoneFusion which is the operating system used in all of StoneFly’s physical, hyper-converged and cloud-based storage appliances. All NAS functionalities are controlled from the NAS menu of the StoneFusion GUI as shown below.

**Figure 3-1 NAS Initial Menu GUI**

**NAS Segment:** NAS segments are a chunk of storage that will be used for NAS functionality. In other words, a NAS segment is part of the total storage resource that can be used for NAS.

Systems can have multiple segments. NAS volumes are created using segments. A NAS volume’s files can be distributed between different segments allocated on the same node or can be allocated on other nodes within a Scale Out configuration.

NAS segments themselves are not visible to NAS clients; only NAS volumes are visible.

Each NAS segment is defined internally as a regular StoneFusion iSCSI volume or as a StoneFusion resource designated for usage as “NAS Managed”. Unlike iSCSI volumes that are used by iSCSI host initiators, NAS segment "volumes" are not exposed as iSCSI targets to any external host.
**NAS Functions**

**NAS Volumes:** NAS volumes are a piece of a segment (like a folder or a subdirectory) which is created by a NAS administrator and is given to different clients.

When creating NAS volumes, the NAS administrator decides what kind of protocol the NAS volume will support. The NAS protocols utilized by the majority of users are CIFS, NFS, or both. The CIFS protocol is mainly used in Windows environments and NFS is mainly used in Linux environments.

One NAS segment can have multiple volumes and each volume can support a different protocol.

There are two ways to create a new NAS volume:

The first way to create a new NAS volume is to allocate a new NAS segment and set a new NAS volume based on this segment.

The second way to create a new NAS volume is to share ownership of the existing segments with another NAS volume or group of NAS volumes.

There is no difference on how the NAS volume is created from the client’s perspective. After the NAS volume is created, the NAS administrator then decides which users can access that particular volume.
### 3.2 Create a NAS Volume

#### 3.2.1 Create a NAS Segment

Before creating a NAS volume, you must create a NAS segment.

The space for a new NAS segment can be allocated from the available pool. It can be selected automatically or manually on managed local storage resources. Alternatively, the Create Direct tab can be used to create a direct NAS Segment using a NAS Managed resource.

To create a NAS segment, navigate to **NAS → Segments → Segment Create** in the menu bar.

![Figure 3-2 Segment Creation](image)

A default **NAS Segment Name** will be displayed. The default name can be used or the name can be edited as desired.

The **Notes** field can be edited to include the user's description for this segment.

The desired segment size should be set after considering how many NAS volumes will be sharing ownership of the segment, and what will be the total size of used space on these volumes. Each segment only provides service for dependent NAS volumes on its node. The segment does not get provisioned on other nodes.

Enter the **Desired NAS Segment Size(GB)**. This number range from as low as "1", all of the way up to the maximum number shown in the "Available Space(GB)" field.

**Note:** It is during this step that you will be able to combine the storage capacities of two or more Azure disks into a single usable unit (up to a maximum of 8 with A3 machines or a maximum of 16 with A4 machines). If you plan to use the StoneFly Cloud Drive with large files greater than 1TB in size, then please make sure to create a segment that is large enough to contain those large files.
**NAS Functions**

**Note:** If this segment will be used to expand an existing NAS Volume, then it is recommended that the entered segment size match the same sizes of the other segments that were used for the volume.

**Note:** No fields can be changed once the segment is created.

Click on **Submit** to finish configuring the segment. It will take a few minutes for the system to format the Segment for use.

It is recommended to reboot the StoneFly Cloud Drive once the first NAS Segment has been created. The reboot is only performed the very first time a NAS Segment is created. Additional Segments do not require a reboot. To perform the reboot, navigate to **System → Admin** in the menu bar and click on **Reboot**. The StoneFly Cloud Drive should be ready within 5 minutes following reboot. This initial reboot insures all settings are updated and ready.

After the segment is created, its status can be checked on the NAS Segments Summary screen found by navigating to **NAS → Segments → Summary** page:

![Figure 3-3 NAS Segments Summary](image)

A segment can be deleted if no NAS volumes use it. To delete a segment, click on the check box to select the segment to be deleted and click on **Submit**. The Delete check box will show as disabled if one or more NAS volumes already use it.

The **Status** of each segment listed in the summary can be either: Active, Non-active, and Off-line (see section 2.3.2).

The **Discover** button provides the same functionality as the Discover button on the Resource Summary screen (see section 2.3.1).

**Usage:** **Disk / Metadata** is the percentage of segment utilization for file storage and file-system meta-data. When either of these sizes approaches 100%, you can either delete unneeded files or consider NAS volume expansion. 'N/A' is displayed when this information is not available.
3.2.2  Create a Volume with Unused Segments

The first NAS volume must be created by using this option. Additional NAS volumes can be created by sharing NAS segments with existing volumes.

Navigate to **NAS → Volumes → Create New Volume → Allocate** in the menu bar. Use this page to create a new NAS volume. The system will check for available unused NAS segments. If the node does not have a required segment, the user will be redirected to the “Segment Create” screen. Revisit the recommendations in section 3.2.1 to correctly provision the needed segment.

![Figure 3-4 No Available NAS Segments Failure Warning Message](image)

When the required segment is created successfully, the user will automatically be returned to the “Create New Volume” screen:

![Figure 3-5 Volume Creation Screen](image)
Complete all of the required fields on the screen.

A default **NAS Volume Name** is entered and can be edited at this time.

**Note:** Once created, the NAS Volume Name cannot be changed.

**Note:** If using a Scale Out configuration, then this name cannot be the same as any existing NAS Volume Name on any node within the Scale Out configuration.

Enter a description in the **Notes** field to identify this volume.

Select "CIFS", "NFS", or both "CIFS" and "NFS" in the **Export As** field as desired.

The NAS network protocols supported are NFS and CIFS (sometimes called SMB). Either, neither or both type of exports can be selected for a volume. Selecting both protocols on the same NAS Volume is not usually recommended due to differences in client file formats and NAS file locking protocol semantics.

Access to CIFS exports are controlled through a CIFS user name and password. Multiple NAS Volumes may use the same user name, but if they do then they must also share the same password. In such a case, changing the CIFS export password for one volume will apply to the other volumes as well.

Access to NFS exports are controlled through a comma-separated list of NFS client IP addresses permitted access to the NAS volume. By default, all clients are allowed access with the wild-card setting of '*'. This wild-card character '*.' can also be used in IP address fields (e.g. "192.168.0.*.192.168.1.*").

Select the NAS segment you wish to use from the drop down list. The volume will automatically equal the size of the NAS segment that is used to create it. If a NAS segment does not exist, then the page will be redirected to NAS "Segment Create" page but then returned to the NAS Volume Allocation page after the segment is created.

When the form is completed, click on **Submit** to create the NAS Volume.

Status of the newly created NAS volume can be checked on the “NAS Volumes Summary” screen:
NAS Functions

An **Operational State** of “OK” indicates that a session with the volume can be initiated. “Offline” indicates that a session could not be initiated. “Disabled” indicates that a user has disabled NAS exports.

The **Usage: Disk / Metadata** column displays the volume utilization percentage for file storage and file-system meta-data. When either of these sizes approaches 100%, the user must either delete unneeded files or consider expanding the NAS volume. 'N/A' is displayed when this information is not available.

The **Size(GB)** column displays the total volume size in GigaBytes of all of the volume's segments adjusted on mirroring. Each volume counts shared NAS segments as many times as the segment is shared.

The **Active Sessions** column displays the number of connections between CIFS clients and the volume. The number of connections between NFS clients and the volume are not included in this number.

### 3.2.3 Create a Volume by Sharing NAS Segments

To create a volume by sharing NAS segments, navigate to **NAS → Volumes → Create New Volume → Share** in the menu bar. Select a volume from the drop-down list to share its segments with the new volume. Complete the remaining fields in the form following the same recommendations described in section 3.2.2.

Although the two NAS volumes share the same storage, they do not share any files. Different NAS export protocols and access settings can be used on each shared NAS volume. However, when all disk space is totally consumed on one of the shared volumes, it is exhausted on all of them.

![Figure 3-7 Create New NAS Volume Share](image-url)
After the volume is successfully created, the user is then redirected to the “NAS Volumes Summary” screen:

![Figure 3-8 NAS Volumes Summary](image)

The newly created volume and the original volume that was used to share space now have the “shared” attribute in the **Type** column.
3.3 Volume Configuration

To configure a volume, navigate to **NAS → Volumes → Configure Volume → General Configuration** in the menu bar. Select the NAS volume from the **Select Volume** drop-down list. The current configuration of the selected volume will be displayed.

The user can use this screen to modify a volume’s notes, modify the list of IP addresses of allowed NFS clients, or completely disable/enable NAS exports. See section 3.2.2 for detailed information about each field.

3.3.1 CIFS Account Unlock

The **Unlock Account** button is only shown when a CIFS User Account has become locked out due to too many bad password login attempts.

Depending upon the configuration, the system may automatically unlock the user’s account after a period of time, or the administrator may unlock the account manually at any time using the **Unlock Account** button.

![Figure 3-9, CIFS Unlock](image)

The CIFS User Account lockout policies can be set by the administrator by navigating to **NAS → CIFS Users → User Access** in the menu as described in section 3.4.3.
3.4 Volume CIFS Access

Configuring CIFS access for a NAS volume provides volume security by restricting user access to the selected volume.

The CIFS access applies to the entire NAS volume, not just to specific files or directories within that volume. For example, a specific user may have Read/Write access to the NAS Volume, but files within that share may be hidden or found to be Read Only based on the individual permissions that have been set on the file or directory. The CIFS permissions on files and directories are viewed and set by the Windows clients.

Each CIFS user is defined in either the local Storage Concentrator Workgroup, or in a Windows Active Directory Server.

The "Workgroup" represents users that have user accounts that were defined directly on the Storage Concentrator. The Storage Concentrator is responsible to keep these accounts in sync with other Scaled Out Storage Concentrators.

The Active Directory Server domain is defined by a Windows Active Directory Server (ADS). Users from the Active Directory domain are defined externally. Each Storage Concentrator obtains the list of Active Directory users automatically from the ADS domain controller.

The Active Directory domain also defines groups. In this case, a Storage Concentrator can offer access to these Active Directory groups as a whole and uses the group name to manage the group access to NAS volumes. Access is granted to the ADS defined group in a manner in which the Storage Concentrator does not know the individual users that are members of the group and the members of the group may change over time.

Unlike Active Directory groups, there are no groups for the "Workgroup" mode of authentication.

3.4.1 "Workgroup" Users

To create a new CIFS Workgroup user, select NAS → CIFS Users → Add/Update User in the menu.

The Add/Update User page can also be used to modify passwords for existing users.
Any existing CIFS user name can be used, including names for users and groups from the Active Directory domain. In this case, the newly created Workgroup user inherits the NAS volume access list that the Active Directory user or group with the same name had before.

### 3.4.2 Deleting User Access

The CIFS Users Summary screen provides high level information on all configured CIFS Users across the current Storage Concentrator configuration. This screen only shows Active Directory domain users that have access to the NAS volumes. Active Directory users without access can only be managed on the "CIFS Access" screen.

To delete a CIFS Workgroup user, select **NAS → CIFS Users → Summary** in the menu. To delete a user’s access to all NAS volumes, click the check box in the **Delete** column to remove the user or group. Click **Submit** after all selections for deletion are done.

After a user or group of users has been deleted, they will no longer be able to access any NAS volumes provisioned by the Storage Concentrator. Deleted “Workgroup” users no longer exist.

**Note:** Deleting an Active Directory user or group on the Storage Concentrator does not remove them from the Active Directory Server; it only prevents them from accessing the Storage Concentrator.

### 3.4.3 Modifying User Access

“Workgroup” and Active Directory domain users and groups can be managed by navigating to **NAS → CIFS Users → User Access** in the menu. This screen can manage only Active Directory users and groups that have at least some access to the Storage Concentrator NAS volumes. This restriction does not apply to “Workgroup” users. Visit section 3.4.5 for details on managing Active Directory users and groups that do not already have access to the Storage Concentrator.
3.4.3.1 **User Access Screen Fields**

**Select User Type** — Select one of three possible options:

- The 'Workgroup' option handles users defined directly on the Storage Concentrator.
- The 'AD Users' option handles CIFS users defined by the Active Directory domain.
- The 'AD Groups' option handles groups of CIFS users defined by the Active Directory domain.

**Select User** — Select a user or a group from the drop down list. If the list is long, type the first few letters of a specific name to quickly jump down the list.

**Volume** — This column lists the NAS volumes that this user currently has access to. To add volumes to this list use the 'Select Volume' drop down or click on Show All.

**CIFS Access** — Select one of four possible options for each volume:

- The 'None' option disables the user’s access to the volume.
- The 'Read Only' option allows the user to view the volume but cannot modify its contents. Some contents may be hidden due to CIFS file and/or directory level permissions that have been set in Windows.
- The 'Read/Write' option allows the user to view and modify the volume’s contents. Some contents may be hidden or set to Read Only due to CIFS file and/or directory level permissions that have been set in Windows.
- The 'Read/Write&Admin' option allows super-user (root) level permission to the volume.

**Refresh** — Click to show the current Access Control Lists for the selected user.

**Submit** — Click to submit the changes you have made to the user’s permissions.
3.4.4 Active Directory Users

Before Active Directory users can be given NAS volume access, the StoneFly Storage Concentrator must join the Windows Active Directory domain. For details see section 2.5.22.

After the system has successfully joined the Active Directory domain, a list of all available users and groups of users can now be managed by selecting NAS → Volumes → CIFS Access in the menu.

Once NAS volumes have been assigned to Active Directory users and groups, then either NAS → Volumes → CIFS Access in the menu or NAS → CIFS Users → User Access in the menu can be used to manage those users.

3.4.5 Access for Active Directory Users and Groups

To manage CIFS access for Active Directory users and groups, select NAS → Volumes → CIFS Access in the menu. The CIFS User Authentication Mode must be set to ACTIVE DIRECTORY on the NAS Server Configuration GUI page. See section 2.5.22.

Figure 3-13 Active Directory User and Group Access
NAS Functions

3.4.5.1 Active Directory Users & Groups CIFS Access Screen Fields

Select Volume — Use the drop down box to select the particular NAS volume that users and groups will be given access.

Show — Users can be filtered to display only those with a particular access type. Options include:

- 'Any' to show all users with any type of access to the volume except 'None'.
- 'All' to show all Active Directory users.
- 'None' to show all users that do not have access to the volume.
- 'R/O' to show all users with Read Only access to the volume.
- 'R/W' to show all users with Read/Write access to the volume.
- 'Admin' to show all users with administrative privileges to the volume. Administrative users can perform any file operations as a super-user(root). In addition, they also have Read/Write access to the volume.

The level of access for each user is further differentiated by displaying different background colors based on their access type:

- A "white" background is used to show users without any access.
- A "light blue" background is used to show users with Read Only access.
- A "green" background is used to show users with Read/Write access.
- A "pink" background is used to show users with Administrative access.

A user's access level can also be displayed by hovering the mouse pointer above their name.

Set Access To — Select 'None', 'R/O' (Read Only), 'R/W' (Read/Write), or 'Admin' in the "Set Access To" drop down. Then click on the cell for each of the individual users that the permission will be granted to. Each new selection will be displayed in bold and it will be underlined. The background will change to the color representing the desired access for that user.

If the changes have not yet been submitted, users can be unselected by clicking on their cell a second time. The background color and font will be restored to their original values.

If a user's access is already the same as what is listed in the "Set Access To" box, then it cannot be selected.

When there are a large number of users, the browser's "Find" function (often Ctrl-F) can be used to locate a specific user in the list.

Using Select All will simultaneously select all available users. Some users may then be unselected if desired. This feature is handy if most but not all users are to receive the same access permissions.

Using Undo resets the page to reflect the current access list.

Click Submit to save the changes to the CIFS access control list before moving onto selecting users for the next "Set Access To" permission type.
3.4.6 **Access for “Workgroup” Users**

To manage CIFS access for “Workgroup” users, select NAS → Volumes → CIFS Access in the menu. The "Workgroup" represents users that have user accounts that were defined directly on the Storage Concentrator. This section shows how to manage permissions for those “Workgroup” users.

**Note:** Visit section 3.4.5 if you are using this screen for managing Active Directory users and groups.

**Note:** Most users prefer to manage CIFS access for “Workgroup” users by navigating to NAS → CIFS Users → User Access in the menu. Return to section 3.4.3 for details.

![Figure 3-14 CIFS Access for “Workgroup” Users](image)

### 3.4.6.1 “Workgroup” CIFS Access Screen Fields

**Select Volume** — Use the drop down box to select the particular NAS volume that users and groups will be given access.

**Access** — Select one of four possible options for each user:

- The 'None' option disables the user’s access to the volume.
- The 'Read Only' option allows the user to view the volume but cannot modify its contents. Some contents may be hidden due to CIFS file and/or directory level permissions that have been set in Windows.
- The 'Read/Write' option allows the user to view and modify the volume’s contents. Some contents may be hidden or set to Read Only due to CIFS file and/or directory level permissions that have been set in Windows.
- The 'Read/Write & Admin' option allows super-user (root) level permission to the volume.

**User** — The “Workgroup” user name.
**NAS Functions**

**Show User** — Select a user or a group from the drop down list. If the list is long, type the first few letters of a specific name to quickly jump down the list. The easiest way to use this feature is to select a single user from the drop down menu, set appropriate permissions for that user and then use **Submit** to submit those changes. Alternatively, **Show All** can be used to display all available “Workgroup” users. Permissions can then be modified for each user in user in the list.

**Submit** — Click **Submit** to save all of the changes that were made to the user’s CIFS access permissions.
3.5 NAS Sessions

The NAS Sessions screen displays all active NAS sessions between clients and the Storage Concentrator. To view active NAS sessions, select NAS → NAS Sessions in the menu.

The list of NAS sessions can be sorted by clicking on any column heading. Click again to reverse the sort order for that column.

**Figure 3-15 NAS Sessions**

- **NAS Type** – The NAS session type can be either NFS or CIFS (also known as SMB).
- **Client Name** – The IP address that the NAS client established the session from will appear here. If the NAS client’s name is known then it will be displayed here as well.
- **Volume** – The name of the volume that the NAS session is currently logged into. The volume name only appears for CIFS sessions. “N/A” (Not Available) will always be displayed for NFS sessions as the volume name cannot be determined.
- **Storage Concentrator** – The name of the Storage Concentrator managing the session.
- **Target IP Address** – The Storage Concentrator’s target IP address that the session terminates on. If the LAN network is also used for NAS, then this address may vary and indicates which interface/network is being used.
- **Time** – The date and time that the NAS session was established. Note that NAS sessions drop due to inactivity and reestablish automatically based on need. The time only appears for CIFS sessions. “N/A” (Not Available) will always be displayed for NFS sessions as the connection time cannot be determined.
3.6 Delete NAS Volume

To delete a NAS volume, select **NAS → Volumes → Summary** in the menu.

![Figure 3-16 Delete NAS Volume](image)

When a NAS volume is deleted, the NAS segments from that volume become unused. Those unused segments can be:

- Left as unused.
- Deleted. Navigate to **NAS → Segments → Summary** in the menu bar if you wish to delete the unused segments.
- Used to expand an existing NAS volume. Jump to section 3.7 for details.
- Used to create a new NAS volume. Return to section 3.2.2 for details.
3.7 NAS Volume Expansion

Expanding a NAS volume consists of several steps:

1. Create new NAS segments of the same size on each Storage Concentrator where the volume is allocated. Refer back to section 3.2.1 for details.
2. Add NAS segments to the volume. Additional details are in this section below.
3. Create a layout of the volume directories on the newly added segments and move volume files between old segments and new segments to balance access. Completion status of the volume rebalance can be checked on the NAS Volume Configuration GUI screen.

Pre-existing NAS Segments that do not already belong to other volumes can be used for expansion.

All NAS volumes that are sharing the same segments will be expanded simultaneously. Only one volume from the group needs to be selected to initiate expansion.

Volumes can be online during expansion.

![Figure 3-17 Expand NAS Volume](image)

3.7.1 Preparation for Expansion

To expand a NAS volume, select NAS → Volumes → Expand Volume in the menu.

Use the Select Volume drop down list to choose a volume for expansion. Click Start to begin the volume expansion.

The next screen that will appear will depend on whether available NAS segments already exist.

If no available NAS segments exist and one must be created, then the following screen will be displayed. Click OK in the dialog box. The user will then be redirected to the page that will allow them to create a new NAS segment for the NAS volume expansion.
If one or more NAS segment(s) already exist, then the following screen will be displayed:
3.7.2 NAS Volume Expansion Fields

Select Volume — Select a volume from the drop down list for expansion.

Select NAS Segment — Select an appropriate NAS segment to use to expand the NAS volume from the drop down list. If the list is empty, the user will automatically be redirected to the "NAS Segment Create" GUI screen. Revisit section 3.2.1 for instructions. After the segment is created, the GUI will automatically return to the "Expand NAS Volume" screen and the user may proceed with the expansion.

Submit — Click to begin the NAS volume expansion.

Undo — Click to revert to the last saved settings.

Once the new segment has been added to the volume, the rebalance process will automatically begin. The screen below shows a rebalance in progress. Click Refresh to update the status. Once the rebalance is completed, data will be successfully rebalanced between all available Scale Out NAS nodes.

![Configure NAS Volume](image)

Figure 3-20 Configure NAS Volume

The Start and Stop buttons can be used to begin or halt a rebalance of the volume.
NAS volumes cannot be renamed once they are created. Please make sure to enter the name you wish to permanently use for the volume when performing the initial naming process when the volume is first created.

3.8 Rename Volume
3.9 Directory Quotas

The Directory Quota functionality allows the user to set and manage limits on the amount of disk space used by directories within the volume, or the volume itself.

Each quota consists of both a “Hard Limit” and a “Soft Limit”. The "Hard Limit" is the actual quota limit expressed in KB to PB. The "Soft Limit" is a percentage of the hard limit. By default, the soft limit is set at 80% of the hard limit.

The Directory Quota facility checks the amount of space used by directories and volumes and compares it to the settings specified in the quotas. Volume servers are updated with the status so that those servers can enforce the limits. The default interval for quota checks is 60 seconds when the usage is below the soft limit. If the usage is above the soft limit, then the interval for quota checks increases to 5 seconds.

Servers will let clients cross the hard limit if it is done so before the amount of used space is updated on server side. For example, the used space is already at 95% of the hard limit and a client is adding an equivalent of 10% more data to the directory. If the client is able to finish writing in less than 5 seconds and before the amount of used space is updated on the server, then the final amount of used space will actually be 5% above the hard limit. However, any writes attempted after the next update is executed will be rejected since the quota has already been reached.

When a quota is set on a volume or directory, clients will no longer be able to see the full size of the volume. The available volume or directory size will be reported to clients as the hard limit.

**Note:** In Scale Out NAS configurations, it can take up to one minute to update NAS volume quotas across all nodes after a segment is replaced. A different list of quotas may initially appear during the interim.

When there are changes in the number of quota configurations in which the used size exceeds either the soft or hard limit, “Warning” messages are stored in the Report Log for the volume. Open the Directory Quota Management screen to view detailed information about each warning. These messages can be transmitted as e-mail or SNMP notifications.

Since the system periodically monitors quotas the appropriate notification is generated post-factum with a delay. The same message will not be repeated until 24 hours have passed since the previous notification was issued. In Scale Out NAS configurations, volume quotas are monitored by the Storage Concentrator managing the first segment of the volume. To avoid having to check Report Logs on multiple nodes, the user can set e-mail or SNMP notifications on all Scale Out nodes so that all notification messages can be collected at a single destination.

If the amount of used space is approaching a quota limit, the System Administrator has option to either delete the quota or increased the quota’s limit. Directory users can delete unneeded files from the directory or move the files to another directory in order to reduce the amount of used space.
3.9.1 Enabling Quotas

To enable a NAS volume quota, select **NAS → Volumes → Configure Volume → Directory Quota** in the menu. Choose a volume in the **Select Volume** drop down box. Click on the **Enabled** radio button and then click **Submit**.

![Figure 3-21 Enabling Directory Quotas](image)

3.9.2 Setting Quota Limits

To configure a NAS volume quota, select **NAS → Volumes → Configure Volume → Directory Quota** in the menu. Make sure that you have already enabled quotas as described in section 3.9.1. The Directory Quota screen will appear as follows (before the first quota configuration is set on the volume):

![Figure 3-22 Setting Quota Limits](image)

The next fields have to be set:

**Select Volume** – Use the drop down box to select the volume to be configured.

**Path** – Enter the absolute path of the directory that the quota will be applied to. The directory must already exist unless you are using "/" to limit the total size of the volume’s used space, or "/cifs_share" to limit the total size used by CIFS clients. The "/cifs_share"
directory is automatically created when CIFS export is enabled. If a nonexistent directory is selected then the quota creation will fail.

Use path "/Dir1" to limit the size available to NFS clients for the "Dir1" directory.

Use path "/cifs_share/Dir2" to limit the size available to CIFS clients for the "Dir2" directory.

**Hard Limit** – Set a size limit for the specific directory in the volume. The hard limit should not be greater than the total volume size. The value can be specified in KB (KiloByte), MB (MegaByte), GB (GigaByte), TB (TeraByte) and PB (PetaByte). If the hard limit is set for an amount that is less than the amount of space that has already been used, then clients will be prevented from writing more data to the directory.

**Soft Limit** – Is a user-specified percentage of the Hard Limit. The Soft Limit is used to adjust quota functionality when the amount of used space size exceeds a certain amount.

### 3.9.3 Modifying Quotas

To modify or delete a NAS volume quota, select **NAS → Volumes → Configure Volume → Directory Quota** in the menu. Choose a volume in the **Select Volume** drop down box. Existing quotas for the volume will be displayed. Enter the directory of the quota you wish to modify in the **Path** field of the Add Quota section. Enter a new **Hard Limit** and **Soft Limit** as needed and click **Submit**.

![Figure 3-23 Modify Quota Limits](image)

Quotas can be deleted by clicking on the box in the **Delete** column for the specific quota to be deleted and then clicking **Submit**.
3.9.4 Disabling Quotas

To disable a NAS volume quota, select NAS → Volumes → Configure Volume → Directory Quota in the menu. Quota functionality for NAS volume will be disabled and all defined quota configurations will be deleted at the same time by selecting the Disabled radio button and clicking Submit.
This page is intentionally left blank.
Chapter 4

Scale Out NAS
### 4.1 Create a Scale Out Configuration

Deployment of a Scale Out NAS configuration provides users with the ability to expand a NAS volume’s capacity beyond a single StoneFly Cloud Drive. By creating a Scale Out NAS configuration you will be able to join together two or more StoneFly Cloud Drives and pool together the 8TB or 16TB of storage resources that each StoneFly Cloud Drive provides. Any node in a Scale Out NAS configuration can be used by an NFS or CIFS client as an access point to volumes provisioned within the Scale Out configuration.

Client sessions can be established manually by IP address or by using the Storage Concentrator’s DNS Server.

A Scale Out NAS configuration can be created by using two or more StoneFly Scale Out NAS Enterprise Cloud Drives for Microsoft Azure. Any standalone StoneFly Scale Out NAS Enterprise Cloud Drive can join the Scale Out configuration later. New nodes can be added at any time to meet needed storage requirements.

The systems must be on the same data and management networks. At least one NTP server has to be setup and enabled on each. System names for each Cloud Drive in the Scale Out must be unique. Existing NAS volume names on each Cloud Drive must also be unique. Accounts for CIFS export must have same login credentials across all StoneFly Cloud Drives within the Scale Out NAS configuration.

**Note:** Two or more separately-configured Scale Out configurations cannot be merged together to create single configuration.

#### 4.1.1 Join Scale Out Configuration

Navigate to **NAS → Scale Out → Summary** in the menu bar. If this is the first Node of a Scale Out NAS configuration, then no action is required. However, if this is Node #2, 3, 4, etc. then a "Join Scale Out Configuration" is required.

To join an existing configuration, enter the **Management IP Address** for the StoneFly Cloud Drive from the Scaled Out configuration. This can be found in the "Hostname" field of the **System → Information** page of a StoneFly Scale Out NAS Enterprise Cloud Drive that is already in the configuration.

Click on **Submit** to join the Scale Out configuration.

![Figure 4-1 Join Scale Out Configuration](image)
Figure 4-2 Finding Hostname in System Information Summary
4.2 Node Monitoring and Management

The Scale Out NAS Configuration Summary screen provides the status of the Scale Out configuration that the local StoneFly Cloud Drive belongs to.

If the local system does not belong to any Scale Out configuration then the Scale Out Summary screen provides the ability for the local system to join an existing configuration. See section 4.1.1 for details.

![Figure 4-3 Scale Out NAS Configuration Summary](image)

- **Node Name**: Name of each Storage Concentrator that belongs to the same Scale Out configuration as the local Storage Concentrator.
- **Type**: The node type will show as "Local" for the node that the current browser window represents. The node type will show as "Scaled Out" for all other nodes in the configuration.
- **Operational State**: Node operational state can have one of the following: "up", "down" and "no response".
- **Connection State**: The network connection state between the local active node and the selected node. Displayed as "OK" or "failed".
- **NAS Monitor State**: For standalone Scale Out nodes this value will be "n/a".
- **Private (Shared) Volumes**: Private - total number of NAS volumes with segments allocated on the selected node only. Shared - total number of NAS volumes allocated on both the selected node and on one or more other nodes from the Scale Out configuration.
- **Delete**: Click the check box to select the node to be deleted from the Scale Out configuration and click **Submit**. A node cannot be deleted if any NAS volumes have segments that reside on both the node to be deleted and other nodes in the Scale Out configuration.
4.3 Segment Replacement

The NAS volume segment replacement procedure is an effective way to move volume contents that are allocated on one node to a different node in the same Scale Out configuration.

The destination node must have enough space available to handle the selected portion of the volume’s data. The segment replacement procedure is executed without interrupting the NAS service. The time required to replace a segment will depend on the size of the segment and the amount of data on that segment. The replacement segment must be at least the same size as or larger than the segment to be replaced. No more than one replacement process can be active for each NAS volume at a time.

The segment replacement procedure must be initiated while the user is logged into the node where the destination segments will be allocated. However, the progress of this replacement and any other active replacements can be checked while logged into any node in the same Scale Out.

If the destination system is rebooted during the segment replacement, then all segment replacements must start over. User intervention is not required as the system will automatically restart the interrupted segment replacements.

Segment replacements are executed simultaneously for all NAS volumes that share the source segment. Each share can take a different amount of time to complete the replacement. Only one volume from the group needs to be selected to initiate the replacement.

After the replacement is complete, the source segment can then be deleted.

Pre-existing NAS Segments that do not belong to other volumes can be used for replacement.
4.3.1 Initiate Segment Replacement

Login to the GUI of the system where the new segment will be allocated. Navigate to **NAS → Scale Out → Segment Replacement → Initiate** in the menu bar. Use the drop down boxes for **Select Volume** (volume that uses the segment that will be replaced) and **Select Scale Out Node** (the node that contains the segment to be replaced). The page will refresh. Use the drop down box for **Select Segments to Replace**. Click on **Start** to initiate the segment replacement.

![Figure 4-4 Initiate Segment Replacement](image)

The page will refresh again. Use the new drop down box to **Select the Replacement Segments**. The segment size of the replacement segment must be equal to or greater than the size of the segment that will be replaced. Click **Submit** to continue.

![Figure 4-5 Select Replacement Segment](image)
The segment replacement will begin and the page will be redirected to the “Segment Replacement Status” page. Click **Refresh** to check the updated progress.

![Figure 4-6 Segment Replacement Status](image)

The following columns are displayed on the “Segment Replacement Status” screen:

- **Volume Name**: Names of the NAS volumes with segment replacement processes.
- **Source**: Node name and name of the segment that were selected for replacement.
- **Destination**: Node name and name of the segment where data from the source segment will be migrated to during the replacement.
- **Status**: Current status of the segment replacement. The first lines shown are the detailed status of each segment. The last line shown is the summary status of the entire replacement process.
- **Command**: The only command that is appropriate for the current state of the segment replacement is shown in this field. The command can be one of the following:
  - **Stop**: For replacements that are currently in the process of migrating their files from the source segment to the destination segment. The "Status" field shows how many files have been migrated.
  - **Start**: To continue a replacement that had previously been stopped.
  - **Commit**: To modify a configuration to allow the volume to begin using the destination segment and to ceasing using the source segment. This command is only available when the migration of all of the files from the source segment to the destination segment has been completed.
  - **n/a**: Only displayed if the system is unable to detect the current status of the segment replacement. The user should verify the state of the Scale Out nodes, and then try again.
4.4 NAS Volume Management

The GUI screens that are used to manage and monitor NAS volumes on local systems are also used to provide the same management and monitoring functionality for volumes in a Scale Out configuration. Revisit Chapter 3 for instructions on how to manage and monitor NAS volumes.

NAS volume management must only be performed on one node at a time within the Scale Out configuration and using a login with administrative privileges.
Appendix 1

System Event Messages
The Storage Concentrator records system event messages in the GUI Reports Log page, and optionally can send those system event messages as notifications to an email address and/or SNMP trap.

System events can be categorized according to their severity levels as follows:

- **Error** – Events that require immediate attention. These are also referred to as ‘Critical’ or ‘Serious’.
- **Warning** – Events either indicating an abnormal situation or they are supplemental events relating to an ‘Error’ event.
- **Informational** – Events providing normal status or progress information.

Only ‘Error’ and ‘Warning’ events can be sent as notifications. All events are stored in the GUI Log.

The following table lists all of the possible system event messages that the Storage Concentrator will log.

Many of the events are parameterized, with those parameters represented by ‘{0}’, ‘{1}’, etc.

Some events can be reported at different severity levels based on context. The highest level used is shown in the following table.
<table>
<thead>
<tr>
<th>Level</th>
<th>Event Message</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error</td>
<td>{0} at ipaddress {1} appears to be having startup problems. Please reboot and if problem continues contact Customer Support.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>{0} to Storage Concentrator {1} failed with return code {2} for {3}. SenseData = {4}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>{0}: IO failed due to space full.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Access to NAS volume &quot;{0}&quot; on Storage Concentrator &quot;{2}&quot; is permanently disabled for CIFS user &quot;{1}&quot; during upgrade of the StoneFusion software. The disabled CIFS user has to be deleted and re-created.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>CIFS Active Directory Server used for NAS user authentication is not functioning: {0}</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>CIFS User &quot;{0}&quot; is disabled on Storage Concentrator &quot;{1}&quot;. The disabled CIFS user has to be deleted and re-created again.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Could not create new Resource {0}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Could not provision {0} on Storage Concentrator {1} from {2}. errorcode={3}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Could not provision node {0} on Storage Concentrator {1}. errorcode={2}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Could not read label from {0} for resource {1} lun {2}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Email Notification could not connect to address {0} for email user {1}. Error = {2}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Email Notification to address {0} failed to email id {1}. Error = {2}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Feature License for &quot;{0}&quot; on Storage Concentrator &quot;{1}&quot; is invalid. This can occur on system hardware replacement, and on changes to virtual machines. A temporary evaluation license is being established. Please contact customer support for a replacement license key.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Hack attempt was made from ipaddress {0} by '{1}' user.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Have failure to remove NAS node &quot;{0}&quot; from the Scaled Out configuration. The failed system has to be restored to factory default configuration. Use console to do this. Don't restart system in the current configuration. It may corrupt nodes that are still present in the Scale system.</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>Event Message</td>
<td>Notes</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Error</td>
<td>Out configuration.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Invalid target reference.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Monitor &quot;{0}&quot; failed on Storage Concentrator &quot;{1}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Name not unique.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Not enough space on resource.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Not enough system memory to expand volume &quot;{0}&quot; on Storage Concentrator &quot;{1}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Not enough system memory to provision volume &quot;{0}&quot; on Storage Concentrator &quot;{1}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Problem provisioning volume {0} on Storage Concentrator {1}. errorcode={2}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Process of segment replacement for NAS volumes &quot;{0}&quot; was terminated. Original segment assignment is restored.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Resource:{0} has the same Extended Unit Identifier/Serial Number as another resource. No passthru volumes can be created in this situation.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Storage Concentrator {0}: invalid argument.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Storage Concentrator {0}: invalid command.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Storage Concentrator {0}: unknown problem with database.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>System failed to create the &quot;nas-metadata&quot; volume automatically. NFS and CIFS Exports are not available for any NAS volume until &quot;nas-metadata&quot; volume is recreated successfully. The system will attempt to create the &quot;nas-metadata&quot; volume on each attempt to create a new NAS volume, add an image to existing NAS volume, or add a new share. If the system has no shared &quot;Managed&quot; resources with space, &quot;NAS Managed&quot; resources will be used instead once available on both Storage Concentrators. Use the resource summary screen to &quot;Manage&quot; or &quot;NAS Manage&quot; a storage resource on the new secondary.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>SYSTEM: &quot;{0}&quot; at ipaddress {1} has been restarted.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>SYSTEM: &quot;{0}&quot;, total memory has fallen below the {1}GB minimum required to support NAS volumes functionality. Please check for failed system memory.</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>Event Message</td>
<td>Notes</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Error</td>
<td>SYSTEM: &quot;{0}&quot;. total memory has fallen below the {1}GB minimum required to support {2} volumes functionality. Please check for failed system memory.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>SYSTEM: Could not provision NAS segment resource {0} on concentrator {1}. Provision error_code={2}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>SYSTEM: Could not provision NAS segments on concentrator {0}. Provision error_code={1}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>SYSTEM: Could not provision NAS segments on concentrator {0}. Try to resolve this by performing a NAS segment rediscovery on the NAS Segment Summary GUI page. Provision error_code={1}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>SYSTEM: Could not provision resource {0} on concentrator {1}. Provision error_code={2}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>SYSTEM: Could not retrieve serial number from {0}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>SYSTEM: Database Failure {0}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>SYSTEM: Failed to add route:{0} gateway:{1} network:{2} netmask:{3} on firefly {4}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>SYSTEM: update routes failed for network={0} netmask={1} gateway={2} device={3}.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>The {0} network MTU setting has been reset to the default on Storage Concentrator &quot;{1}&quot; at {2}; was &quot;{3}&quot;, now is &quot;{4}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>The {0} network port assignments have been changed on Storage Concentrator &quot;{1}&quot; at {2}; was &quot;{3}&quot;, now is &quot;{4}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>The {0} network port assignments have been reset to default on Storage Concentrator &quot;{1}&quot; at {2}; was &quot;{3}&quot;, now is &quot;{4}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>The Maximum number of segments ({0}) in volume {1} have already been created.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>The Maximum number of volumes have already been created.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>The primary and secondary meta data backups do not match for resource {0}. Please call customer support for assistance.</td>
<td>The Storage Concentrator resource reserved</td>
</tr>
</tbody>
</table>
## A.1 System Event Messages

<table>
<thead>
<tr>
<th>Level</th>
<th>Event Message</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error</td>
<td>The resource &quot;{0}&quot; has changed in size from {1} GB to {2} GB. Old block size is {3}. New block size is {4}. It is strongly recommended to delete old &quot;Non-Active&quot; copy of the resource from the resource summary page.</td>
<td>space DB redundant copies are not equal.</td>
</tr>
<tr>
<td>Error</td>
<td>The resource &quot;{0}&quot; has increased in size from {1} GB to {2} GB. It is strongly recommended that a reboot be done if a reboot has not been done since the resource increased in size.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>The resource &quot;{0}&quot; has increased in size from {1} GB to {2} GB.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>The Storage Concentrator &quot;{0}&quot; CIFS Volume Service is down.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>The Storage Concentrator &quot;{0}&quot; Management Service is down.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>The Storage Concentrator &quot;{0}&quot; NAS Volume Service is down.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>The Storage Concentrator &quot;{0}&quot; Volume Service is down.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>There was a problem updating configuration at ipaddress &quot;{0}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>This is a test Message arg0 &quot;{0}&quot;, arg1 &quot;{1}&quot;, arg2 &quot;{2}&quot;, arg3 &quot;{3}&quot;, arg4 &quot;{4}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Version of Storage Concentrator database is not correct. Have version &quot;{0}&quot;, was expected &quot;{1}&quot;. Try a reboot. If problem persists please call customer support.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Volume '{0}' has been unprovisioned from Storage Concentrator '{1}'.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>VOLUME: Error zeroing volume '{0}'.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Your &quot;{0}&quot; Feature License evaluation period on Storage Concentrator &quot;{1}&quot; has expired! Feature operation is inhibited. Please contact customer support for a license for this feature.</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Your StoneFusion Base OS evaluation period has expired! Storage Concentrator operation is inhibited. Please contact customer support for</td>
<td></td>
</tr>
</tbody>
</table>
### A. 1 System Event Messages

<table>
<thead>
<tr>
<th>Level</th>
<th>Event Message</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a license for this product.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>{0} is ok after retry.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Could not do a autosave to {0}.</td>
<td>Storage Concentrator DB periodic backup failed.</td>
</tr>
<tr>
<td>Info</td>
<td>Could not do a full autosave recover following a resource resize for {0}.</td>
<td>The Storage Concentrator resource reserved space DB backup could not be moved during a resource resize.</td>
</tr>
<tr>
<td>Info</td>
<td>Could not retrieve DNS info on Storage Concentrator:{0} from DNS server {1} for {2}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Could not retrieve DNS info on Storage Concentrator:{0} from DNS server {1}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Database backup to {0} {1} {2}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Discovered a resource not usable by Storage Concentrator:{3} of type &quot;{0}&quot;.</td>
<td>Manufacturer={1} SerialNumber={2}.</td>
</tr>
<tr>
<td>Info</td>
<td>Duplicate request for security for {0}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Failed to Create device for target:{0} lun:{1} local initiator:{2} from Storage Concentrator:{3} sense data={4}</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Failed to discover targets target:{0} local initiator:{1} from Storage Concentrator:{2} sense data={3}</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Failed to query device Manufacture:{0} target:{1} from Storage Concentrator:{2} sense data={3}</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Feature License for &quot;{0}&quot; on Storage Concentrator &quot;{1}&quot; has been &quot;{1}&quot;{2}</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Invalid access used to create security for {0}.</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>Event Message</td>
<td>Notes</td>
</tr>
<tr>
<td>-------</td>
<td>---------------</td>
<td>-------</td>
</tr>
<tr>
<td>Info</td>
<td>Invalid Host used to create security for {0}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Invalid security used for {0}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>License generation login attempt failed from ipaddress &quot;{0}&quot; by user &quot;{1}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Local Storage Concentrator &quot;{0}&quot; joined the Scaled Out configuration.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Local Storage Concentrator &quot;{0}&quot; was removed from the Scaled Out configuration.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Monitor &quot;{0}&quot; critical on Storage Concentrator &quot;{1}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Monitor &quot;{0}&quot; OK on Storage Concentrator &quot;{1}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Monitor &quot;{0}&quot; unknown on Storage Concentrator &quot;{1}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>NAS node &quot;{0}&quot; was removed from the Scaled Out configuration.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>NAS Volume &quot;{0}&quot; rebalance status: {1}</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>NAS volume &quot;{0}&quot; was expanded from {1} GB to {2} GB.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>NAS volume {0} segments are no longer exported for manual repair.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>NAS volume {0} segments have been exported for manual repair.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>NAS volumes will be reassigned to use segment &quot;{0}&quot; from node &quot;{1}&quot; as a replacement for segment &quot;{2}&quot; from node &quot;{3}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Performed autosave following a resource resize for {0}.</td>
<td>The Storage Concentrator resource reserved space DB backup moved successfully during a resource resize.</td>
</tr>
<tr>
<td>Info</td>
<td>Performed autosave to {0}.</td>
<td>Storage Concentrator DB periodic</td>
</tr>
<tr>
<td>Level</td>
<td>Event Message</td>
<td>Notes</td>
</tr>
<tr>
<td>-------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Info</td>
<td>Process of segment replacement for NAS shares &quot;{0}&quot; was started. Check status of the replacement on GUI screen. When the replacement copied all data to the destination segment, use the status screen to commit the replacement. If shares are replicas, the replacement process starts for segment from the second image automatically. Continue to check status of the second replacement and commit it after the second replacement is done. The shares start to use new segments after the last commit command.</td>
<td>backup worked.</td>
</tr>
<tr>
<td>Info</td>
<td>Process of segment replacement for NAS volume &quot;{0}&quot; was started. Check status of the replacement on GUI screen. When the replacement copied all data to the destination segment, use the status screen to commit the replacement. The source segments are removed after the commit command.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Process of segment replacement for NAS volumes &quot;{0}&quot; finished successfully.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Process of segment replacement for NAS volumes &quot;{0}&quot; was terminated. Original segment assignment is restored.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Rebuild of NAS volume {0} has completed.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Rebuilding of NAS volume {0} has started.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Replication:{0} could not be started. Problem:{1}</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Scsi command {2} used by volume service on Storage Concentrator:{0} failed for {1}. Scsi status = {3}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Scsi command {2} used by volume service on Storage Concentrator:{0} failed for {1}. Sense key = {3}, ASC:ASCQ = {4}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Scsi command {2} used by volume service on Storage Concentrator:{0} timed out for {1}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Shared space for NAS volumes &quot;{0}&quot; was expanded from {1} GB to {2} GB.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Storage Concentrator &quot;{0}&quot; joined the Scaled Out configuration.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>SYSTEM: &quot;{0}&quot; at ipaddress {1} has started.</td>
<td></td>
</tr>
</tbody>
</table>
### A. 1 System Event Messages

<table>
<thead>
<tr>
<th>Level</th>
<th>Event Message</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Info</td>
<td>SYSTEM: &quot;{0}&quot; at ipaddress {1} is now running.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>SYSTEM: The Debug utility has been navigated to by user {0}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>SYSTEM: The Debug utility has been used by user {0}. Parameter {1} is {2}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>SYSTEM: User {0} has been logged in.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Test unit ready not valid from {0} for {1} check_cond/sense_data={2}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>The {0} network multipath port assignments have been changed on Storage Concentrator &quot;{1}&quot; at {2}; was &quot;{3}&quot;, now is &quot;{4}&quot;.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>The {0} oldest log messages were deleted because the max log limit had been reached.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>There are multiple resources having the same StoneFly label. Label is {0}, Resource: {1} and Resource: {2}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>There was a problem to access reserved space on resource &quot;{0}&quot;. Please check status of the resource.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Unit does not support inquiry. Device Query Manufacture:{0} target:{1} from Storage Concentrator:{2} sense data={3}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Volume '{0}' has been deleted.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Volume {0} is Offline.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Volume service failed for {1} on Storage Concentrator:{0}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Volume service failed to get list of virtual volumes from Storage Concentrator:{0}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Volume service failed to open iSCSI session with Storage Concentrator:{0}.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Volume: {0} expand was reverted back to {1} GB.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Volume: {0} expanded from {1} GB to {2} GB.</td>
<td></td>
</tr>
<tr>
<td>Info</td>
<td>Your &quot;{0}&quot; Feature License {1} day evaluation period on Storage Concentrator &quot;{2}&quot; has only {2} days remaining. Please contact</td>
<td></td>
</tr>
</tbody>
</table>
## A.1 System Event Messages

<table>
<thead>
<tr>
<th>Level</th>
<th>Event Message</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warn</td>
<td>customer support for a license for this feature.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td><code>{0}</code> at ipaddress <code>{1}</code> appears to be having startup problems. It is being automatically rebooted.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>Access to NAS volume &quot;{0}&quot; on Storage Concentrator &quot;{2}&quot; is disabled for CIFS user &quot;{1}&quot; until all nodes in the configuration are functioning properly and are running the same version of the StoneFusion software.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>Access to the NAS volume &quot;{0}&quot; had been temporarily disabled, but access has now been restored.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>Active boot check done on <code>{0}</code>.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>Could not retrieve time on Storage Concentrator:{0} from NTP server {1}.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>NAS client sessions(s) are not using Storage Concentrator NAS alias IP addresses, but should be. The following clients have sessions to invalid target IP addresses (Client Name/IP : Target IP): <code>{0}</code></td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>NAS service critical on Storage Concentrator:{0} - <code>{1}</code></td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>NAS service failed on Storage Concentrator:{0} - <code>{1}</code></td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>Problem provisioning NAS volume <code>{0}</code> on Storage Concentrator <code>{1}</code>. errorcode={2}.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>Quota of used space for NAS volume '{0}' exceeded soft limit for {1} and hard limit for {2} directories. Open NAS volume Directory Quota management GUI screen for details.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>Rebooting &quot;{0}&quot; by user &quot;{1}&quot; from {2}.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>Rebuild of NAS volume <code>{0}</code> has been stopped due to &quot;{1}&quot;. Rebuild will be restarted automatically when possible.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>RESOURCE: Discovery Failed on &quot;{1} : {0} sense data = {2}&quot;</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>SESSION: Host &quot;{0}&quot;, from ipaddress {1}, failed to login in to volume &quot;{2}&quot; not allowed in ACLS.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>Shutting down &quot;{0}&quot; by user &quot;{1}&quot; from {2}.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>SYSTEM: &quot;{0}&quot; UUID has changed, old value={1}, new value={2}.</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>Event Message</td>
<td>Notes</td>
</tr>
<tr>
<td>-------</td>
<td>---------------</td>
<td>-------</td>
</tr>
<tr>
<td>Warn</td>
<td>SYSTEM: &quot;{0}&quot; , total memory has been changed, old value={1}KB, new value={2}KB.</td>
<td></td>
</tr>
<tr>
<td>Warn</td>
<td>Your StoneFusion Base OS {0} day evaluation period has only {1} days remaining. Please contact customer support for a license for this product.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 2

License Agreement and Service Information
A. 2 License Agreement and Service Information

A2.1 End-User License Agreement

IMPORTANT-READ CAREFULLY:

This StoneFly, Inc. (StoneFly) End-User License Agreement ("EULA") is a legal agreement between you (either an individual or a single entity) and StoneFly for the StoneFly software accompanying this EULA, which includes computer software and may include associated media, printed materials, and "online" or electronic documentation ("SOFTWARE PRODUCT" or "SOFTWARE"). By using the SOFTWARE PRODUCT, you agree to be bound by the terms of this EULA. If you do not agree to the terms of this EULA, you may not use the SOFTWARE PRODUCT.

1. Software PRODUCT LICENSE

The SOFTWARE PRODUCT is licensed, not sold. This EULA grants you the following non-exclusive rights:

1.1 Use. You may use the SOFTWARE PRODUCT as long as it is installed on the StoneFly hardware it was purchased with or on replacement StoneFly hardware in the event of a warranty replacement.

1.2 Reproduction. You may reproduce copies of the SOFTWARE PRODUCT for backup or archival purposes only.

2. DESCRIPTION OF OTHER RIGHTS AND LIMITATIONS

2.1 Reverse Engineering, Decompilation, and Disassembly. You may not, and you shall not allow third parties to, reverse engineer, decompile, or disassemble the SOFTWARE PRODUCT, except and only to the extent that such activity is expressly permitted by applicable law notwithstanding this limitation.

2.2 Modification. You may not, and you shall not allow third parties to, modify the SOFTWARE PRODUCT or incorporate the SOFTWARE PRODUCT into, or with, any other software.

2.3 Separation of Components. The SOFTWARE PRODUCT is licensed as a single product. The SOFTWARE PRODUCT’s component parts may not be separated for use on more than one computer.

2.4 Software Transfer. You may permanently transfer all of your rights under this EULA, provided the recipient agrees to the terms of this EULA.

2.5 Product Identification. You may not, and you shall not allow third parties to, remove any SOFTWARE PRODUCT identification or other notices.

3. COPYRIGHT

The SOFTWARE PRODUCT is protected by copyright laws and international copyright treaties, as well as other intellectual property laws and treaties. All title, copyrights and all other intellectual property rights in and to the SOFTWARE PRODUCT (including but not limited to any images, photographs, animations, video, audio, music, text, and “applets” incorporated
into the SOFTWARE PRODUCT), the accompanying printed materials, and any copies of the SOFTWARE PRODUCT are owned by StoneFly or its suppliers. The SOFTWARE PRODUCT is protected by copyright laws and international treaty provisions. Therefore, you must treat the SOFTWARE PRODUCT like any other copyrighted material.

4. TRADEMARKS

“StoneFly” and any other registered and non-registered trademarks are trademarks of StoneFly, All Rights Reserved. StoneFly’s failure to list a trademark in this Section shall not constitute a waiver of any trademark rights. All other trademarks in the SOFTWARE PRODUCT not owned by StoneFly are the property of their respective owners.

5. U.S. GOVERNMENT RESTRICTED RIGHTS

The SOFTWARE PRODUCT and documentation are provided with RESTRICTED RIGHTS. Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subparagraph ©(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 or subparagraphs ©(1) and (2) of the Commercial Computer Software-Restricted Rights at 48 CFR 52.227-19, as applicable. Manufacturer is StoneFly, Inc., 26250 Eden Landing Road, Hayward, CA 94545.

6. LIMITED WARRANTY

6.1 NO WARRANTIES. STONEFLY EXPRESSLY DISCLAIMS ANY WARRANTY FOR THE SOFTWARE PRODUCT. THE SOFTWARE PRODUCT AND ANY RELATED DOCUMENTATION IS PROVIDED “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OR MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NONINFRINGEMENT. THE ENTIRE RISK ARISING OUT OF USE OR PERFORMANCE OF THE SOFTWARE PRODUCT REMAINS WITH YOU.

6.2 Some jurisdictions do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. You may have other rights which vary from jurisdiction to jurisdiction.

6.3 LIMITATION OF LIABILITY. THE ENTIRE RISK AS TO THE RESULTS AND PERFORMANCE OF THE SOFTWARE PRODUCT IS ASSUMED BY YOU. STONEFLY SHALL NOT HAVE ANY LIABILITY TO YOU OR ANY OTHER PERSON OR ENTITY FOR ANY INDIRECT, INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES WHATSOEVER, INCLUDING, BUT NOT LIMITED TO, LOSS OF REVENUE OR PROFIT, LOST OR DAMAGED DATA OR OTHER COMMERCIAL OR ECONOMIC LOSS, EVEN IF STONEFLY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR THEY ARE FORESEEABLE. OUR MAXIMUM AGGREGATE LIABILITY TO YOU FOR DIRECT DAMAGES SHALL NOT EXCEED THE AMOUNT PAID BY YOU FOR THE SOFTWARE PRODUCT. THE LIMITATIONS IN THIS SECTION SHALL APPLY WHETHER OR NOT THE ALLEGED BREACH OR DEFAULT IS A BREACH OF A FUNDAMENTAL CONDITION OR TERM OR A FUNDAMENTAL BREACH.

Because some states/jurisdictions do not allow the exclusion or limitation of liability for consequential or incidental damages, the above limitation may not apply to you.
7. TERM

The EULA is effective until terminated. You may terminate the EULA at any time by returning or destroying all copies of the SOFTWARE PRODUCT and related documentation. The EULA will terminate automatically if you fail to comply with any term or condition of the EULA, including any attempt to transfer a copy of the SOFTWARE PRODUCT to another party except as provided in the EULA. You agree upon such termination, you will return or destroy all copies of the EULA and related documentation. The provisions of Sections 2 – 8 shall survive termination.

8. Miscellaneous

8.1 Governing Law. You agree that this EULA is governed by the laws of the State of California, without reference to conflicts of law principles or the United Nations Convention on Contracts for the International Sale of Goods. The sole jurisdiction and venue for actions related to the subject matter hereof shall be the state and U.S. federal courts having within their jurisdiction the location of the StoneFly’s principal place of business. Both parties consent to the jurisdiction of such courts and agree that process may be served in the manner provided herein for giving notices or otherwise as allowed by California state or U.S. federal law. In any action to enforce this Agreement, the prevailing party shall be entitled to costs and attorneys’ fees.

8.2 Severability. If any provision of these End-User Terms and Conditions is held to be invalid, illegal or unenforceable, it shall be severed and the remaining provisions shall continue in full force and effect.

8.3 Entire Agreement and Waiver. The EULA is the entire agreement regarding your use of the SOFTWARE PRODUCTS, superseding any other agreement or discussions, oral or written, and may not be changed except by a signed agreement. At no time shall a failure or delay in enforcing any provisions, exercising any option or requiring performance, be construed to be a waiver.

Should you have any questions concerning this EULA, or if you desire to contact StoneFly for any reason, please write to: StoneFly, Inc., 26250 Eden Landing Road, Hayward, CA 94545.
A. 2 License Agreement and Service Information

A2.2 Service Policy

Your StoneFly Cloud Drive service is covered 7 days a week, 24 hours a day, and 365 days a year by StoneFly’s web-based and telephone technical support for as long as you have a valid StoneFly Cloud Drive subscription.

In order to initiate StoneFly Customer Support coverage for your product you must first register your product via StoneFly’s web site, www.stonefly.com. Please have your System UUID and MAC addresses available when you start the registration process and contact StoneFly for support.
A2.3 Legal Terms and Disclosures

The information in this document has been reviewed and is believed to be accurate. However, neither StoneFly nor its affiliates assume any responsibility for inaccuracies, errors, or emissions that may be contained herein. In no event will StoneFly or its affiliates be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect or omission in this document, even if advised of the possibility of such damages. StoneFly reserves the right to make improvements or changes to this document and the products and services described at any time, without notice or obligation.
Trade Names

StoneFly, the StoneFly logo, Storage Concentrator, Integrated Storage Concentrator, ISC, Modular Storage Concentrator, StoneFly Backup Advantage, StoneFusion, StoneFly Replicator CDP, ValueSAN, Unified Scale Out, USO, Super Scale Out, SSO, Twin Scale Out, TSO, Unified Storage & Server, USS, Unified Deduplicated Storage, UDS, Unified Encrypted Storage, UES, OptiSAN, StoneFly Voyager, DR365, DR365 Fusion, StoneFly Mirroring, Storage Concentrator Virtual Machine, SCVM, Software-Defined Unified Storage, SDUS, and StoneFly Cloud Drive are trademarks of StoneFly, Inc., a wholly owned subsidiary of Dynamic Network Factory, Inc. Other trademarks and trade names may be used in this document to refer to either the entities claiming the marks and names or their products. StoneFly disclaims any proprietary interest in trademarks and trade names other than its own. StoneFly cannot be responsible for errors in typography and photography. All rights reserved. Service specifications are valid in the US only and subject to change without notice. Reproduction in any manner whatsoever without the written permission of StoneFly is strictly forbidden.
This page is intentionally left blank.
Appendix 3

Other Licenses
A. 3 Other Licenses

GNU General Public License

Standard versions of the following software modules are installed on your StoneFly product along with StoneFly-developed software, reference StoneFly End User License Agreement. StoneFly has not made modifications to these modules.

Listed below are the copyright notices for each of these software modules, as well a copy of the GNU General Public License, GNU Library General Public License, Source Code Agreement, Other Copyrights and the Artistic License that apply. Complete, machine-readable source code for each of these software modules is provided on your StoneFly product.

ANSIColor

Copyright 1996, 1997, 1998, 2000, 2001 Russ Allbery <rra@stanford.edu> and Zenin <zenin@bawdycaste.org>. This program is free software; you may redistribute it and/or modify it under the same terms as Perl itself.

CGI.pm

Copyright 1995-1997, Lincoln D. Stein. All rights reserved. It may be used and modified freely, but I do request that this copyright notice remain attached to the file. You may modify this module as you wish, but if you redistribute a modified version, please attach a note listing the modifications you have made.

libnet

© 1996-2000 Graham Barr. All rights reserved. This library is free software; you can redistribute it and/ or modify it under the same terms as Perl itself.

MIME-Base64

Copyright 1995-1999,2001 Gisle Aas. This library is free software; you can redistribute it and/or modify it under the same terms as Perl itself.

Time-HiRes

Copyright © 1996, 1997, 1998 Douglas E. Wegscheid. All rights reserved. This program is free software; you can redistribute it and/or modify it under the same terms as Perl itself.

ApacheDBI

© Edmund Mergl, November 20, 1999. You may distribute under the terms of either the GNU General Public License or the Artistic License, as specified in the Perl README file.

Data-Dumper

Copyright © 1996-98 Gurusamy Sarathy. All rights reserved. This program is free software; you can redistribute it and/or modify it under the same terms as Perl itself.
A. 3 Other Licenses

DBI.pm

© 1994-2000 Tim Bunce. England. All rights reserved. You may distribute under the terms of either the GNU General Public License or the Artistic License, as specified in the Perl README file.

Mail-Sendmail

© Milivoj Ivkovic. You can use it freely. (Someone complained this is too vague. So, more precisely: do whatever you want with it, but be warned that terrible things will happen to you if you use it badly, like for sending spam, claiming you wrote it alone, or ...?) I would appreciate a short (or long) e-mail note if you use this (and even if you don’t, especially if you care to say why). And of course, bug-reports and/or suggestions are welcome.

SNMP

Copyright © 1995-2000 G. S. Marzot. All rights reserved. This program is free software; you can redistribute it and/or modify it under the same terms as Perl itself.

URI

Copyright 1998-2001 Gisle Aas. Copyright 1998 Graham Barr. This library is free software; you can redistribute it and/or modify it under the same terms as Perl itself.


Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software-to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation’s software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.
We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author’s protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors’ reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that re-distributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone’s free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.
A. 3 Other Licenses

A3.1 GNU GENERAL PUBLIC LICENSE TERMS AND CONDITIONS
FOR COPYING, DISTRIBUTING AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by
the copyright holder saying it may be distributed under the terms of this General Public License.
The "Program", below, refers to any such program or work, and a "work based on the Program" means
either the Program or any derivative work under copyright law: that is to say, a work containing
the Program or a portion of it, either verbatim or with modifications and/or translated into another
language. (Hereinafter, translation is included without limitation in the term "modification".) Each
licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License;
they are outside its scope. The act of running the Program is not restricted, and the output
from the Program is covered only if its contents constitute a work based on the Program
(independent of having been made by running the Program). Whether that is true depends
on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you
receive it, in any medium, provided that you conspicuously and appropriately publish on each
copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices
that refer to this License and to the absence of any warranty; and give any other recipients
of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option
offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a
work based on the Program, and copy and distribute such modifications or work under the
terms of Section 1 above, provided that you also meet all of these conditions:

a) You must cause the modified files to carry prominent notices stating that you changed the
files and the date of any change.

b) You must cause any work that you distribute or publish, that in whole or in part contains
or is derived from the Program or any part thereof, to be licensed as a whole at no charge to
all third parties under the terms of this License.

c) If the modified program normally reads commands interactively when run, you must cause
it, when started running for such interactive use in the most ordinary way, to print or display
an announcement including an appropriate copyright notice and a notice that there is no
warranty (or else, saying that you provide a warranty) and that users may redistribute the
program under these conditions, and telling the user how to view a copy of this License.
(Exception: if the Program itself is interactive but does not normally print such an
announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that
work are not derived from the Program, and can be reasonably considered independent and
separate works in themselves, then this License, and its terms, do not apply to those
sections when you distribute them as separate works. But when you distribute the same
sections as part of a whole which is a work based on the Program, the distribution of the
whole must be on the terms of this License, whose permissions for other licensees extend to
the entire whole, and thus to each and every part regardless of who wrote it.
Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

   a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

   b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

   c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.
6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients’ exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and “any later version”, you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.
A. 3 Other Licenses

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

GNU Library General Public License

Version 2, June 1991 Copyright © 1991 Free Software Foundation, Inc. 59 Temple Place - Suite 330, Boston, MA 02111-1307, USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

[This is the first released version of the library GPL. It is numbered 2 because it goes with version 2 of the ordinary GPL.]

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users.

This license, the Library General Public License, applies to some specially designated Free Software Foundation software, and to any other libraries whose authors decide to use it. You can use it for your libraries, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library, or if you modify it.
For example, if you distribute copies of the library, whether gratis or for a fee, you must give
the recipients all the rights that we gave you. You must make sure that they, too, receive or
can get the source code. If you link a program with the library, you must provide complete
object files to the recipients so that they can relink them with the library, after making
changes to the library and recompiling it. And you must show them these terms so they
know their rights.

Our method of protecting your rights has two steps: (1) copyright the library, and (2) offer
you this license which gives you legal permission to copy, distribute and/or modify the
library.

Also, for each distributor’s protection, we want to make certain that everyone understands
that there is no warranty for this free library. If the library is modified by someone else and
passed on, we want its recipients to know that what they have is not the original version, so
that any problems introduced by others will not reflect on the original authors’ reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the
danger that companies distributing free software will individually obtain patent licenses, thus
in effect transforming the program into proprietary software. To prevent this, we have made
it clear that any patent must be licensed for everyone’s free use or not licensed at all.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public
License, which was designed for utility programs. This license, the GNU Library General Public
License, applies to certain designated libraries. This license is quite different from the
ordinary one; be sure to read it in full, and don’t assume that anything in it is the same as in
the ordinary license.

The reason we have a separate public license for some libraries is that they blur the
distinction we usually make between modifying or adding to a program and simply using it.
Linking a program with a library, without changing the library, is in some sense simply using
the library, and is analogous to running a utility program or application program. However, in
textual and legal sense, the linked executable is a combined work, a derivative of the
original library, and the ordinary General Public License treats it as such.

Because of this blurred distinction, using the ordinary General Public License for libraries did
not effectively promote software sharing, because most developers did not use the libraries.
We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those
programs of all benefit from the free status of the libraries themselves. This Library General
Public License is intended to permit developers of non-free programs to use free libraries,
while preserving your freedom as a user of such programs to change the free libraries that
are incorporated in them. (We have not seen how to achieve this as regards changes in
header files, but we have achieved it as regards changes in the actual functions of the
Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close
attention to the difference between a “work based on the library” and a “work that uses the
library”. The former contains code derived from the library, while the latter only works
together with the library.

Note that it is possible for a library to be covered by the ordinary General Public License
rather than by this special one.
A3.2 GNU GENERAL PUBLIC LICENSE TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION, AND MODIFICATION OF SOFTWARE LIBRARY

0. This License Agreement applies to any software library which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Library General Public License (also called “this License”). Each licensee is addressed as “you”.

A “library” means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The “Library”, below, refers to any such software library or work which has been distributed under these terms. A “work based on the Library” means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term “modification”.)

“Source code” for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library’s complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a) The modified work must itself be a software library.

b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

d) If a facility in the modified Library refers to a function or a table of data to be supplied by
an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful. (For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls
outside the scope of this License.

However, linking a “work that uses the Library” with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a “work that uses the library”. The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a “work that uses the Library” uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a “work that uses the Library” with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer’s own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable “work that uses the Library”, as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

c) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

d) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.
For an executable, the required form of the “work that uses the Library” must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

b) Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

8. You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients’ exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License...
would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

13. The Free Software Foundation may publish revised and/or new versions of the Library General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and “any later version”, you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR
REDISTRICT THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License).

To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the “copyright” line and a pointer to where the full notice is found.

One line to give the library’s name and an idea of what it does.

Copyright © year name of author

This library is free software; you can redistribute it and/or modify it under the terms of the GNU Library General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Library General Public License for more details.

You should have received a copy of the GNU Library General Public License along with this library; if not, write to the Free Software Foundation, Inc., 59 Temple Place - Suite 330, Boston, MA 02111-1307, USA.

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a “copyright disclaimer” for the library, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the library ‘Frob’ (a library for tweaking knobs) written by James Random Hacker.

signature of Ty Coon, 1 April 1990 Ty Coon, President of Vice

That’s all there is to it!

SOURCE CODE Version 1.2D

AGREEMENT PLEASE READ THIS AGREEMENT CAREFULLY. By accessing and using the Source Code, you accept this Agreement in its entirety and agree to only use the Source Code in accordance with the following terms and conditions. If you do not wish to be bound by these terms and conditions, do not access or use the Source Code.
A3.3 YOUR REPRESENTATIONS

A3.3.1 You represent and warrant that:

a. If you are an entity, or an individual other than the person accepting this Agreement, the person accepting this Agreement on your behalf is your legally authorized representative, duly authorized to accept agreements of this type on your behalf and obligate you to comply with its provisions;

b. You have read and fully understand this Agreement in its entirety;

c. Your Build Materials are either original or do not include any Software obtained under a license that conflicts with the obligations contained in this Agreement;

d. To the best of your knowledge, your Build Materials do not infringe or misappropriate the rights of any person or entity; and,

e. You will regularly monitor the Website for any notices.

A3.3.2 DEFINITIONS AND INTERPRETATION

1. For purposes of this Agreement, certain terms have been defined below and elsewhere in this Agreement to encompass meanings that may differ from, or be in addition to, the normal connotation of the defined word.

a. “Additional Code” means Software in source code form which does not contain
   i. any of the Source Code, or
   ii. derivative work (such term having the same meaning in this Agreement as under U.S. Copyright Law) of the Source Code.

b. “AT&T Patent Claims” means those claims of patents (i) owned by AT&T and (ii) licensable without restriction or obligation, which, absent a license, are necessarily and unavoidably infringed by the use of the functionality of the Source Code.

c. “Build Materials” means, with reference to a Derived Product, the Patch and Additional Code, if any, used in the preparation of such Derived Product, together with written instructions that describe, in reasonable detail, such preparation.

d. “Capsule” means a computer file containing the exact same contents as a computer file downloaded from the Website.

e. “Derived Product” means a Software Product which is a derivative work of the Source Code.

f. “IPR” means all rights protectable under intellectual property law anywhere throughout the world, including rights protectable under patent, copyright and trade secret laws, but not trademark rights.

g. “Patch” means Software for changing all or any portion of the Source Code.

h. “Proprietary Notice” means the following statement:
“This product contains certain software code or other information (“AT&T Software”) proprietary to AT&T Corp. (“AT&T”). The AT&T Software is provided to you “AS IS”. YOU ASSUME TOTAL RESPONSIBILITY AND RISK FOR USE OF THE AT&T SOFTWARE. AT&T DOES NOT MAKE, AND EXPRESSLY DISCLAIMS, ANY EXPRESS OR IMPLIED WARRANTIES OF ANY KIND WHATSOEVER, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WARRANTIES OF TITLE OR NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHTS, ANY WARRANTIES ARISING BY USAGE OF TRADE, COURSE OF DEALING OR COURSE OF PERFORMANCE, OR ANY WARRANTY THAT THE AT&T SOFTWARE IS “ERROR FREE” OR WILL MEET YOUR REQUIREMENTS.

Unless you accept a license to use the AT&T Software, you shall not reverse compile, disassemble or otherwise reverse engineer this product to ascertain the source code for any AT&T Software.

© AT&T Corp. All rights reserved. AT&T is a registered trademark of AT&T Corp.”

i. “Software” means, as the context may require, source or object code instructions for controlling the operation of a central processing unit or computer, and computer files containing data or text.

j. “Software Product” means a collection of computer files containing Software in object code form only, which, taken together, reasonably comprise a product, regardless of whether such product is intended for internal use or commercial exploitation. A single computer file can comprise a Software Product.

k. “Source Code” means the Software contained in compressed form in the Capsule.

l. “Website” means the Internet website having the URL http://www.research.att.com/sw/download/. AT&T may change the content or URL of the Website, or remove it from the Internet altogether.

2. By way of clarification only, the terms Capsule, Proprietary Notice and Source Code when used in this Agreement shall mean the materials and information defined by such terms without any change, enhancement, amendment, alteration or modification (collectively, “change”).

A3.3.3 GRANT OF RIGHTS

1. Subject to third party intellectual property claims, if any, and the terms and conditions of this Agreement, AT&T grants to you under:

a. the AT&T Patent Claims and AT&T’s copyright rights in the Source Code, a non-exclusive, fully paid-up license to:

i Reproduce and distribute the Capsule;

ii Display, perform, use, and compile the Source Code and execute the resultant binary Software on a computer;

iii Prepare a Derived Product solely by compiling Additional Code, if any, together with the code resulting from operating a Patch on the Source Code; and,
iv Execute on a computer and distribute to others *Derived Products*,

except that, with respect to the *AT&T Patent Claims*, the license rights granted in clauses (iii) and (iv) above shall only extend, and be limited, to that portion of a *Derived Product* which is *Software* compiled from some portion of the *Source Code*; and,

b. AT&T’s copyright rights in the *Source Code*, a non-exclusive, fully paid-up license to prepare and distribute *Patches* for the *Source Code*.

2. Subject to the terms and conditions of this Agreement, you may create a hyperlink between an Internet website owned and controlled by you and the *Website*, which hyperlink describes in a fair and good faith manner where the *Capsule* and *Source Code* may be obtained, provided that, you do not frame the *Website* or otherwise give the false impression that AT&T is somehow associated with, or otherwise endorses or sponsors your website. Any goodwill associated with such hyperlink shall inure to the sole benefit of AT&T. Other than the creation of such hyperlink, nothing in this Agreement shall be construed as conferring upon you any right to use any reference to AT&T, its trade names, trademarks, service marks or any other indicia of origin owned by AT&T, or to indicate that your products or services are in any way sponsored, approved or endorsed by, or affiliated with, AT&T.

3. Except as expressly set forth in Section 3.1 above, no other rights or licenses under any of AT&T’s *IPR* are granted or, by implication, estoppels or otherwise, conferred. By way of example only, no rights or licenses under any of AT&T’s patents are granted or, by implication, estoppels or otherwise, conferred with respect to any portion of a *Derived Product* which is not *Software* compiled from some portion, without change, of the *Source Code*.

A3.3.4 YOUR OBLIGATIONS

1. If you distribute *Build Materials* (including if you are required to do so pursuant to this Agreement), you shall ensure that the recipient enters into and duly accepts an agreement with you which includes the minimum terms set forth in Appendix A (completed to indicate you as the LICENSOR) and no other provisions which, in AT&T’s opinion, conflict with your obligations under, or the intent of, this Agreement. The agreement required under this Section 4.1 may be in electronic form and may be distributed with the *Build Materials* in a form such that the recipient accepts the agreement by using or installing the *Build Materials*. If any *Additional Code* contained in your *Build Materials* includes *Software* you obtained under license, the agreement shall also include complete details concerning the license and any restrictions or obligations associated with such *Software*.

2. If you prepare a *Patch* which you distribute to anyone else you shall:
   a. Contact AT&T, as may be provided on the *Website* or in a text file included with the *Source Code*, and describe for AT&T such *Patch* and provide AT&T with a copy of such *Patch* as directed by AT&T; or,
   b. Where you make your *Patch* generally available on your Internet website, you shall provide AT&T with the URL of your website and hereby grant to AT&T a non-exclusive, fully-paid up right to create a hyperlink between your website and a page associated with the *Website*.

3. If you prepare a *Derived Product*, such product shall conspicuously display to users, and any corresponding documentation and license agreement shall include as a provision, the *Proprietary Notice*. 
A3.3.5 YOUR GRANT OF RIGHTS TO AT&T

1. You grant to AT&T under any IPR owned or licensable by you which in any way relates to your Patches, a non-exclusive, perpetual, worldwide, fully paid-up, unrestricted, irrevocable license, along with the right to sublicense others, to (a) make, have made, use, offer to sell, sell and import any products, services or any combination of products or services, and (b) reproduce, distribute, prepare derivative works based on, perform, display and transmit your Patches in any media whether now known or in the future developed.

A3.3.6 AS IS CLAUSE / LIMITATION OF LIABILITY

1. The Source Code and Capsule are provided to you “AS IS”. YOU ASSUME TOTAL RESPONSIBILITY AND RISK FOR YOUR USE OF THEM INCLUDING THE RISK OF ANY DEFECTS OR INACCURACIES THEREIN. AT&T DOES NOT MAKE, AND EXPRESSLY DISCLAIMS, ANY EXPRESS OR IMPLIED WARRANTIES OF ANY KIND WHATSOEVER, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WARRANTIES OF TITLE OR NONINFRINGEMENT OF ANY IPR OR TRADEMARK RIGHTS, ANY WARRANTIES ARISING BY USAGE OF TRADE, COURSE OF DEALING OR COURSE OF PERFORMANCE, OR ANY WARRANTY THAT THE SOURCE CODE OR CAPSULE ARE “ERROR FREE” OR WILL MEET YOUR REQUIREMENTS.

2. IN NO EVENT SHALL AT&T BE LIABLE FOR (a) ANY INCIDENTAL, CONSEQUENTIAL, OR INDIRECT DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, LOSS OF PROGRAMS OR INFORMATION, AND THE LIKE) ARISING OUT OF THE USE OF OR INABILITY TO USE THE SOURCE CODE OR CAPSULE, EVEN IF AT&T OR ANY OF ITS AUTHORIZED REPRESENTATIVES HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, (b) ANY CLAIM ATTRIBUTABLE TO ERRORS, OMISSIONS, OR OTHER INACCURACIES IN THE SOURCE CODE OR CAPSULE, OR (c) ANY CLAIM BY ANY THIRD PARTY.

3. BECAUSE SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU. IN THE EVENT THAT APPLICABLE LAW DOES NOT ALLOW THE COMPLETE EXCLUSION OR LIMITATION OF LIABILITY OF CLAIMS AND DAMAGES AS SET FORTH IN THIS AGREEMENT, AT&T’S LIABILITY IS LIMITED TO THE GREATEST EXTENT PERMITTED BY LAW.

A3.3.7 INDEMNIFICATION

1. You shall indemnify and hold harmless AT&T, its affiliates and authorized representatives against any claims, suits or proceedings asserted or commenced by any third party and arising out of, or relating to, your use of the Source Code. This obligation shall include indemnifying against all damages, losses, costs and expenses (including attorneys’ fees) incurred by AT&T, its affiliates and authorized representatives as a result of any such claims, suits or proceedings, including any costs or expenses incurred in defending against any such claims, suits, or proceedings.

A3.3.8 GENERAL

1. You shall not assert against AT&T, its affiliates or authorized representatives any claim for infringement or misappropriation of any IPR or trademark rights in any way relating to the Source Code, including any such claims relating to any Patches.

2. In the event that any provision of this Agreement is deemed illegal or unenforceable,
3. Your rights and license (but not any of your obligations) under this Agreement shall terminate automatically in the event that (a) notice of a non-frivolous claim by a third party relating to the Source Code or Capsule is posted on the Website, (b) you have knowledge of any such claim, (c) any of your representations or warranties in Article 1.0 or Section 8.4 are false or inaccurate, (d) you exceed the rights and license granted to you or (e) you fail to fully comply with any provision of this Agreement. Nothing in this provision shall be construed to restrict you, at your option and subject to applicable law, from replacing the portion of the Source Code that is the subject of a claim by a third party with non-infringing code or from independently negotiating for necessary rights from the third party.

4. You acknowledge that the Source Code and Capsule may be subject to U.S. export laws and regulations, and, accordingly, you hereby assure AT&T that you will not, directly or indirectly, violate any applicable U.S. laws and regulations.

5. Without limiting any of AT&T’s rights under this Agreement or at law or in equity, or otherwise expanding the scope of the license and rights granted hereunder, if you fail to perform any of your obligations under this Agreement with respect to any of your Patches or Derived Products, or if you do any act which exceeds the scope of the license and rights granted herein, then such Patches, Derived Products and acts are not licensed or otherwise authorized under this Agreement and such failure shall also be deemed a breach of this Agreement. In addition to all other relief available to it for any breach of your obligations under this Agreement, AT&T shall be entitled to an injunction requiring you to perform such obligations.

6. This Agreement shall be governed by and construed in accordance with the laws of the State of New York, USA, without regard to its conflicts of law rules. This Agreement shall be fairly interpreted in accordance with its terms and without any strict construction in favor of or against either AT&T or you. Any suit or proceeding you bring relating to this Agreement shall be brought and prosecuted only in New York, New York, USA.
Portions of code may be covered by the following copyrights:

### A3.4.1 X Consortium

Copyright © 1996 X Consortium

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “Software”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED “AS IS”, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE X CONSORTIUM BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of the X Consortium shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization from the X Consortium.

X Window System is a trademark of X Consortium, Inc.

### A3.4.2 Berkeley-based copyrights:

**General**

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR “AS IS” AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

A3.4.3 UCB/LBL

Copyright © 1993 The Regents of the University of California. All rights reserved.

This software was developed by the Computer Systems Engineering group at Lawrence Berkeley Laboratory under DARPA contract BG 91-66 and contributed to Berkeley.

All advertising materials mentioning features or use of this software must display the following acknowledgement: This product includes software developed by the University of California, Lawrence Berkeley Laboratory.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

3. All advertising materials mentioning features or use of this software must display the following acknowledgement: This product includes software developed by the University of California, Berkeley and its contributors.

4. Neither the name of the University nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

The "Artistic License" Preamble

The intent of this document is to state the conditions under which a Package may be copied, such that the Copyright Holder maintains some semblance of artistic control over the development of the package, while giving the users of the package the right to use and distribute the Package in a more-or-less customary fashion, plus the right to make reasonable modifications.
A3.5 Definitions:

“Package” refers to the collection of files distributed by the Copyright Holder, and derivatives of that collection of files created through textual modification.

“Standard Version” refers to such a Package if it has not been modified, or has been modified in accordance with the wishes of the Copyright Holder as specified below.

“Copyright Holder” is whoever is named in the copyright or copyrights for the package.

“You” is you, if you’re thinking about copying or distributing this Package.

“Reasonable copying fee” is whatever you can justify on the basis of media cost, duplication charges, time of people involved, and so on. (You will not be required to justify it to the Copyright Holder, but only to the computing community at large as a market that must bear the fee.)

“Freely Available” means that no fee is charged for the item itself, though there may be fees involved in handling the item. It also means that recipients of the item may redistribute it under the same conditions they received it.

1. You may make and give away verbatim copies of the source form of the Standard Version of this Package without restriction, provided that you duplicate all of the original copyright notices and associated disclaimers.

2. You may apply bug fixes, portability fixes and other modifications derived from the Public Domain or from the Copyright Holder. A Package modified in such a way shall still be considered the Standard Version.

3. You may otherwise modify your copy of this Package in any way, provided that you insert a prominent notice in each changed file stating how and when you changed that file, and provided that you do at least ONE of the following:
   a. place your modifications in the Public Domain or otherwise make them Freely Available, such as by posting said modifications to Usenet or an equivalent medium, or placing the modifications on a major archive site such as uunet.uu.net, or by allowing the Copyright Holder to include your modifications in the Standard Version of the Package.
   b. use the modified Package only within your corporation or organization.
   c. rename any non-standard executables so the names do not conflict with standard executables, which must also be provided, and provide a separate manual page for each non-standard executable that clearly documents how it differs from the Standard Version.
   d. make other distribution arrangements with the Copyright Holder.

4. You may distribute the programs of this Package in object code or executable form, provided that you do at least ONE of the following:
   a. distribute a Standard Version of the executables and library files, together with instructions (in the manual page or equivalent) on where to get the Standard Version.
A. 3 Other Licenses

b. accompany the distribution with the machine-readable source of the Package with your modifications.

c. give non-standard executables non-standard names, and clearly document the differences in manual pages (or equivalent), together with instructions on where to get the Standard Version.

d. make other distribution arrangements with the Copyright Holder.

5. You may charge a reasonable copying fee for any distribution of this Package. You may charge any fee you choose for support of this Package. You may not charge a fee for this Package itself. However, you may distribute this Package in aggregate with other (possibly commercial) programs as part of a larger (possibly commercial) software distribution provided that you do not advertise this Package as a product of your own. You may embed this Package’s interpreter within an executable of yours (by linking); this shall be construed as a mere form of aggregation, provided that the complete Standard Version of the interpreter is so embedded.

6. The scripts and library files supplied as input to or produced as output from the programs of this Package do not automatically fall under the copyright of this Package, but belong to whoever generated them, and may be sold commercially, and may be aggregated with this Package. If such scripts or library files are aggregated with this Package via the so-called “undump” or “unexec” methods of producing a binary executable image, then distribution of such an image shall neither be construed as a distribution of this Package nor shall it fall under the restrictions of Paragraphs 3 and 4, provided that you do not represent such an executable image as a Standard Version of this Package.

7. Subroutines (or comparably compiled subroutines in other languages) supplied by you and linked into this Package in order to emulate subroutines and variables of the language defined by this Package shall not be considered part of this Package, but are the equivalent of input as in Paragraph 6, provided these subroutines do not change the language in any way that would cause it to fail the regression tests for the language.

8. Aggregation of this Package with a commercial distribution is always permitted provided that the use of this Package is embedded; that is, when no overt attempt is made to make this Package’s interfaces visible to the end user of the commercial distribution. Such use shall not be construed as a distribution of this Package.

9. The name of the Copyright Holder may not be used to endorse or promote products derived from this software without specific prior written permission.

10. THIS PACKAGE IS PROVIDED “AS IS” AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
Appendix 4

Glossary
Administrative Interface

The graphical administrative interface is accessed from a computer on the network via a web browser. The following functions are available through the interface: Storage Concentrator discovery, physical resource management, storage pool management, logical volume management, target management, Access Control List management (ACL), system management, session management.

Concatenation

A logical joining of two series of data, usually represented by the symbol "|". In data communications, two or more data are often concatenated to provide a unique name or reference (e.g., S_ID | X_ID). Volume managers concatenate disk address spaces to present a single larger address space.

Configuration

1. The process of installing or removing hardware or software components required for a system or subsystem to function.
2. Assignment of the operating parameters of a system, subsystem, or device. For example, disk array configuration includes designating the member disks or extents for the array, as well as setting parameters such as stripe depth, RAID model, and cache allowance.
3. The collection of hardware and software components and operating parameters for an operating system.

Database Management System (DBMS)

A set of computer programs with a user and/or programming interface that supports defining the format of a database, and creating and accessing the data. A database management system removes the need for a user or program to manage low-level database storage. It also provides security and assures the integrity of the data it contains. Database management systems may be relational (table-oriented) or object oriented.

Data Transfer Rate

The amount of data per unit time moved across an I/O bus while executing an I/O load. For any I/O load, the data transfer capacity of an I/O subsystem is limited by its data transfer rate. For disk subsystem I/O, data transfer rate is usually expressed in MB/second (millions of bytes per second where 1 million is $10^6$).

File System

Software that imposes structure on the address space of one or more physical or logical disks so that applications may deal more conveniently with abstract-named data objects of variable size (files). File systems are often supplied as operating system components, but are implemented and marketed as independent software components.
Graphical User Interface (GUI)

A user interface for intelligent devices that is characterized by pictorial displays and highly structured forms-oriented input.

Host

A computer connected to storage; typically a server running applications or providing services that access and consume storage.

Input/Output (I/O)

The process of moving data between the main memory of a computer system and an external device or interface such as a storage device, display, printer, or network connected to other computer systems. I/O is a collective term for reading, or moving data into a computer system's memory, and writing, or moving data from a computer system's memory to another location.

Live Volume

The volume that is being accessed by the host for normal operations. The data on this volume is complete and not accessed via pointers and/or data structures. The difference between a regular volume and a Live Volume is that the Live Volume has been Snapshot enabled.

Logical Device

A device presented to an operating environment by control software or by a volume manager. From an application standpoint, a logical device is equivalent to a physical one. In some implementations, logical devices may differ from physical ones at the operating system level (e.g., booting from a host based disk array may not be possible).

Logical Partition Logical Unit

A logical partition is a segmentation of a logical volume.

Logical Unit Number (LUN)

The entity within a SCSI target that executes I/O commands. SCSI I/O commands are sent to a target and executed by a logical unit within that target. A SCSI physical disk typically has a single logical unit. Tape drives and array controllers may incorporate multiple logical units to which I/O commands can be addressed. Each logical unit exported by an array controller corresponds to a logical disk. (Common practice uses the terms “Logical Unit” and “LUN” interchangeably, although this is not strictly correct).

A SCSI representation of a system drive on a given channel and target ID. An encoded three-bit identifier for the logical unit.
**Logical Volume**

An arbitrary-sized space in a volume group that can be used as an address space for a file system or as device swap space. Logical volumes behave like disk block devices, except that, unlike physical disk partitions, they can be dynamically grown, shrunk and moved about without rebooting an operating system or entering into a maintenance or stand-alone mode.

**Mapping**

Conversion between two data addressing spaces. For example, mapping refers to the conversion between physical disk block addresses and the block addresses of the logical disks presented to operating environments by control software.

**Management Information Base (MIB)**

In SNMP, a collection of data elements that define the device settings the Storage Concentrator can control and the information it can retrieve it from a storage device.

**Metadata**

Data that describes data. In disk arrays, meta-data consists of items such as array membership, member extent sizes and locations, descriptions of logical disks and partitions, and array state information. In file systems, meta-data includes file names, file properties and security information, and lists of block addresses at which each file’s data is stored.

**Mount Directory**

Directory in any file system where the top directory of a descendent file system is mounted. The contents of the mount directory are the contents of the top directory in the mounted file system. If the mount directory is not empty before the file system is mounted, any existing files and directories in that directory as well as any descendent directories become invisible (and inaccessible) until the file system is un-mounted.

**Mount Point**

Synonym for mount directory. The mount point is the location (directory) where a file system, known to the host system, is mounted. Usually defined in terms of which system the file system is mounted on and where on that system the file system is mounted.

**Network Attached Storage (NAS)**

A term used to refer to storage elements that connect to a network and provide file access services to computer systems. “Network Attached Storage” is abbreviated as “NAS”. A NAS Storage Element consists of an engine, which implements the file services, and one or more devices, on which data is stored. NAS elements may be attached to any type of network. A class of systems that provide file services to host computers. A host system that uses network attached storage uses a file system device driver to access data using file access protocols such as NFS or CIFS. NAS systems interpret these commands and perform the internal file and device I/O operations necessary to execute them.
**Network File System**

In NAS, a distributed file system and its associated network protocol originally developed by Sun Microsystems Computer Corporation and commonly implemented in UNIX systems, although most other computer systems have implemented NFS clients and/or servers. Abbreviated as NFS. The IETF is responsible for the NFS standard.

**Partition**

1) Subdivision of the capacity of a physical or logical disk. Partitions are consecutively numbered ranges of blocks that are recognized by MS-DOS, Windows, and most UNIX operating systems.

2) Synonym for the type of extent used to configure arrays.

3) A contiguously addressed range of logical blocks on a physical media that is identifiable by an operating system via the partition’s type and subtype fields. A partition’s type and subtype fields are recorded on the physical media and hence make the partition self-identifying.

**Partitioning**

Presentation of the usable storage capacity of a disk or array to an operating environment in the form of several logical disks whose aggregate capacity approximates that of the underlying physical or logical disk. Partitioning is common in MS-DOS, Windows, and UNIX environments. Partitioning is useful with hosts that cannot support the full capacity of a large disk or array as one device. It can also be useful administratively, for example, to create hard subdivisions of a large logical disk.

**Path**

Path is the access path from a host computer to a storage device.

**Physical Extent**

A unit of storage space on a physical device containing a specific amount of storage space. A collection of physical extents is then managed by the StoneFly Volume Manager as a logical volume, and a group of logical volumes make up a volume group. Physical extents are the smallest manageable element in a logical volume that can be managed by the StoneFly Volume Manager. The kernel and file system then use standard disk or file-system blocks when writing or reading to and from.

**Physical Volume**

A physical device such as a disk drive or RAID sub-system that, usually together with other devices, is configured as a volume group for subsequent division into one or more logical volumes. Logical volumes can be of arbitrary size (in multiples of physical extent size), whereas the physical volume is defined by the physical storage boundaries of the actual recording media or recording surface area in the device.
**A. 4 Glossary**

**Port**

An I/O adapter used to connect an intelligent device (node) to an I/O bus or network storage subsystems. Port is the synonym for the head end of a device I/O bus containing the arbitration logic.

**Provisioning**

The logical volume management services provided by the Storage Concentrator system create a centrally administered SAN infrastructure ideally suited for provisioning enterprise or departmental SAN, over an IP network.

Storage provisioning is the process of presenting a uniform and logical representation of physical storage resources transparent to the consumers of the storage (applications and users). Storage provisioning is not restricted by the type of storage, server platform or connection methodology. Storage provisioning dynamically maps data from the logical storage space required by applications to the actual physical storage space.

**Relational Database Management System (RDBMS)**

An RDBMS is a type of database management system that stores data in the form of related tables. Relational databases are powerful because they require few assumptions about how data is related or how it will be extracted from the database. As a result, the same database can be viewed in many different ways.

An important feature of relational systems is that a single database can be spread across several tables.

**Resource (Physical Device)**

A disk drive, RAID (Redundant Array of Independent Disks) subsystem or other mass storage device and the data-storing media it contains. Sometimes referred to as a physical volume.

**Scalability**

Capable of being changed in size and configuration. It typically refers to a computer, product or system’s ability to expand.

**Simple Network Management Protocol (SNMP)**

SNMP is an IETF protocol for monitoring and managing systems and devices in a network. The data being monitored and managed is defined by a MIB. The functions supported by the protocol are the request and retrieval of data, the setting or writing of data, and traps that signal the occurrence of events.

**Small Computer Storage Interface (SCSI)**

SCSI is a collection of ANSI standards and proposed standards that define I/O buses primarily intended for connecting storage subsystems or devices to hosts through host bus adapters. Originally intended primarily for use with small (desktop workstation) computers, SCSI has been extended to serve most computing needs, and is arguably the most widely implemented I/O bus in use today.
Source

A place from which data is taken. The place from which the data is acquired is called the source, whereas the place it is sent to or moved to is called the destination or target.

Spanning

A volume that is created comprised of regions or sections of several physical devices.

Storage Area Network (SAN)

A storage area network (SAN) is a separate and specialized network whose primary purpose is the transfer of data among storage elements and between computer systems and storage elements. A SAN consists primarily of a communication infrastructure and a management layer. The communication infrastructure provides physical connections and the management layer organizes the connections, storage elements, and computer systems so that data transfer is secure and robust.

Storage Concentrator

The Storage Concentrator delivers iSCSI target volumes to hosts over TCP connections in an Ethernet network. Configuring and managing these iSCSI target volumes is accomplished using a browser-based graphical user interface (GUI) resident in the Storage Concentrator. Storage resources are connected to the Storage Concentrator through a parallel SCSI connection or other connections. The system administrator uses the graphical user interface to allocate blocks of storage to create the iSCSI target volumes and authorizes their use by individual host systems.

Target

Target is synonymous with destination, a target is a file, a device, or any type of location to which data is moved or copied. The target is the provider of storage.

Volume Group

A volume group (also referred to as SPAN) is one or more separate physical devices (disk drives or RAID sub-systems) called physical volumes that are configured to form a single large storage area that is then divided into one or more separate storage areas of arbitrary size called logical volumes. Each logical volume can then be a used as a separate storage space for file system or for raw data storage by specific applications; without being constrained by physical disk boundaries. This feature is useful in various situations such as creating large file systems that exceed the size of a single disk or disk array, creating two or more separate file systems on a single disk device and/or creating a number of file systems having dissimilar geometries. Volume group is a management abstraction term. For example, management actions and policies are applied to volume groups.
This page is intentionally left blank.
StoneFly, Inc.
26250 Eden Landing Road
Hayward, CA  94545
(510) 265-1616
www.stonefly.com
www.iscsi.com