Carrier VoIP

STORM Basics

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STORM Basics

New in this release

There are no changes in this release.

Functional description

STORage Management (STORM) provides network file system (NFS) services to applications running in Nortel's Succession Communication Server 2000 - Compact (CS 2000 - Compact). STORM cPCI uses STORM application cards in slot 5 of the Services Application Module 21 (SAM21) shelf. STORM Integrated Array (STORM-IA) uses two rack-mount servers installed below the breaker interface panel (BIP) in the call control frame (CCF). Each rack-mount server is the STORM SAM-XTS hardware. Each server has two disk units.

NFS is a distributed file system that allows applications to access files and directories on remote computers over a network. Applications are able to access the files and directories as if they were stored locally.

NFS operates through a client-server relationship. The computers that make their files available for remote access are called servers. The computers or processes that use the resources of a server are called clients.

STORM cPCI cards are attached to a persistent data storage (PDS) device by optical fiber channel links. The PDS device contains multiple disks which are set up in a redundant array of inexpensive disks (RAID) level 5 configuration. This RAID-5 configuration allows for a disk to fail and be replaced without any data loss or downtime. The PDS hardware with its' redundant interface cards, redundant cooling modules, and redundant power supplies provides a highly reliable disk solution.

In STORM-IA, the STORM SAM-XTS units store data on internal disk drives and use RAID level one (RAID-1) mirroring for data redundancy. RAID-1 allows one of the two drives to fail without loss of data.

The STORM application supports the following functionality:

- logical volume management (LVM)

  online creation and expansion of new and existing file systems without causing application downtime (file system delete is also supported)

- journaled file system

  database transaction techniques keep the file system in a consistent state and to speed recovery should the system crash

- Web-based STORM management (STORM Manager)

  The server application runs locally on the STORM unit. A web browser client on a customer supplied workstation is required to enable management, alarming and monitoring of the card.

The CS 2000 - Compact requires two STORM units. Each Call Agent card uses one STORM unit as a primary storage device and the other STORM unit as a secondary storage device. The STORM units do not provide any redundancy between themselves. All component applications using the STORM services provide their own data redundancy (if required) by ensuring that any important data is written to both STORM units. If a STORM unit is out of service, then access to data stored on it is interrupted until the STORM unit is recovered.

Hardware

STORM hardware is housed in the call control frame (CCF), NTRX51FA or NTRX51TA. The CCF is a PTE 2000 cabinet frame that is network equipment building system (NEBS)-compliant.

STORM cPCI

The card based configuration uses STORM cards and a RAID persistent storage device.

STORM card

Each SAM21 shelf contains one STORM card with fiber channel access to the persistent data storage shelf. The STORM card is a Motorola MCPN750 board with 366 MHz PowerPC processor with 256 MB RAM and fiber channel peripheral component interconnect (PCI) mezzanine card (PMC). The STORM card occupies slot 5 in each SAM21 shelf.

Persistent data storage

In the call control frame (CCF) of the CS 2000 - Compact, the PDS shelf occupies the position immediately below the power distribution shelf. The shelf houses disk drives, two interface cards, and the redundant power supplies. Each interface card has a fiber channel interface. Each fiber channel interface connects to a STORM card in each SAM21 shelf.

The following paragraphs list capabilities that the PDS supports.

Hardware capabilities The persistent data storage shelf supports the following capabilities:

- fiber channel connectivity to each STORM card
- NEBS Level 3-compliancy for single-server applications with carrier grade reliability
- -48 VDC power (with optional alternating current [AC])
- an alarm display for indicating operational status of the storage shelf

Reliability capabilities The persistent data storage shelf supports the following reliability capabilities:

- 99.999% reliability rating
- dual redundant active/active fiber channel controllers
- hot-swappable, field-replaceable disk drives
- operation and data integrity not affected by disk drive removal or replacement
- dual-ported disks for additional reliability
- redundant fans and power supplies
- unit can reboot in a degraded mode (if one of the redundant drives has failed, the unit still starts correctly from a cold restart)

RAID capabilities The persistent data storage shelf supports the following RAID capabilities:

- RAID level 5 - provides reliable disk storage with minimal disk space overhead
- spare drive support - if one of the disks in the RAID-5 group fails, the spare drive automatically joins the group to minimize the possibility of data loss from a double hardware fault

STORM-IA

For CS 2000-Compact persistent data storage, Nortel introduced the STORM Integrated Array (STORM-IA) in SN06 to replace the STORM cPCI card and the DotHill RAID combination, which provided this same function in earlier releases. The STORM cPCI card and DotHill RAID combination continues to be supported in the field. STORM-IA is provided for all new installations.

The STORM-IA utilizes a redundant pair of rack-mount servers based on the SAM-XTS platform. Each of the STORM SAM-XTS units has two 100 MBit Ethernet interfaces that are bound in software into a redundant, single interface. The Ethernet links connect to the Compact Call Agent

and to a router switch by way of the Communications Server Local Area Network (CS LAN). STORM-IA does not require the STORM cPCI cards in the SAM21 shelf.

In STORM-IA, the two STORM SAM-XTS units are stacked in the CCF below the BIP. Each STORM SAM-XTS unit is NEBS compliant and has two 72 GB hot-swappable disk drives. A CDROM drive on the front of each unit is used for initial software loading and is available for software-upgrade media.

Software

Software loads

For information about the software load version, see *Upgrading the Carrier Voice over IP Network*, NN10440-450.

Delivery and ordering processes

Software for the STORM-IA is ordered as STRM0006. Software for the STORM cPCI units is managed through maintenance releases only. That software is ordered as STRMM004.

Upgrade and patch system

STORM software is not patchable. Refer to *Upgrading the STORM*,NN10066-461 For information about completing software upgrades, see *Upgrading Carrier Voice over IP Network*, NN10440-450.

Firmware flash

For the STORM cPCI platform, firmware is stored in flash memory. If a new firmware load is available, the firmware load is delivered with the SAM21 Shelf Controller (SC) software. To load the new firmware, check the Firmware Flash enable checkbox on the Provisioning panel of the card view at the CS 2000 SAM21 Manager client.

OAMP strategy

Platform operations, administration, maintenance, and provisioning (OAM&P) functionality for STORM cPCI units is available through the CS 2000 SAM21 Manager client. OAM&P functionality related to the services and storage for the both units is available on the STORM Manager.

Interfaces

Network interfaces and protocols

STORM cPCI units use BOOTP/TFTP to boot images from the CS 2000 Core Manager. These units also have a fiber channel interface that connects to the RAID device. Each STORM unit has a single 100 Base T interface to the CS LAN.

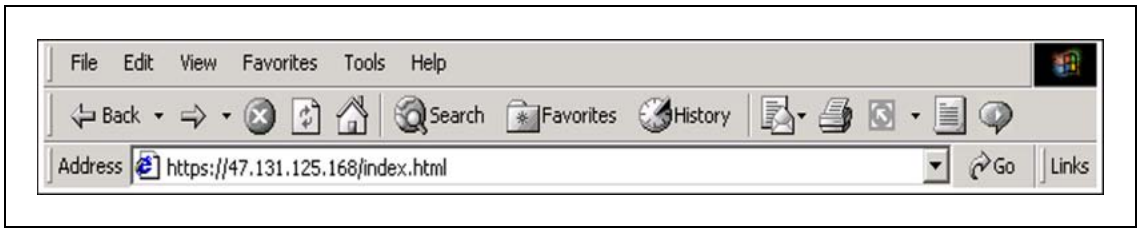
STORM-IA has two STORM SAM-XTS units, each of which has two 100 Base T Ethernet interfaces to the CS LAN. Software binds the two interfaces into a single, virtual, and redundant interface.

For both platform units, secure hypertext transfer protocol (HTTPS) is used to ensure secure communications between the web browser on the client workstation and the server application on the STORM unit.

User interfaces

The graphical user interface (GUI) to the STORM Manager is accessed from a web browser.

To access the STORM Manager, enter the IP address of the STORM unit into the browser. The following figure shows an example of accessing the STORM Manager from a web browser.



Note: This figure shows loading the STORM Manager using Microsoft Internet Explorer, which requires additional configuration to enable Java applets. Refer to the procedure "Configure Internet Explorer preferences" for details.

STORM Alarms panel

The Alarms panel enables an end user to view the set of currently active alarms against the STORM card.

Information in this panel reflects real-time updates; that is, alarm information displays as soon as the alarm is raised or cleared. Once an alarm is cleared, it is removed from the Alarms panel immediately.

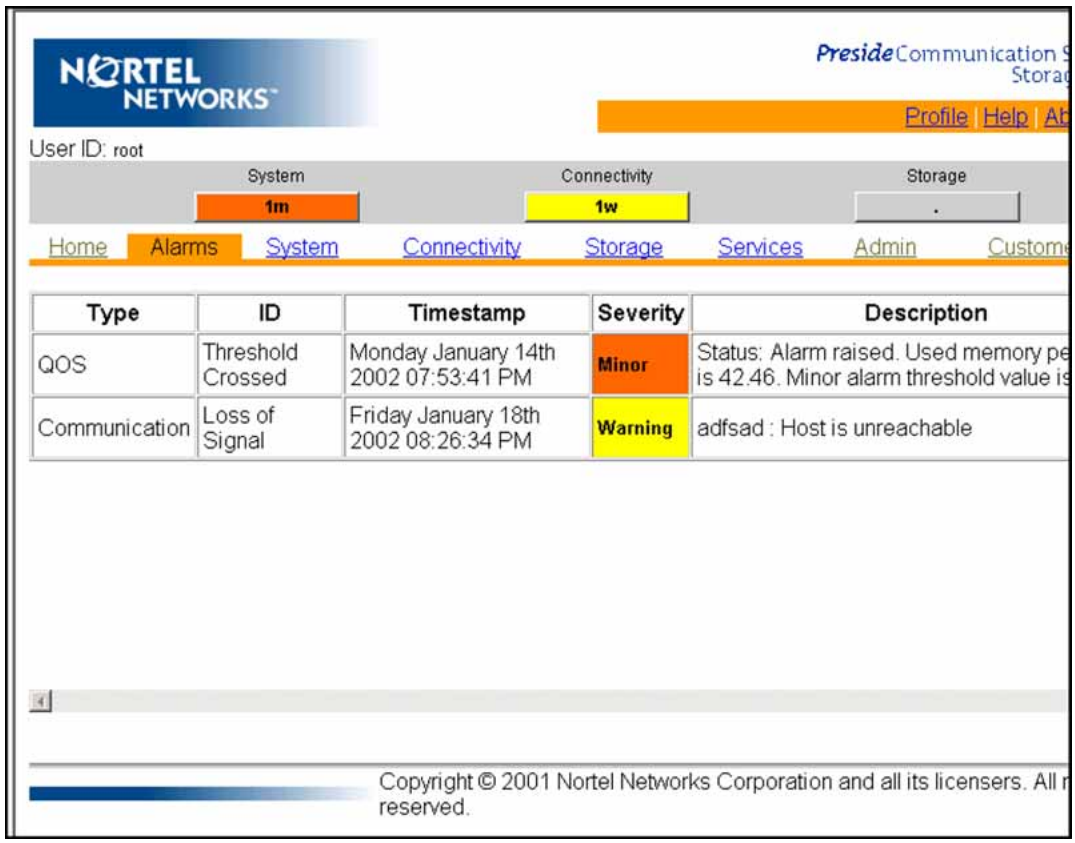
Alarm information sorts in the following priorities:

- severity, with most severe alarms first
- time, with oldest alarm first

Panel descriptions

The following figure shows an example of the STORM Alarms panel.

Alarms panel on STORM cPCI



The STORM Alarms panel displays the following information regarding currently active alarms:

- type - identifies the alarm as being one of the following categories:
  - communication
  - environmental
  - equipment
  - no alarm
  - processing error
  - quality of service (QOS)
- ID - lists the following reasons why the system raised the given alarm:
  - Threshold Crossed
  - Communications subsystem failure
  - Loss of signal
- timestamp - identifies when the alarm was originally raised.
- severity - ranks the alarm in terms of the following levels of importance:
  - critical - indicates that a service-affecting condition has triggered an alarm that requires immediate corrective action
  - major - indicates that a service-affecting condition has triggered an alarm that requires urgent corrective action
  - minor - indicates that a non-service affective fault condition has triggered an alarm. Corrective action is recommended to prevent a more serious fault.
  - warning - indicates the detection of a potential or impending service-affecting fault

    Note: A fifth level, "cleared," is also available, although it does not appear on the Alarms panel. (The Alarms panel displays only active alarms.)
- description - provides specific details about the given alarm

Limitations and restrictions

Alarm panel information for the STORM card includes the following limitations and restrictions:

- Displayed text information is accurate only from when the alarm was raised. After an alarm is raised, the Alarms panel does not update its timestamps if the STORM system date and time change. Nor does the

Alarms panel update its values in the description field if the STORM system threshold values change after an alarm is raised.

- The Alarms panel does not support filtering of alarms. Nor can an end user resort the order of the alarms.
- If the browser client cannot display all alarms, the Alarms panel scrolls upwards and the user must scroll to the bottom of the window to view the remaining information.
- The Alarms panel does not refresh automatically if the Alarm banner is not operational.

Panel messages

The following system and error messages can appear during use of the Alarms panel:

- *No alarms currently*

Panel procedures

The following procedure(s) apply to using the STORM Alarms panel:

- Viewing alarms information

STORM Connectivity panel

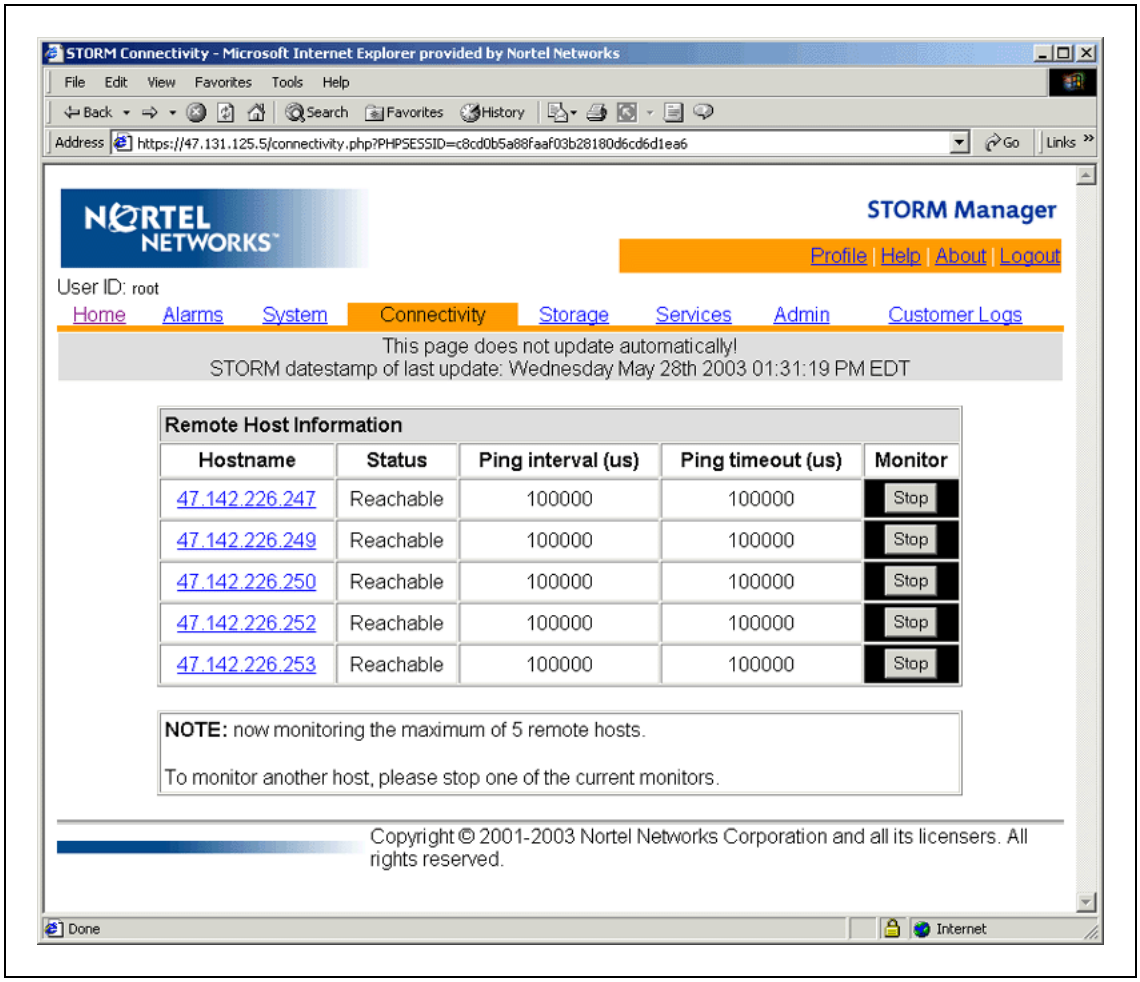
The Connectivity panel enables an end user to execute the following tasks on connections to and from the STORM card:

- view the status of the STORM disk array for STORM cPCI
- view the status of all currently monitored remote hosts
- start (add) and stop (delete) the connections from the STORM card to a remote host
- modify the parameters of a given remote host monitor

Panel descriptions

The following figure shows an example of the STORM Connectivity panel:

Connectivity panel for a STORM SAM-XTS unit in a STORM-IA



Fiber Channel Status - for STORM cPCI

The top section in the Connectivity panel includes the following information:

- link status - identifies if the fiber channel link to the disk array is Up or Down
- disk status - identifies if the disk array to the STORM card is Available or Unavailable

  Note: The availability of the STORM disk array depends on both Link Status and Disk Status. The Disk Status can be "Unavailable" briefly after the Link Status changes to "Up." Contact Nortel support personnel for assistance if the Disk Status remains "Unavailable" while the Link Status is "Up."

Remote Host Information

The middle section of the Connectivity panel reflects the status of the currently monitored remote hosts, and includes the following information:

- hostname - identifies the name of the host being monitored
- status - indicates if the connection from STORM to the remote host is either:
  - reachable - STORM can connect to the remote host
  - unreachable - STORM cannot connect to the remote host
- ping interval - indicates the length of time, in microseconds, between ping requests from the STORM unit to a given host to test for connectivity
- ping timeout - indicates the length of time, in microseconds, in which the STORM unit waits for a response before it determines it cannot connect to a given host
- monitor - stops the monitoring for a given host

Limitations and restrictions

Connectivity for the STORM card includes the following limitations and restrictions:

- The Connectivity panel does not refresh automatically. To update the display, reload the browser client.
- An end user can set a maximum of five remote hosts from the Connectivity panel to monitor simultaneously. An end user cannot change the value after it has been set.
- When an end user starts a host to monitor, the system does not check if the host has already been set through its host name or its IP address. As hostnames and IP addresses are acceptable entries for the host, the system can monitor both identifiers independently

- STORM does not validate the host entry. Therefore, the same error response, "Unreachable," displays when the STORM card cannot connect to the host due to connectivity problems, as well as when the user entered an invalid host.

Panel messages

The following system and error messages can appear during use of the Connectivity panel:

```
STORM ERROR: Host <hostname> is no longer being monitored.
```

The end user tried to stop monitoring a host that is no longer being monitored. This can occur if the host monitor has been stopped, but the Connectivity panel has not been updated.

Note: If the limit of five remote hosts being monitored has been reached, stop one of the hosts before attempting to start another one.

```
STORM ERROR: Host <hostname> is already being monitored.
```

The end user tried to monitor a host that is already being monitored. This can occur if the host monitor was started from another STORM EM, but the current Connectivity panel has not been refreshed. (To update the display, reload the browser client running the STORM EM.)

```
NOTE: now monitoring the maximum of 5 remote hosts.  To
monitor another host, please stop one of the current
monitors.
```

The limit of five hosts being monitored simultaneously has been reached. Stop one of the hosts before trying to monitor another host.

```
STORM ERROR: Ping interval must be a numeric value.
```

The end user tried to start a host monitor by entering non-numeric characters in the Ping interval field. Re-enter using only numeric characters 0 through 9, inclusive, and the comma (,) characters.

```
STORM ERROR: Ping interval must be an integer value.
```

The end user tried to start a host monitor by entering a fractional number in the Ping interval field. Re-enter using only numeric characters 0 through 9, inclusive, and the comma (,) characters.

```
STORM ERROR: Ping timeout must be a numeric value.
```

The end user tried to start a host monitor by entering a non-numeric character in the Ping timeout field. Re-enter using only numeric characters 0 through 9, inclusive, and the comma (,) characters.

```
STORM ERROR: Ping timeout must be an integer value.
```

The end user tried to start a host monitor by entering a fractional number in the Ping timeout field. Re-enter using only numeric characters 0 through 9, inclusive, and the comma (,) characters.

```
STORM ERROR: Please enter the name of a host to be monitored.
```

The end user tried to start a host monitor by clicking the Start button without having entered a host in the Hostname field.

Panel procedures

The following procedure(s) apply to using the STORM Connectivity panel:

- Viewing the status of the fiber channel link and remote hosts
- Adding or starting a remote host monitor
- Deleting or stopping a remote host monitor
- Modifying remote host monitor parameters

STORM Storage panel

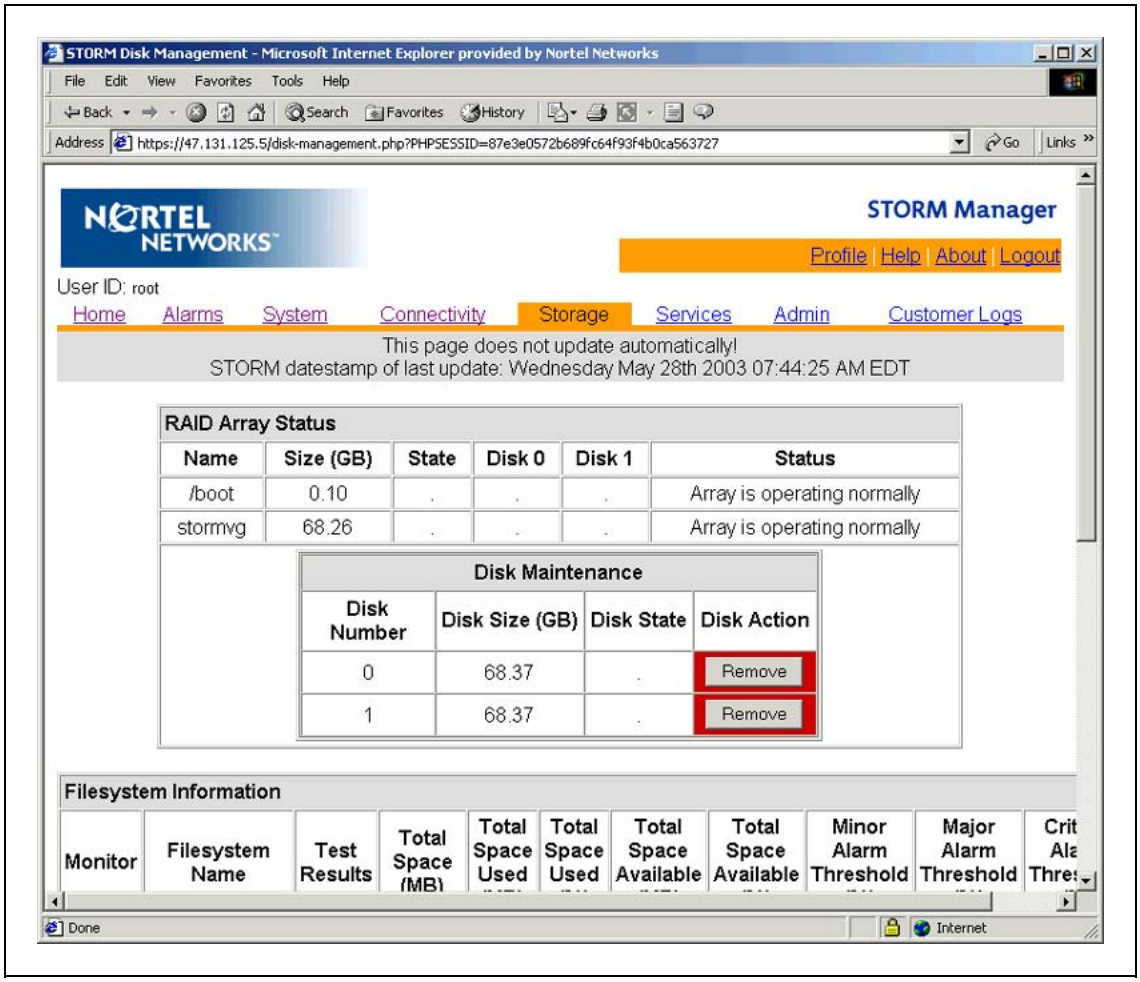
The Storage panel enables an end user to execute the following storage-related tasks on the STORM server:

- view volume group information
- view the status of the currently existing file systems on the STORM disk array
- add and delete file systems
- increase a file system
- monitor a file system and modify alarm thresholds
- for STORM SAM-XTS, add and remove disks from the array

Panel descriptions

The following figure shows an example of the STORM Storage panel.

Storage panel for a STORM SAM-XTS unit in a STORM-IA



Volume Group Information

The top section of the Storage panel includes the following information:

- Volume Group Name - indicates the name of the volume group
- Volume Group Size (GB) - indicates the volume group capacity in gigabytes. The sum of "Total Space" values for all file systems cannot exceed the Volume Group Size.
- Total Space Allocated (GB) - indicates the number of gigabytes from the volume group that are allocated to existing file systems
- Total Space Allocated (%) - indicates the percentage of the space in the volume group that is allocated to existing file systems
- Total Space Available (GB) - indicates the number of gigabytes available for use by new file systems or growth of existing file systems in the volume group

- Total Space Available (%) - indicates the percentage of space available for use by new file systems or growth of existing file systems in the volume group

File system Information

The bottom section of the Storage panel includes the following information:

- Monitor - indicates if STORM is monitoring the designated file system. If the panel displays "Stop," then click the button to halt monitoring of the file system. If the panel displays "Start," then click the Start button to begin monitoring of the file system. The file system monitor triggers alarms if file system usage crosses alarm thresholds.
- File system Name - identifies the name of each file system.
- Total Space (MB) - indicates the number of megabytes allocated to the file system
- Total Space Used (MB) - indicates the number of megabytes currently in use by the file system
- Total Space Used (%) - indicates the percentage of file system space in use
- Total Space Available (MB) - indicates the number of megabytes available for use by the file system
- Total Space Available (%) - indicates the percentage of space available for use by the file system
- Minor Alarm Threshold (%) - indicates the percentage of used space by a file system which triggers a minor alarm. (For example, an entry of 85% in this field triggers a minor alarm when it has reached 85% of its available storage space.)
- Major Alarm Threshold (%) - indicates the percentage of used space by a file system which triggers a major alarm. Entries in this field must be greater than entries in field Minor Alarm Threshold (%).
- Critical Alarm Threshold (%) - indicates the percentage of used space by a file system which triggers a critical alarm. Entries in this field must be greater than entries in fields Minor and Major Alarm Threshold (%).

Limitations and restrictions

Storage for STORM includes the following limitations and restrictions:

- The Storage panel does not refresh automatically. To update the display, reload the browser.
- The Storage panel does *not* support the following tasks or features:
  - the creation or removal of volume groups
  - the modification or removal of multiple file systems simultaneously

— sorting or filtering Storage panel data

— an indication if a specific file system is in use

— the display of files on a specific file system

- Do *not* attempt to remove file systems without first conferring with Nortel support personnel.
- Deleting or incorrectly editing an exports entry can cause the STORM client to lose access to its data on the STORM card.
- STORM does not validate exports entries.

Panel messages

The following system and error messages can appear during use of the Storage panel.

```
Please enter the name of a filesystem to remove.
```

Enter a name for the file system before clicking the Remove button.

```
WARNING: filesystem removal could result in data loss
and/or service interruption.  Please consult STORM Customer
Documentation and/or Nortel Networks support personnel for
more information on the possible impacts of removing a
filesystem.  Click OK to confirm the removal of name.
```

Do not attempt to remove a file system without conferring with Nortel support personnel. Deleting a file system results in permanent loss of data.

```
STORM Error:  Filesystem name is no longer being monitored.
```

The specified file system had already ceased to be monitored. Since the Storage panel is not refreshed dynamically, another user could have performed a task on the specific file system.

```
Filesystem name was created successfully.
```

The user successfully created a file system.

```
Filesystem name was removed successfully.
```

The user successfully removed a file system.

```
STORM ERROR: Error removing filesystem name, RC=(rc).
```

The user tried to remove a file system. Contact Nortel support personnel for assistance.

```
STORM ERROR: Filesystem name cannot be resized - there is no
space available on the volume group.
```

The user tried to increase the size of a file system and not enough space exists on its volume group. First recover some space on the volume group, and then try to resize.

```
STORM ERROR: Filesystem name cannot be resized since it is
not mounted from a RAM disk.
```

Users cannot resize special STORM file systems that are mounted from a RAM disk.

```
STORM ERROR: Filesystem name cannot be resized since it is
not mounted locally.
```

Users cannot resize a file system that STORM has mounted from another file system.

```
STORM ERROR: Filesystem name doesn't exist.
```

The user tried to delete a file system by entering a non-existent name. First check the spelling of the file system name, and then retry.

```
STORM ERROR: Please edit the exports entry in order to export
this filesystem.
```

The user tried to export a file system without first editing the example exports entry. Retry.

```
STORM ERROR: Please fully specify the filesystem name from
root ('/').
```

The user tried to add or remove a file system without fully specifying the file system name from root. Retry, ensuring that the file system is fully specified from root.

```
STORM ERROR: Cannot remove filesystem name.
```

A system error occurred while trying to remove a file system. Contact Nortel support personnel for assistance.

```
STORM ERROR: New filesystem size equals current size.
```

The user tried to increase the size of a file system but neglected to add a value under field New Size (MB) greater than the current value. Retry, entering a new size that is greater than the current size.

```
STORM ERROR: Filesystem size must be a numeric value.
```

The user tried to add a file system using non-numeric values in field New Size (MB). Retry, ensuring to use numeric characters in field New Size (MB).

Panel procedures

The following procedures apply to using the STORM Storage panel:

- Viewing volume group and file system information
- Creating a file system
- Modifying a file system
- Removing a file system

STORM Services panel

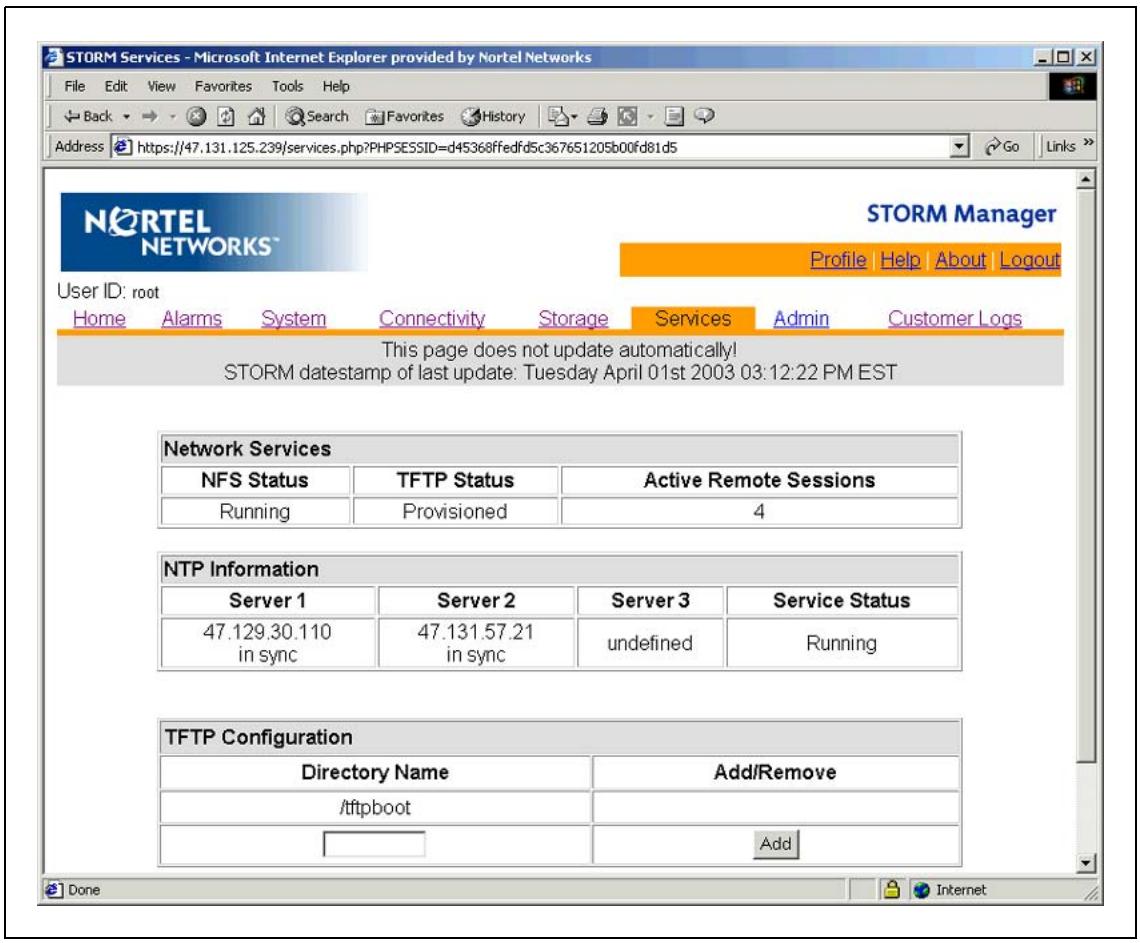
The Services panel displays status information on network file system (NFS) service, trivial file transfer protocol (TFTP) configuration, remote login sessions, and network time protocol (NTP) service. In addition to viewing information on these services, this panel enables an end user to execute the following tasks on the STORM card.

- add a TFTP directory
- delete a TFTP directory

Panel descriptions

The following figure shows an example of the STORM Services panel.

Services panel for a STORM SAM-XTS unit in a STORM-IA



Network Services

The Network Services category in the STORM Services panel displays the following status regarding NFS, TFTP and telnet sessions.

- The NFS Status can consist of the following states:
  - Running -- indicates that STORM clients can mount exported file systems
  - NOT Running -- indicates that the NFS daemon (nfsd) is not running
- The TFTP Status can consist of the following states:
  - Provisioned -- indicates that STORM clients can use TFTP to retrieve files
  - NOT Provisioned -- indicates that the entry for the TFTP directory has not been provisioned in file /etc/inetd.conf. The TFTP service is unavailable.
  - NOT Running -- indicates that the inet daemon (inetd) is not running. The TFTP service is unavailable.
- The Active Remote Sessions value indicates the number of remote logins.

NTP Information

The NTP Information category in the STORM Services panel displays the following information regarding the NTP server:

- if a time server has been defined. For STORM cPCI, NTP is configured at the CS 2000 SAM21 Manager client. For a STORM SAM-XTS unit, NTP is configured with the commish tool from a login.
- the IP address of the time server
- if the STORM card is in sync with the time server

The Server fields can consist of the following states:

- undefined
- in sync (with the IP address of the NTP server)
- establishing a sync (with the IP address of the NTP server)
- not syncing (with the IP address of the NTP server)

The Service Status for the NTP server can consist of the following states:

- Running -- indicates that STORM clients can mount exported file systems
- NOT Running -- indicates that the NTP daemon is not running

Limitations and restrictions

Services for the STORM card include the following limitations and restrictions:

- The Services panel does not refresh automatically. To update the display, reload the browser.
- An end user cannot delete multiple entries in the TFTP directory simultaneously.

Panel messages

The following system and error messages can appear during use of the Services panel.

```
STORM Error:  <TFTP directory> is already provisioned as a
tftp directory.
```

Do not try to provision a TFTP directory that is already contained in the list of entries.

```
STORM Error:  Please enter a directory to be added.
```

Ensure field Directory Name includes an entry when adding information.

```
STORM Error:  Directory <TFTP directory> contains invalid
characters.  Valid filesystem name characters are letters:
a-z, A-Z, numbers:  0-9, and the characters /+$."
```

Re-enter the name of the directory using valid characters specified in the error response.

```
STORM Error:  The directory <TFTP directory> does not exist.
```

Check the name of the directory that was entered. Either correct the entry or add the entered name to STORM before adding it as a TFTP directory.

Panel procedures

The following procedure(s) apply to using the STORM Services panel:

- Viewing Services information
- Adding TFTP configuration information
- Deleting TFTP configuration information

STORM Administration panel

The Administration panel enables an end user to change the timezone on the STORM card.

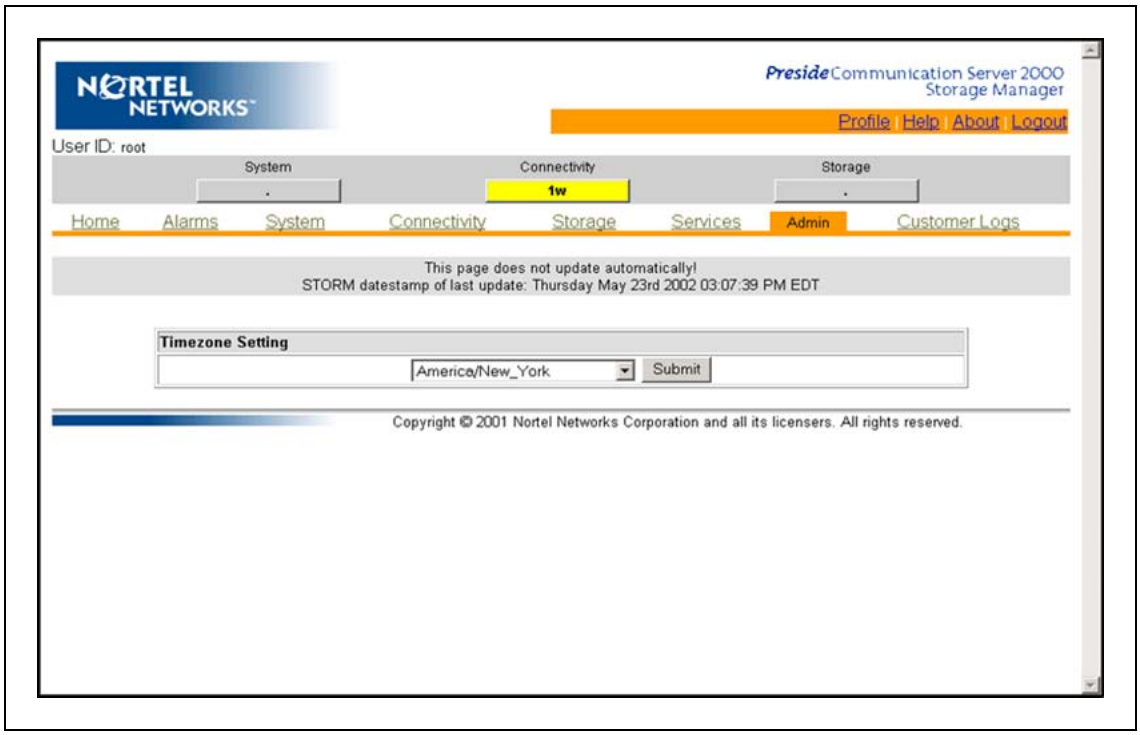
An NTP server must be provisioned for the Shelf Controller (SC) using the CS 2000 SAM21 Manager client. The STORM card then retrieves the Network Time Protocol (NTP) server IP address information from the bootp response.

Note: Access the Services panel to monitor the status of the NTP service.

Panel descriptions

The following figure shows an example of the STORM Administration panel.

Administration panel on STORM cPCI



Limitations and restrictions

The Administrator panel does not refresh automatically. To update the display, reload the browser client running the STORM EM.

Panel messages

No error messages appear during use of the Administration panel.

Panel procedures

The following procedure(s) apply to using STORM Administration panel:

- Changing the timezone on the STORM server

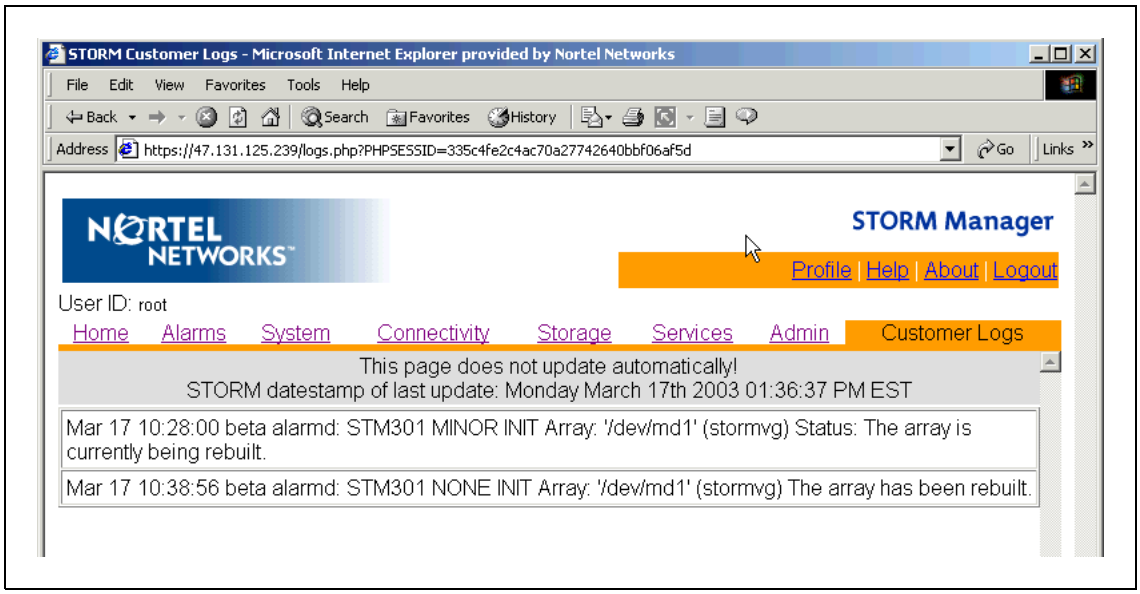
STORM Customer Logs panel

The Customer Logs panel enables an end user to view STORM-related customer logs.

Panel descriptions

The following figure shows an example of the STORM Customer Logs panel.

Customers Logs panel for a STORM SAM-XTS unit in a STORM-IA



The information in a Customer Logs panel shows the timestamp, log name, alarm severity, and a brief description of each log.

Limitations and restrictions

Logs for the STORM card includes the following limitations and restrictions:

- Do not use this panel to sort, filter or clear any STORM-related customer logs.
- The Logs panel does not refresh automatically. To update the display, reload the browser.
- The Logs panel shows logs only in the `/var/storm/custlog` file. The STORM program rotates older logs into other log files in the same directory, which cannot be viewed from the browser.

Panel messages

The following system and error message(s) can appear during use of the Logs panel.

```
STORM Error:  Did not find /var/storm/custlog file.
```

This error indicates that the file /var/storm/custlog was not found. This path is the location of where STORM stores customer logs. Contact Nortel support personnel for assistance.

Panel procedures

The following procedure(s) apply to using STORM Customer Logs panel:

- Viewing customer logs

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