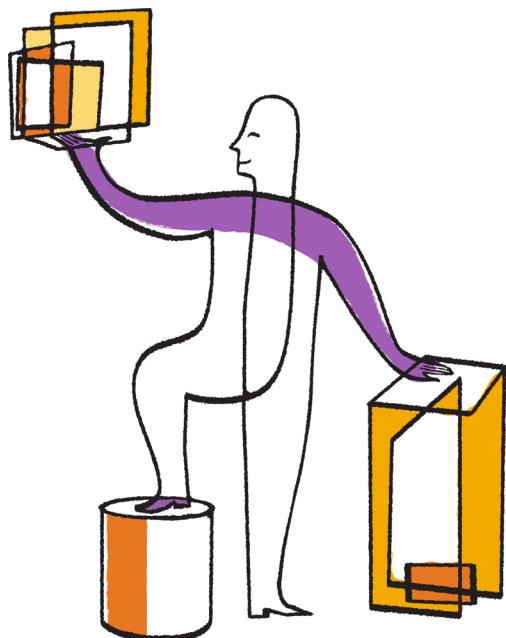




NetApp®

StorageGRID® Webscale 10.2

Grid Primer



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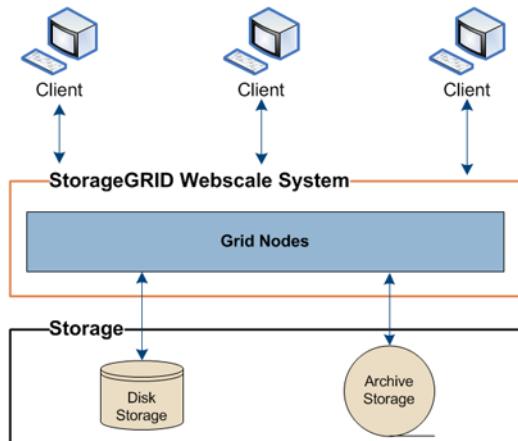
Introduction to the StorageGRID Webscale system

The StorageGRID Webscale system is a distributed object storage system that stores, protects, and preserves fixed-content data over long periods of time.

By employing a grid architecture that distributes copies of object data throughout the system, a highly reliable system is created where data is continuously available. If one part of the system goes down, another immediately takes over, which results in objects always being available for retrieval. To implement this architecture, the StorageGRID Webscale system employs a system of network-connected servers hosting grid nodes. These grid nodes host a collection of one or more services, each providing a set of capabilities to the StorageGRID Webscale system.

To manage objects ingested into the system, the StorageGRID Webscale system employs metadata-based information lifecycle management (ILM) rules. These ILM rules determine what happens to an object's data once it is ingested—where it is stored, how it is protected from loss, and how long it is stored.

The StorageGRID Webscale system operates over wide area network (WAN) links, providing the system with the capability of off-site loss protection. Copies are made and distributed throughout the system so that objects are continuously available. In systems with multiple sites, this distribution of copies means that if a site is lost, data is not lost, and clients are able to seamlessly retrieve it from other sites.



Advantages of the StorageGRID Webscale system include the following:

- Software-defined storage management for hardware independence
- Support standard object storage protocols:
Simple Storage Service (S3), OpenStack Swift, Cloud Data Management Interface (CDMI), and StorageGRID API (SGAPI)
- Ability to address hardware obsolescence through the transparent migration of data from previous to current generations of hardware
- Policy-driven tiered storage that reduces overall storage costs
- Virtualization of storage across sites and tiers, insulating applications from changes to underlying storage infrastructure
- Ability to monitor and verify data integrity proactively as data is stored, updated, retrieved, and deleted

- Nondisruptive upgrade, expansion, and maintenance that maintains access to content

Data management with StorageGRID Webscale and AltaVault

Using StorageGRID Webscale, you can manage large file archives, media repositories, and web datastores on the hybrid cloud. Adding NetApp AltaVault cloud-integrated data protection, you can extend your StorageGRID Webscale cloud to include backups and cold archived data.

The combination of StorageGRID Webscale and AltaVault provides the following benefits:

- Enables you to leverage the economy of on-premise and public cloud storage
- Leverages your existing backup and recovery Service Level Agreements (SLAs) of large data sets
- Delivers storage efficiency through deduplication, compression, and encryption of backups and archived data

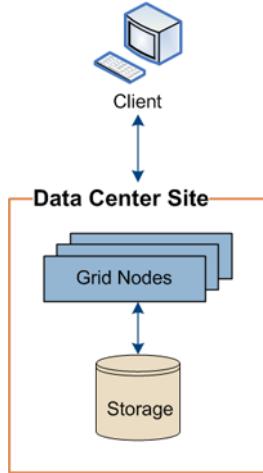
For details about AltaVault, see the AltaVault information on the NetApp Support Site at mysupport.netapp.com.

Deployment topologies

The StorageGRID Webscale system can be deployed as either a single data center site or multiple data center sites topology.

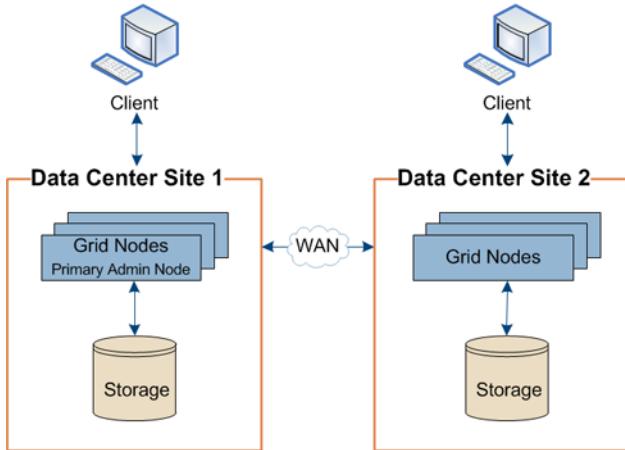
Single data center site

In a single data center (DC) site deployment, the infrastructure and operations of the StorageGRID Webscale system are centralized in a single site.



Multiple data center sites

In a multiple data center site deployment, the infrastructure of the StorageGRID Webscale system can be asymmetrical across data center sites and proportional to the needs of each data center site. Typically, data center sites are located in geographically different locations. Data sharing and disaster recovery is achieved in a peer-to-peer manner by automatically distributing data to other sites. Each data center site acts as a disaster recovery site for another site.



What grid nodes and services are

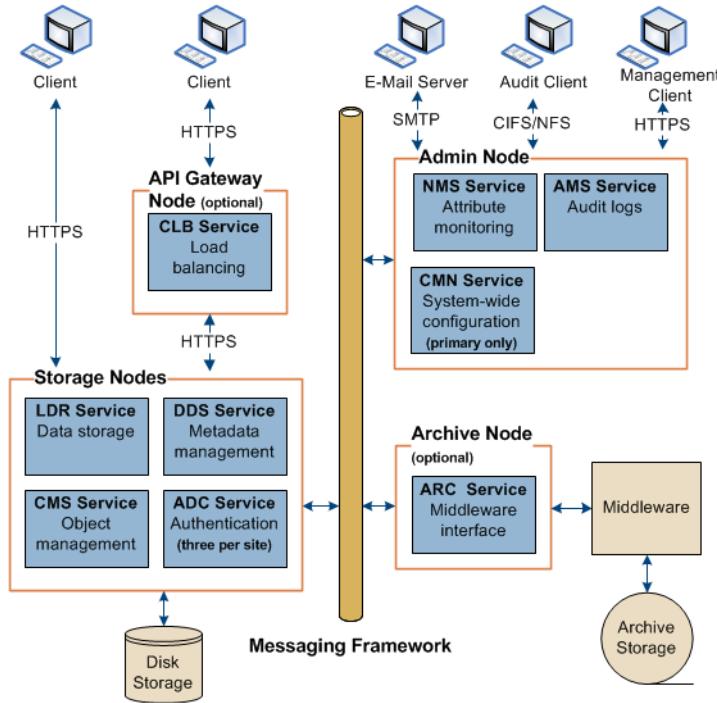
A data center site is built as a series of interconnected grid nodes. Each grid node type hosts a particular set of services that perform a specialized set of operations.

Grid nodes

The basic building blocks of a StorageGRID Webscale system are grid nodes. There are four grid node types:

- Admin Node: provides management services such as system configuration, monitoring, and logging
- API Gateway Node: provides a load balancing interface to the StorageGRID Webscale system through which applications can connect to the system (optional)
- Archive Node: provides an interface through which object data can be archived to an external archival storage system (tape or the cloud) for long term storage.
- Storage Node: manages object data and metadata storage including loss protection

This diagram shows how grid nodes and service are arranged within a StorageGRID Webscale system:



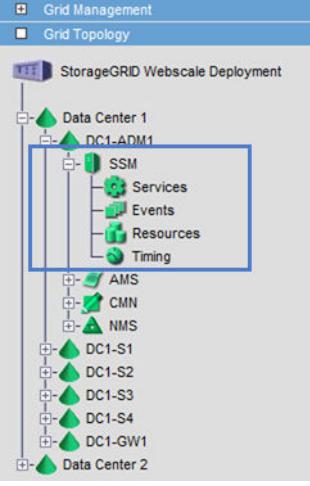
Services

Each grid node includes a set of services, which are software modules that provide a set of capabilities to the grid node. These services work together during the object lifecycle of ingest, retrieval, and deletion. The different types of services are as follows:

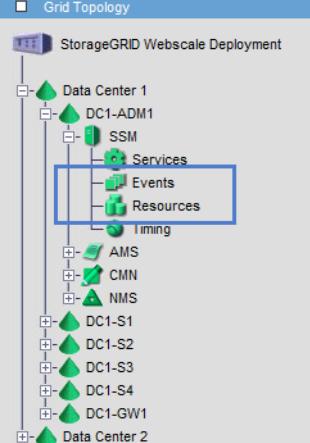
- Administrative Domain Controller (ADC) service: maintains topology information and provides authentication services
- Audit Management System (AMS) service: tracks system activity and events
- Archive (ARC) service: communicates with archiving services through which object data is sent to an external archival storage system (tape or the cloud)
- Connection Load Balancer (CLB) service: acts as a switchboard for connecting clients to the most efficient LDR service
- Configuration Management Node (CMN) service: manages system-wide configurations, connection profiles, and grid tasks
- Content Management System (CMS) service: manages object data through the StorageGRID Webscale system's ILM policy
- Distributed Data Store (DDS) service: manages object metadata
- Local Distribution Router (LDR) service: manages the storage to disk of object data
- Network Management System (NMS) service: used to monitor system status and to configure the StorageGRID Webscale system
- Server Status Monitor (SSM) service: monitors hardware performance such as key operating system metrics and network metrics

Common services and components

The Server Status Monitor (SSM) service monitors hardware performance such as key operating system metrics and network metrics. The SSM service is found on every grid node.

Service	Component	Description
 SSM <ul style="list-style-type: none"> Grid Management Grid Topology StorageGRID Webscale Deployment <ul style="list-style-type: none"> Data Center 1 <ul style="list-style-type: none"> DC1-ADM1 <ul style="list-style-type: none"> SSM Services Events Resources Timing AMS CMN NMS DC1-S1 DC1-S2 DC1-S3 DC1-S4 DC1-GW1 Data Center 2 	Services	View the status of services and support modules running on the grid node.
	Events	View information about events for the service. Reset event counts.
	Resources	View resource information (processors, memory, interfaces, volumes, IP addresses) for the service. Reset network error counts.
	Timing	View attributes that report on the state of the service's time and the time recorded by neighboring services.

All services use a standard set of attributes for the Events and Resources components.

Service	Component	Go here to...
 All <ul style="list-style-type: none"> Grid Management Grid Topology StorageGRID Webscale Deployment <ul style="list-style-type: none"> Data Center 1 <ul style="list-style-type: none"> DC1-ADM1 <ul style="list-style-type: none"> SSM Services Events Resources Timing AMS CMN NMS DC1-S1 DC1-S2 DC1-S3 DC1-S4 DC1-GW1 Data Center 2 	Events	View the logged events from the hardware drivers.
	Resources	View attributes that report on the service health and all computational, disk device, and network resources.

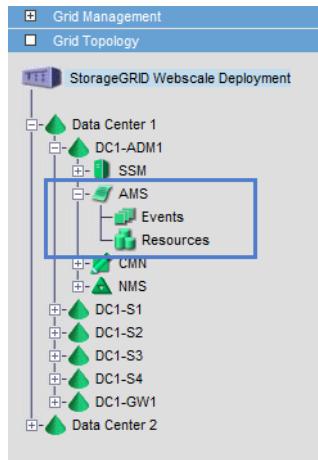
Admin Node overview

The Admin Node provides system administration services such as system configuration, monitoring, and logging.

For purposes of redundancy, a StorageGRID Webscale system can have more than one Admin Node (one at each site). There is one primary Admin Node per deployment, which hosts the CMN service.

Audit Management System service

The Audit Management System (AMS) service tracks system activity and events. The AMS service is found on the Admin Node.



Related information

- [StorageGRID Webscale 10.2 Administrator Guide](#)
- [StorageGRID Webscale 10.2 Audit Message Reference](#)
- [StorageGRID Webscale 10.2 StorageGRID API Reference](#)

Configuration Management Node service

The Configuration Management Node (CMN) service manages system-wide configurations, connection profiles, and grid tasks. The CMN service is found on the primary Admin Node.

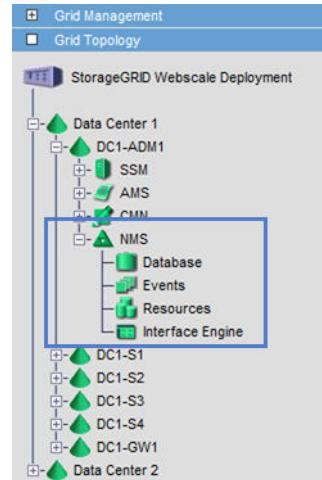
Service	Component	Description
CMN	Grid Tasks	Manage grid tasks. Manually submit a grid task. View pending, active, and historical grid tasks.
	Object Lookup	Display object metadata, including storage location.
	Identifiers	View the total number of unique object identifiers installed and available.
	Connect to Support	Deprecated and no longer supported.

Related information

- [StorageGRID Webscale 10.2 Troubleshooting Guide](#)

Network Management System service

You can use the Network Management System (NMS) service to monitor system status and to configure the StorageGRID Webscale system. The NMS service is found on the Admin Node.

Service	Component	Description
 <p>The screenshot shows the StorageGRID Webscale Deployment interface. Under the Grid Management section, the NMS service is highlighted with a blue box. The NMS structure includes Database, Events, Resources, and Interface Engine. The interface also shows other components like SSM, AMS, and CMM, and a list of storage nodes (DC1-S1 through DC1-GW1).</p>	<p>Database</p> <p>Interface Engine</p>	<p>View information about the database used by the NMS service for tracking attributes.</p> <p>View information about the status of the NMS MI, notification events, and connection pool. View e-mail notification status and the size of the notifications queue.</p>

Related concepts

[NMS database usage rates](#) on page 65

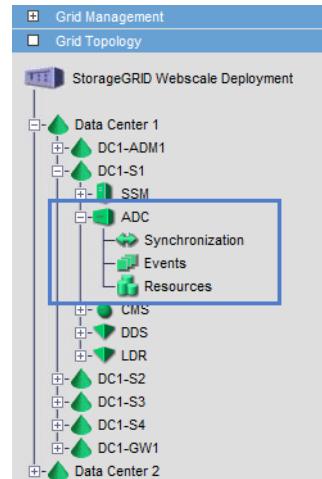
Storage Node overview

The Storage Node manages the storage of objects to spinning disk.

This object management (both object data and object metadata) includes the evaluation of objects against ILM rules to determine how an object's data is stored over time and protected from loss.

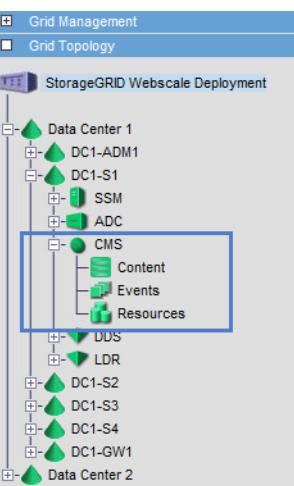
Administrative Domain Controller service

The Administrative Domain Controller (ADC) service maintains topology information and provides authentication services. The ADC service is found on the first three Storage Nodes deployed at a site.

Service	Component	Description
 <p>The screenshot shows the StorageGRID Webscale Deployment interface. Under the Grid Management section, the ADC service is highlighted with a blue box. The ADC structure includes Synchronization, Events, and Resources. The interface also shows other components like SSM, CMS, DDS, and LDR, and a list of storage nodes (DC1-S1 through DC1-GW1).</p>	Synchronization	Allows you to monitor attributes related to the discovery and monitoring of services and configuration by the ADC service.

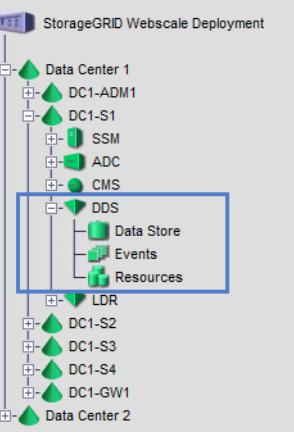
Content Management System service

The Content Management System (CMS) service manages object data through the StorageGRID Webscale system's ILM policy. The CMS service is found on the Storage Node.

Service	Component	Go here to...
 <p>CMS</p> <ul style="list-style-type: none"> + Grid Management - Grid Topology <p>StorageGRID Webscale Deployment</p> <ul style="list-style-type: none"> - Data Center 1 <ul style="list-style-type: none"> - DC1-ADM1 - DC1-S1 <ul style="list-style-type: none"> - SSM - ADC - CMS <ul style="list-style-type: none"> - Content - Events - Resources - DDS - LDR - DC1-S2 - DC1-S3 - DC1-S4 - DC1-GW1 - Data Center 2 	Content	View ILM information and statistics on object transfer activities based on ILM rules.

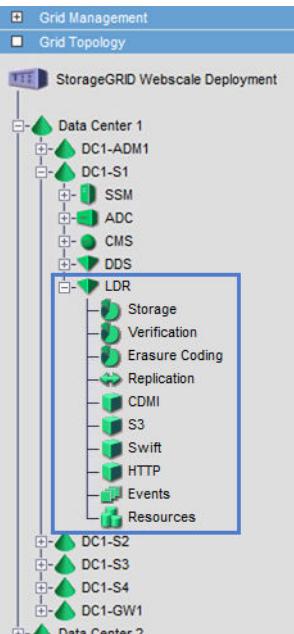
Distributed Data Store service

The Distributed Data Store (DDS) service manages object metadata. The DDS service interfaces with the distributed key value store to automatically make copies of object metadata and store these copies to disc. The DDS service is found on Storage Nodes.

Service	Component	Go here to...
 <p>DDS</p> <ul style="list-style-type: none"> + Grid Management - Grid Topology <p>StorageGRID Webscale Deployment</p> <ul style="list-style-type: none"> - Data Center 1 <ul style="list-style-type: none"> - DC1-ADM1 - DC1-S1 <ul style="list-style-type: none"> - SSM - ADC - CMS <ul style="list-style-type: none"> - DDS <ul style="list-style-type: none"> - Data Store - Events - Resources - LDR - DC1-S2 - DC1-S3 - DC1-S4 - DC1-GW1 - Data Center 2 	Data Store	<p>Monitor the status of the data store.</p> <p>Determine the total number of ingested objects that are known by the DDS service.</p> <p>Determine the total number of CDMI container objects, S3 buckets, and Swift containers known by the DDS service.</p> <p>View statistics for CQL queries.</p> <p>Reset lost object counts.</p>

Local Distribution Router service

The Local Distribution Router (LDR) service manages the storage to disk of object data. The LDR service is found on Storage Nodes.

Service	Component	Go here to...
 <p>LDR</p> <ul style="list-style-type: none"> Grid Management Grid Topology StorageGRID Webscale Deployment <ul style="list-style-type: none"> Data Center 1 <ul style="list-style-type: none"> DC1-ADM1 DC1-S1 <ul style="list-style-type: none"> SSM ADC CMS DDS LDR <ul style="list-style-type: none"> Storage Verification Erasure Coding Replication CDMI S3 Swift HTTP Events Resources DC1-S2 DC1-S3 DC1-S4 DC1-GW1 Data Center 2 	Storage	<p>Monitor space utilization and availability.</p> <p>Set the storage state of the LDR service.</p> <p>Change the LDR health check timeout period.</p> <p>For more information, see Key attributes to monitor on page 59.</p>
	Verification	<p>Monitor the current state of the background verification process for replicated object data.</p> <p>Set the background verification priority.</p> <p>Reset missing object counts.</p> <p>Reset corrupt replicated object data counts during background verification.</p>
	Erasure Coding	<p>Monitor read and write erasure coding operations based on ILM rules for this Storage Node.</p> <p>Reset read, write, and delete failure counts for erasure coded object data.</p> <p>Reset lost erasure coded copies and corrupt erasure coded fragment counts.</p> <p>For more information about erasure coding, see the Administrator Guide.</p>
	Replication	<p>Monitor the transfer of data from one LDR service to another LDR service.</p> <p>Reset replication failure counts.</p> <p>Disable inbound and outbound replications.</p> <p>For more information, see Data flow on page 46.</p>
	CDMI	<p>Monitor CDMI sessions.</p> <p>Reset CDMI counts.</p> <p>For more information, see the Cloud Data Management Interface Integration Guide.</p>
	S3	<p>Monitor S3 sessions.</p> <p>For more information, see the Simple Storage Service Implementation Guide.</p>
	Swift	<p>Monitor Swift sessions.</p> <p>For more information, see the Swift Implementation Guide.</p>
	HTTP	<p>Monitor HTTP sessions.</p> <p>Reset HTTP counts.</p> <p>For more information, see the StorageGRID API Reference and Simple Storage Service Integration Guide.</p>

Related information

[StorageGRID Webscale 10.2 Administrator Guide](#)

[StorageGRID Webscale 10.2 Simple Storage Service Implementation Guide](#)

[StorageGRID Webscale 10.2 Swift Implementation Guide](#)

[StorageGRID Webscale 10.2 Cloud Data Management Interface Implementation Guide](#)

[StorageGRID Webscale 10.2 StorageGRID API Reference](#)

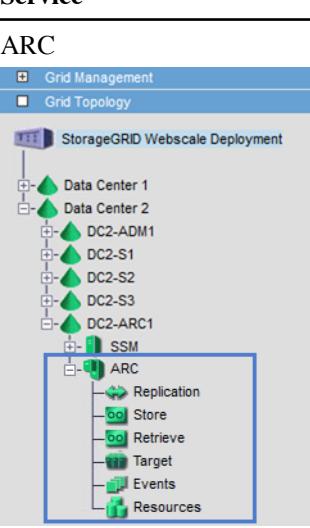
Archive Node overview

The Archive Node provides an interface through which object data is sent to an external archival storage system (tape or the cloud) for long term storage.

Archiving to tape is achieved by connecting to Tivoli Storage Manager (TSM) middleware, while storing to the cloud is achieved by connecting to a system that is capable of interfacing through the S3 API.

Archive service

The ARC service provides the interface used to configure connections to external archival storage such as the cloud through the S3 API or tape through TSM middleware. The ARC service is found on the Archive Node.

Service	Component	Go here to...
	Replication	View information about replication activities for the Archive Node. Reset replication failure counts. Disable inbound and outbound replications.
	Store	View information about the object data written to the targeted archival storage system. Reset the failure count. Take the Store component offline (TSM middleware only). Disable the store components of the ARC service at startup (TSM middleware only).
	Retrieve	View the status of objects requested from the Archive Node. Reset the request and verification failure counts. Configure the retrieval state to online or offline (TSM middleware only).
	Target	Select the targeted type of archival storage system, tape through TSM middleware or the cloud through the S3 API. View information about the targeted archival storage system. Configure connection information used to connect to archival storage system. Take an Archive Node offline. (TSM middleware only.) Optimize the Archive Node for a Storage Node rebuild, read-only mode, or when the Archive Node is full. (TSM middleware only.)

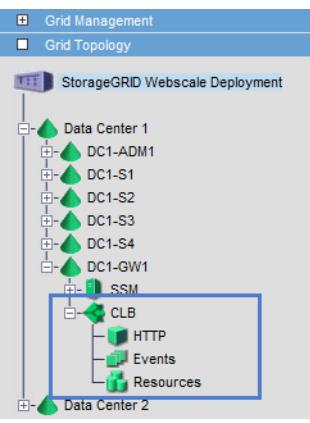
API Gateway Node overview

The API Gateway Node provides a load balancing interface to the StorageGRID Webscale system through which applications can connect to the system.

The API Gateway Node provides load balancing read-write access to the system for SGAPI, CDMI, S3, and Swift applications.

Connection Load Balancer service

The Connection Load Balancer (CLB) service acts as a switchboard for connecting clients to the most efficient LDR service. The CLB service is found on the API Gateway Node.

Service	Component	Go here to...
CLB 	HTTP	Monitor TCP/IP connectivity for HTTP connections. Reset the HTTP counter.

Optional system configuration settings

The StorageGRID Webscale system includes a number of options that affect how the system operates.

This table lists the key options that a StorageGRID Webscale system might be deployed with:

Option	Description
Compression	Compresses object data, reducing object data size by roughly 50% for content that is not already in a compressed format.
Deletion protection	Prevents clients from deleting objects from the StorageGRID Webscale system.
Encryption	Enables encrypted storage of all ingested object data. Content is encrypted during ingest and object data is stored in an encrypted form so that if a server's object store is compromised object data cannot be retrieved in a readable form. Once enabled, encryption cannot be disabled.
Security partitions	Provides the ability to restrict access to object data such that clients can access only their own objects. For more information, see the <i>StorageGRID API Reference</i> . Note: Security partitions are ignored for objects ingested through S3 or Swift.

For more information about options, see the *Administrator Guide*.

Related information

[StorageGRID Webscale 10.2 Administrator Guide](#)

[StorageGRID Webscale 10.2 StorageGRID API Reference](#)

SAID package and system configuration information

The Software Activation and Integration Data (SAID) package contains deployment specific files and software needed to install, expand, upgrade, and maintain a StorageGRID Webscale system. The package also contains system-specific configuration and integration information, including server hostnames and IP addresses.

The SAID package is generated during the provisioning phase of installation.

The SAID package contains highly confidential passwords needed during system maintenance, upgrade, and expansion. Store the SAID package in a secure location. Passwords used to access the StorageGRID Webscale system can be found in the `Passwords.txt` file.

The SAID package includes a `\Doc` directory that contains HTML pages documenting the configuration of the StorageGRID Webscale system.



The screenshot shows the StorageGRID Webscale Grid Services interface. The top navigation bar has tabs for Grid Services, Network, Groups, Storage, and NTP. The Grid Services tab is selected and highlighted with a red border. A 'Print Page' button is located in the top right corner of the main content area. The main content area displays the 'Grid Wide Settings' and 'Grid Options' sections, followed by a 'Servers Summary' table.

Grid Wide Settings						
Grid ID:	401713					
Grid Description:	StorageGRID Webscale Deployment					
Software Suite Version:	10.2					
Service Pack Required:	none					
Metadata Replication:	enabled					
Grid Options:						
Servers Summary						
Hostname	Grid IP	SSH Access	Services	Node ID	Hardware Spec	
//StorageGRID Webscale Deployment/Data Center 1/						
DC1-ADM1	10.96.99.39	***	SSM AMS CMN NMS	16222419 15884145 18243957 14031022	vmware_admin	
DC1-S1	10.96.99.40	***	SSM ADC CMS DDS LDR	16659171 11252657 13578648 21696557 12938847	vm_nonadmin	
DC1-S2	10.96.99.41		SSM ADC CMS DDS LDR	16029821 11045624 13170267 21192406 12365575	vm_nonadmin	
DC1-S3	10.96.99.42		SSM ADC CMS DDS LDR	16991900 11429892 13356303 21887921 12131621	vm_nonadmin	

Overview of the Network Management System Management Interface

The Network Management System Management Interface (NMS MI) is the StorageGRID Webscale system's browser-based graphical interface.

The NMS MI enables you to perform the following tasks:

- Manage globally-distributed, petabyte-scale repositories of objects, such as images, video, and records
- Monitor grid nodes and services to ensure object availability
- Manage the placement of object data over time using information lifecycle management (ILM) rules. These rules govern what happens to an object's data once it is ingested, how it is protected from loss, where object data is stored, and for how long.
- Monitor transactions, performance, and operations within the system.

Signing in to the NMS MI

You access the NMS Management Interface (NMS MI) by signing in through a supported web browser using the web address or domain name defined by your system administrator.

Before you begin

- You must have an authorized user name and password. If signing in to the NMS MI for the first time, note the NMS MI password for the Vendor account or the Admin account as listed in the `Passwords.txt` file.
- Cookies must be enabled in your web browser.
- Acquire the IP address or domain name to the NMS MI. If signing in to the NMS MI for the first time, note the IP address of the Admin Node as listed in the `Configuration.txt` file.
- Acquire access to a supported web browser.

The following browsers have been tested with the StorageGRID Webscale system to verify compatibility:

- Google Chrome 43
- Microsoft Internet Explorer 11.0
- Mozilla Firefox 38.0.5

About this task

When you sign in to the NMS MI, you are connecting to a data center site's Admin Node. In a multi-site StorageGRID Webscale deployment, each site may include an Admin Node. You can connect to any Admin Node and each Admin Node displays a similar view of the StorageGRID Webscale system; however, alarm acknowledgments made at one Admin Node are not copied to the other Admin Node. It is therefore possible that the Grid Topology tree will not look the same for each Admin Node.

The NMS MI uses a self-signed certificate based on the StorageGRID Webscale system's IP address. The expected URL to the NMS MI is this IP address and not a domain name. In cases where a domain name is used to connect to the NMS MI, your browser might not be able to match the self-

signed certificate to the identity of the NMS server. For information about importing this certificate into a browser, see the browser's documentation.

Steps

1. Launch a supported web browser.
2. In the browser's address bar, enter the IP address or domain name of the NMS MI.
3. If you are prompted with a security alert, do one of the following:
 - Proceed with this session. The alert will appear again the next time you access this URL.
 - View and install the certificate using the browser's installation wizard. The alert will not appear the next time you access this URL.

The Network Management System Sign In page appears.



4. Enter your case-sensitive username and password and click **Sign In**.

The NMS MI appears.

CMS Service	Number of Objects	ILM Evaluation Rate
Data Center 1/DC1-S1-98-162/CMS	0	0 Objects/s
Data Center 1/DC1-S2-98-163/CMS	0	0 Objects/s
Data Center 1/DC1-S3-98-164/CMS	0	0 Objects/s
Data Center 2/DC2-S1-98-166/CMS	0	0 Objects/s
Data Center 2/DC2-S2-98-167/CMS	0	0 Objects/s
Data Center 2/DC2-S3-98-168/CMS	0	0 Objects/s
Data Center 3/DC3-S1-98-169/CMS	0	0 Objects/s
Data Center 3/DC3-S2-98-170/CMS	0	0 Objects/s
Data Center 3/DC3-S3-98-171/CMS	0	0 Objects/s

Signing out of the NMS MI

When you have completed your NMS MI session, to keep the system secure, you must log out of the NMS MI.

Step

1. Click **Sign Out** located at the top-right corner of the screen.

The logging out message appears.

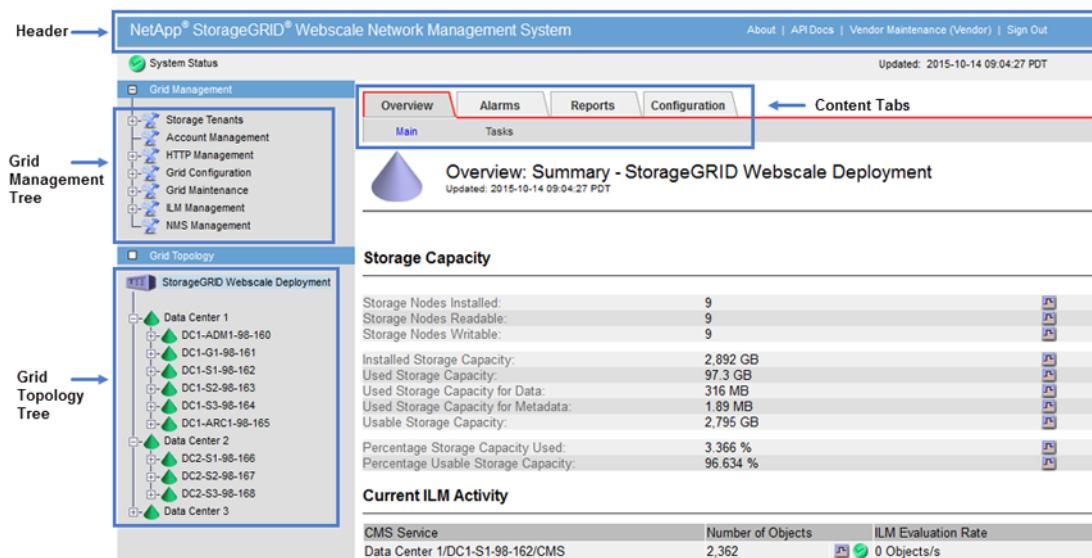
Note: Failure to log out can give unauthorized users access to your NMS MI session. Simply closing your browser is not sufficient to log out of the session.

NMS Management Interface elements

The NMS MI provides basic operational data, alarm status, reporting functionality, and configuration options for each grid node, service, and component.

The main elements of the NMS MI are:

- Header
- Grid Management Tree
- Grid Topology Tree
- Content Tabs

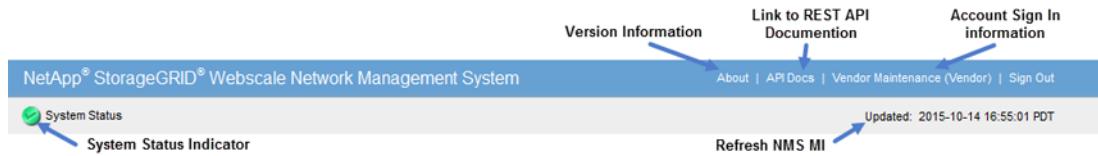


Reviewing header information

The header contains high-level system information, such as latest browser refresh time, system status, and currently logged in user name.

About this task

- The currently logged-in user's name, user group, and Sign Out link appear on the right.
- The System Status indicator on the left provides an indication of the system's health and whether any alarms exist.
- The time stamp on the right displays when the browser was last refreshed.



Steps

- To view user account information, click on the user name.
The Account Management page appears.
- To view NMS MI version information, click **About**.
- To view documentation for API-based management, click **API Docs**.
This section also allows you to perform grid and tenant management tasks for S3 and Swift accounts. For more information, see the *Administrator Guide*.
- To view system alarm information, click **System Status**.
- To exit the NMS MI, click **Sign Out**.

Related concepts

[Types of built-in user accounts](#) on page 28

[Alarms and state indicators](#) on page 30

Related information

[StorageGRID Webscale 10.2 Administrator Guide](#)

Refreshing the data manually

Information presented in the NMS MI is time-sensitive. You can update displayed information at any time by manually performing a data refresh.

About this task

The Updated timestamp indicates when the data shown was collected, that is, the time at which the last system status “snapshot” was taken. Local time is shown as determined from the preferences set in the user account. The information is refreshed automatically at set intervals (the default is 15 seconds).

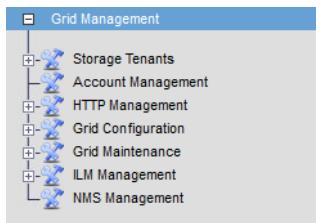
Step

1. To refresh the display manually, do one of the following:
 - Click the timestamp.
 - Click the refresh button for the browser.

After the page has finished reloading, the content and the timestamp are updated. If you leave the NMS MI open with no activity, the session expires after the configurable timeout and returns you to the Sign In window.

Grid Management tree

The Grid Management tree provides access to a number of configuration pages. Use the tree to manage user accounts, add and edit S3 and Swift tenant accounts, manage HTTP client permissions and certificates, set audit levels, set link costs, identify storage grades, and configure Information Lifecycle Management (ILM) rules.



Branch	Used to configure
Storage Tenants	S3 or Swift tenant accounts. For details, see managing storage tenant account information in the <i>Administrator Guide</i> . For details about S3, Swift, or CDMI accounts, see the implementation guide for that API.
Account Management	User and group accounts. For details, see account information in the <i>Administrator Guide</i> .
HTTP Management	System-wide options such as client permissions, certificates, security partitions, client IP addresses, and HTTP metadata. Configuration is restricted to user accounts that have Maintenance permissions such as the Admin and Vendor accounts. For information about HTTP management, see the <i>Administrator Guide</i> .
Grid Configuration	System-wide options such as audit levels, link costs, and storage grades. Configuration is restricted to user accounts that have Grid Management permissions such as the Vendor account. For information about configuration, see the <i>Administrator Guide</i> .
Grid Maintenance	Wizard for completing system-wide software upgrades, expansions, backup provisioning, and decommissioning in the NMS MI.

Branch	Used to configure
ILM Management	Information Lifecycle Management (ILM) policies and ILM rules. Configuration is restricted to user accounts that have Grid Management permissions such as the Vendor account. For information about ILM, see the <i>Administrator Guide</i> .
NMS Management	NMS overview, custom alarms, notifications, AutoSupport, Admin Node name, and GUI timeout period. Configuration is restricted to user accounts that have Maintenance permissions such as the Admin and Vendor accounts. For information about alarm customization and notifications, see the <i>Administrator Guide</i> .

Related information

[StorageGRID Webscale 10.2 Administrator Guide](#)

[StorageGRID Webscale 10.2 Simple Storage Service Implementation Guide](#)

[StorageGRID Webscale 10.2 Swift Implementation Guide](#)

[StorageGRID Webscale 10.2 Cloud Data Management Interface Implementation Guide](#)

Summary of configuration options in the NMS MI

The NMS Management Interface (NMS MI) provides configuration options for each grid node and service.

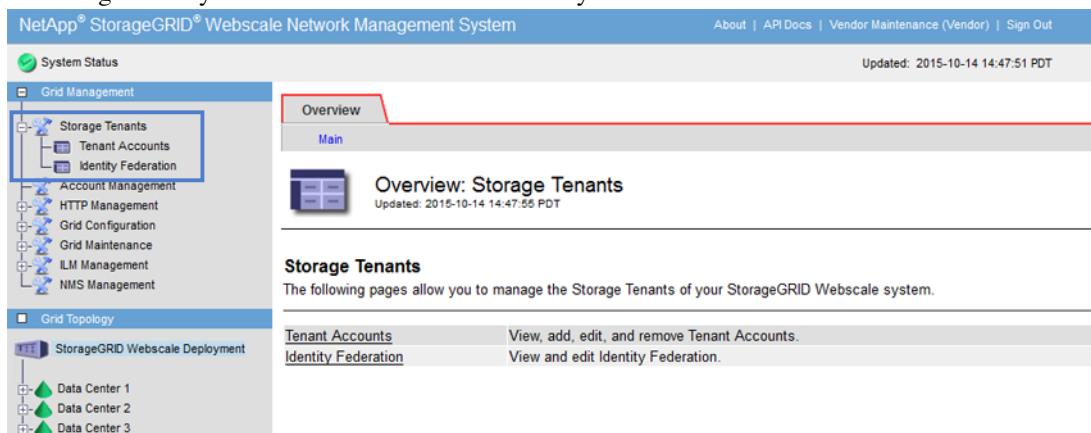
Warning: Changing configuration settings requires careful and deliberate planning. Some configurable elements can affect the state of the live system. Only experienced administrators should alter the device and component configuration settings.

The configuration options in NMS MI are as follows:

- Storage Tenants

StorageGRID Webscale supports the creation of tenant accounts to provide access to storage for S3 and Swift clients.

Access credentials are created within the context of the tenant account to provide S3 or Swift clients access to the buckets or containers and objects within the account. A tenant account is created with support for either S3 or Swift protocol access, but not both. LDAP federation can also be used to enable users belonging to configured LDAP groups to acquire access credentials for the tenant account. Configuration of tenant accounts is supported both in the NMS MI and through the REST API. Storage usage tracking is provided at the tenant account level, including the storage used by each bucket or container owned by that account.



- Account Management

You can use the Account Management branch to configure accounts.

User Name	Password	First Name	Last Name	Language	Status	Group Name	Actions
Vendor	*****	Vendor	Maintenance	United States - English	Active	Vendor	
Admin	*****	Network	Administrator	United States - English	Active	Admin	

Group Name	Group Description	Grid Management	Maintenance	Alarm Acknowledgement	Accounts	Actions
Vendor	Vendor Maintenance Personnel	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Admin	Administrator	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
User	User	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

- HTTP Management

You can use the HTTP Management branch to configure connection profiles for StorageGRID API (SGAPI) or Cloud Data Management Interface (CDMI) integration. For more information, see the *StorageGRID API Reference*, *Cloud Data Management Interface Integration Guide*, and *Simple Storage Service Integration Guide*.

HTTP Management
The following pages configure client permission profiles to allow connections to the grid via the HTTP protocol.

Permissions	Create HTTP permission profiles with required rights
Certificates (Optional)	Add certificate authorities and client certificates
Security Partitions (Optional)	Configure security partitions
Clients	Associate an IP range to an HTTP permission profile

Metadata Information

Metadata	View a list of metadata that can be used by HTTP clients
----------	--

- Grid Configuration

You can use the Grid Configuration branch to configure system-wide options. For information on configuring these settings, see the *Administrator Guide*.

The screenshot shows the 'Grid Configuration' section of the StorageGRID Webscale Network Management System. The left sidebar has a tree view with 'Grid Management' expanded, showing 'Storage Tenants', 'Account Management', 'HTTP Management', 'Grid Configuration' (which is selected and highlighted in blue), 'Grid Maintenance', 'ILM Management', and 'NMS Management'. Under 'Grid Configuration', there are sub-options: 'Audit', 'Domain Names', 'Events', 'Network', 'NMS Entities', 'Link Cost', 'Storage', and 'Storage Grades'. The main content area has tabs 'Overview' (selected) and 'Configuration'. Below the tabs is a 'Main' button. The 'Overview' tab displays the 'Overview: Grid Configuration' section, which includes a summary table with information like Grid ID (401448), Configured (2015-10-13 23:59:15 PDT), Vendor (NetApp Inc.), and Software Suite Interoperability Version (10.2.0). Below this is the 'Grid Information' section, which lists the same details. Further down is the 'API Server Certificates' section, which contains fields for 'CA Certificate' (CN=GPT, OU=NetApp StorageGRID, O=NetApp Inc., L=Sunnyvale, ST=California, C=US) and 'Custom Server Certificate' (Not configured). The final section is 'Grid Options', which lists various system settings.

- **Grid Maintenance**

The Grid Maintenance branch is used to perform various system-wide task including software upgrades, expansions, backing up of provisioning, and decommissioning.

The screenshot shows the 'Grid Maintenance' section of the StorageGRID Webscale Network Management System. The left sidebar has a tree view with 'Grid Management' expanded, showing 'Storage Tenants', 'Account Management', 'HTTP Management', 'Grid Configuration' (selected and highlighted in blue), 'Grid Maintenance' (selected and highlighted in blue), 'ILM Management', and 'NMS Management'. Under 'Grid Maintenance', there are sub-options: 'Software Upgrade', 'Expansion', 'Decommission', and 'Provisioning Backup'. The main content area has tabs 'Overview' (selected) and 'Main'. Below the tabs is a 'Main' button. The 'Overview' tab displays the 'Overview: Grid Maintenance' section, which includes a summary table with information about maintenance procedures: Software Upgrade (Upgrade the StorageGRID Webscale system to the latest version), Expansion (Add grid nodes and data center sites to the StorageGRID Webscale system), Decommission (Remove grid nodes from the StorageGRID Webscale system), and Provisioning Backup (Download the Grid Provisioning archive file containing encryption keys and passwords).

- **ILM Management**

The ILM Management branch is used to configure information lifecycle management (ILM) policies and ILM rules. For more information, see the *Administrator Guide*.

The screenshot shows the 'Grid Management' section of the interface. The 'ILM Management' item is selected and highlighted with a blue box. The main content area displays the 'Overview (Active Policy): ILM Management' page, which includes a pie chart, the policy name 'Baseline Two Copy Purge Deleted Objects v1.0', and a list of rules: '1. Purge Deleted Objects v1.0' and '2. Make 2 Copies v1.0 (Default)'. Below this is a 'Storage Pools' section with a single entry: '1. All Storage Nodes'.

- **NMS Management**

The NMS Management branch is used to configure the e-mail server, custom alarms, alarm notifications, Admin Node names, the GUI timeout period, and enable or disable AutoSupport. For information on configuring these settings, see the *Administrator Guide*.

The screenshot shows the 'Grid Management' section of the interface. The 'NMS Management' item is selected and highlighted with a blue box. The main content area displays the 'Overview: NMS Management' page, which includes a pie chart, the title 'Main', and a 'NMS Information' table. The table shows one entry: Data Center 1/DC1-ADM1-98-160/NMS, with Type listed as 'Consolidated' and Name listed as 'ADMIN-DC1-ADM1-98-160'.

Related information

- [StorageGRID Webscale 10.2 Administrator Guide](#)
- [StorageGRID Webscale 10.2 Simple Storage Service Implementation Guide](#)
- [StorageGRID Webscale 10.2 Swift Implementation Guide](#)
- [StorageGRID Webscale 10.2 Cloud Data Management Interface Implementation Guide](#)
- [StorageGRID Webscale 10.2 StorageGRID API Reference](#)

Exporting configuration settings

You can export the current configuration settings as a comma-separated list.

About this task

Each configuration page includes an export button at the top right corner.

Site ID	Site Name	Actions
10	Data Center 1	
20	Data Center 2	
30	Data Center 3	

Steps

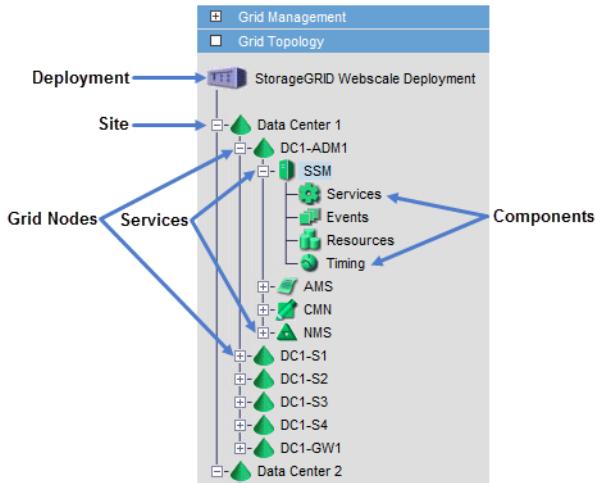
1. Go to **Grid Management > Grid Configuration > configuration > Configuration tab**.
 2. Click the export icon ().
- A browser window opens, listing configuration settings.
3. Select **File > Save As**.
 4. Type a descriptive name for the settings file.
For example: `GridID_HTTP_Settings_YYYYMMDD.txt`.
 5. Select **Save as type > Text File (*.txt)**.
 6. Click **Save**.
- You can import the list of settings to a spreadsheet program as a comma-separated list.

Grid Topology tree

The Grid Topology tree provides you with quick access to various system elements and their related pages.

These elements are:

- Deployment
- Site
- Grid Nodes
- Services
- Components



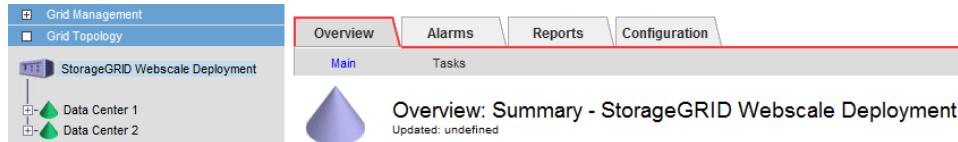
Each site can be expanded to reveal one or more grid nodes, which can be expanded to reveal services.

To expand or collapse the Grid Topology tree, click and . **<Ctrl>** clicking at either the site or grid nodes level opens (or closes) all items in the Grid Topology tree at the level clicked.

To view system elements in the Grid Topology tree, click an element's name.

Content tabs in Grid Topology tree pages

Content on each page is organized under four tabs: Overview, Alarms, Reports, and Configuration.



- **Overview:** Use the Overview tab to monitor attributes. Each attribute represents a property, for example, the number of managed objects, available storage space, backup size, or service state. These attributes are used to monitor system operations and to detect and troubleshoot abnormal conditions. While there are hundreds of attributes, most of them are used for troubleshooting and only a small number must be monitored on a regular basis to ensure smooth operation.
- **Alarms:** Use the Alarms tab to view and acknowledge alarms.
- **Reports :** Use the Reports tab to create charts and text reports.
- **Configuration :** Use the Configuration tab to change configuration settings at the site, grid node, service, or component level. Configuration is restricted to user accounts that have Maintenance permissions such as the Admin and Vendor accounts.

Some tabs contain multiple pages. Click the page selector to access content. The page currently selected is shown in blue and the other pages in black.



Related concepts

[Monitoring operations](#) on page 58

[Alarms and state indicators](#) on page 30

[Reports](#) on page 37

Attributes on pages

Through the NMS MI, you can monitor the health and activities of your StorageGRID Webscale system by reviewing attribute values on grid nodes, services, and components.

The following image shows several attributes on the Storage Node Overview page.

The screenshot shows the StorageGRID Webscale Deployment interface. The left sidebar lists Data Centers (DC1-ADM1, DC1-S1, DC1-S2, DC1-S3, DC1-S4, DC1-GW1) and Data Center 2. The main panel is titled 'Overview: LDR (DC1-S1) - Storage' (Updated: 2014-04-14 18:12:58 PDT). It displays storage state (Online, No Errors), utilization metrics (Total Space: 160 GB, Total Usable Space: 160 GB, etc.), and object store details for three stores (ID 0000, 0001, 0002).

ID	Total	Available	Stored Data	Stored (%)	Cached Data	Cached (%)	Health
0000	53.4 GB	53.4 GB	315 KB	0.001 %	0 B	0 %	No Errors
0001	53.4 GB	53.4 GB	266 KB	0.001 %	0 B	0 %	No Errors
0002	53.4 GB	53.4 GB	336 KB	0.001 %	0 B	0 %	No Errors

Types of built-in user accounts

The StorageGRID Webscale system two built-in user accounts: Admin and Vendor.

Admin: Responsible for maintenance. The admin account can configure services and components, but cannot make system-wide changes.

Vendor: Responsible for system configuration. The vendor account has full permissions.

These built-in accounts cannot be deleted. Additional accounts can be added to the system. For example, a read-only account intended for users who simply monitor the system.

User group permissions

Three built-in user groups (group accounts) have been configured for the StorageGRID Webscale system: Vendor, Admin, and User. Built-in groups are granted a collection of permissions.

There are four types of permissions. The following table describes the allowable tasks for each set of permissions.

Table 1: User Groups Permissions

Permission set	Allowable tasks
Grid Management	<ul style="list-style-type: none"> Configure system-wide options Configure ILM

Permission set	Allowable tasks
Maintenance	<ul style="list-style-type: none"> Configure the NMS MI (customize alarms, configure e-mail notifications, and configure GUI timeout) Configure services and components
Alarm acknowledgment	<ul style="list-style-type: none"> Acknowledge alarms
Accounts	<ul style="list-style-type: none"> Create new Grid Administrator user accounts, configure existing accounts, and delete accounts Create new Grid Administrator user groups, configure existing user groups, and delete user groups

The following figure shows the built-in user accounts and group accounts. Depending on the permissions on your account, you might not see all the accounts.

The screenshot displays the 'Account Management' page. At the top, there's a navigation bar with tabs: 'Accounts' (which is selected and highlighted in red) and 'Main'. Below the navigation bar is a header section featuring a user icon, the title 'Account Management', and the text 'Updated: 2015-07-31 11:47:48 PDT'. The main content area is divided into two sections: 'User Accounts' and 'Group Accounts'. The 'User Accounts' section contains a table with columns: User Name, Password, First Name, Last Name, Language, Status, Group Name, and Actions. It lists two entries: 'Vendor' and 'Admin'. The 'Group Accounts' section contains a table with columns: Group Name, Group Description, Grid Management, Maintenance, Alarm Acknowledgement, Accounts, and Actions. It lists three entries: 'Vendor', 'Admin', and 'User'.

User Name	Password	First Name	Last Name	Language	Status	Group Name	Actions
Vendor	*****	Vendor	Maintenance	United States - English	Active	Vendor	
Admin	*****	Network	Administrator	United States - English	Active	Admin	

Group Name	Group Description	Grid Management	Maintenance	Alarm Acknowledgement	Accounts	Actions
Vendor	Vendor Maintenance Personnel	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Admin	Administrator	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
User	User	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Configuring your account

You can modify your account settings by changing your password, first name, and last name.

Before you begin

Browser pop-ups must be enabled to change your password.

About this task

Note: Creating accounts and modifying accounts of other users is restricted to accounts that have Accounts permission, such as the Admin and Vendor accounts. For more information about creating and modifying accounts, see the *Administrator Guide*.

Steps

1. Select **Grid Management > Account Management**.

2. Click **Edit**.
3. To change your password:
 - a. Double-click in the **Password** text box to select the complete field.
 - b. Type a new password. Your password must contain between 8 and 32 characters and is case-sensitive.
 - c. Press Tab.

A confirmation pop-up window appears.

 - d. Re-enter the password and click **Confirm Password**.

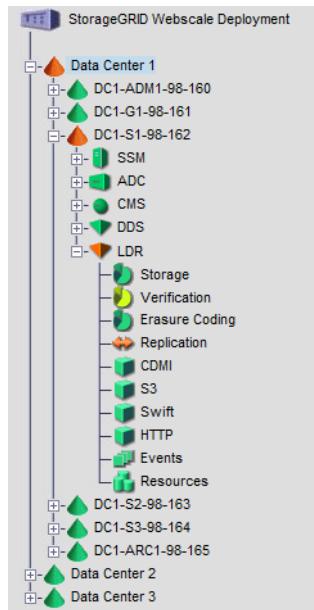
If the password fails to match, re-enter the password as prompted.
4. To change your name, edit the values in **First Name** or **Last Name** text boxes.
5. Click **Apply Changes**.

Related information

[StorageGRID Webscale 10.2 Administrator Guide](#)

Alarms and state indicators

The color of the icon next to each site, grid node, service, and component in the Grid Topology tree reflects the overall status of that part of the StorageGRID Webscale system.



If there are no alarms and all services are connected, the icon appears in the normal (green) state. If there is an alarm, the color of the icon reflects the most severe alarm currently active on that branch of the tree. Sites display the highest alarm level of the grid nodes on that branch. Grid nodes display the color of the most severe state or alarm among their hosted services. Each individual service reflects the highest alarm severity of its components.

Service state indicators

A service can have one of three states: Unknown, Connected, or Administratively Down. A service that is Unknown is problematic and must be investigated. A service that is Connected is operating normally and displays the color of its highest alarm severity—either itself or its components. A service that is Administratively Down has been deliberately shut down for maintenance by an administrator.

Icon	Color	State	Meaning
	Blue	Unknown	An unknown condition exists that has stopped normal operation. Requires immediate attention. The “Unknown” state is considered the most severe. It is typically used to indicate loss of connection between the NMS service and another service.
	Green	Connected	All services are working normally.
	Gray	Administratively Down	A service has stopped. All alarms on the stopped service including acknowledged alarms are removed.

Alarm indicators

An alarm is triggered when the value of an attribute reaches an alarm threshold value. When an alarm is triggered, the alarm information is displayed in the NMS MI and a notification is automatically sent to designated personnel.

A change in the value of an attribute can trigger an alarm. A change in the state of a service does not trigger an alarm.

Alarms are generated at the attribute level. There are five alarm severity levels displayed in the NMS MI. Each alarm level has an associated color and icon as displayed in the following table. Note that a severity level of Normal does not trigger an alarm, and the entries are listed from top to bottom with increasing severity.

Icon	Color	State	Severity	Meaning
	Green	Connected	Normal	Functionality normal
	Yellow	Connected	Notice	An unusual condition exists that does not affect normal operations.
	Light Orange	Connected	Minor	An abnormal condition exists that could affect operation in the future; should be investigated to prevent escalation.
	Dark Orange	Connected	Major	An abnormal condition exists that currently affects operation; requires prompt attention to prevent escalation.
	Red	Connected	Critical	An abnormal condition exists that has stopped normal operations; address immediately.

Propagation of alarms and states

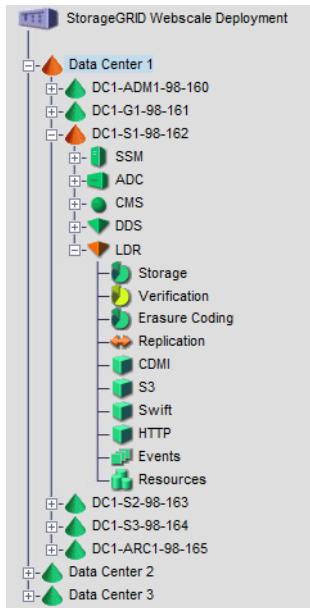
Both alarms and state indicators impact the color of the icons.

Alarm indicators

Alarms are generated at the attribute level. When an issue is detected, the alarm is propagated up through the Grid Topology tree. The associated attribute, component, service, grid node, and site information displayed in the NMS MI all change to reflect the alarm's severity. The color displayed reflects the most severe alarm currently active on that branch of the Grid Topology tree. As a result, you can view the general alarm severity level at the system level, then click through the service components to locate the specific details.

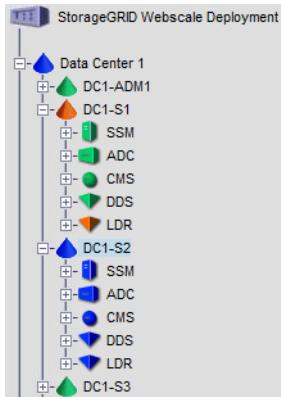
For example, in the following figure, the LDR service has at least two alarms:

- The Verification component has at least one alarm with a severity of Notice.
- The Replication component has at least one alarm with a severity of Major. Major is the more severe of the two alarms and therefore it propagates up the Grid Topology tree so that the LDR service takes on the Major alarm color: dark orange.



State indicators

priority over alarm indicators. When a service enters either an Administratively Down or Unknown state, the state color is propagated down through the service to its components. This overrides any component alarm indicators. For example, a service state of Unknown supersedes an alarm severity of Critical and results in the service displaying the blue Unknown state color and not the Critical alarm severity color. The state of the service also propagates up to the node level.



For example, in the following figure, Storage Node DC1-S2 has been shut down and has a state of Unknown. This state overrides any alarms that might have been raised on any of its components. Unknown is a more severe state than any alarm and therefore propagates up the Grid Topology tree so that the Unknown state color blue is the most critical state of any services. The state condition of a grid node's services propagates up the Grid Topology tree in the same manner that alarms do.

Enabling alarm e-mail notifications

E-mail notifications are automatically sent to designated personnel to alert recipients that an alarm has been triggered or that a service state has changed.

About this task

Managing e-mail notifications is restricted to user accounts with Maintenance permissions such as, Admin or Vendor. For more information about e-mail notifications, see the *Administrator Guide*.

Step

- To view the status of e-mail notifications, go to the **Admin_Node > NMS > Overview** page.

The E-mail Notifications Status attribute displays the selected Admin Node's current ability to send e-mail notifications to the mail server.

The screenshot shows the 'Overview' tab selected in the top navigation bar. Below it, the main content area displays the following information:

- Overview: NMS (DC1-ADM1) - NMS**
- Updated: 2014-04-24 17:08:26 EDT**
- NMS State:** Online (Green)
- NMS Status:** No Errors (Green)
- NMS Interface Engine Status:** Connected (Green)
- E-mail Notifications Status:** No Errors (Green)
- Node Information**
 - Device Type: Network Management System
 - Version: 10.0.0
 - Build: 20140424.0019.fb7281f
 - Node ID: 14862732
 - Group ID: 10
- Binding Information**
 - Name: ADMIN-DC1-ADM1
 - Type: Consolidated
 - Bound Nodes: 45
 - Maximum Supported Bindings: 160
 - Remaining Capacity: 71.875 %

If there is an error, the selected NMS service cannot send e-mail notifications to the mail server. Depending on system configurations, this can mean that the NMS service is not sending notifications and that switch-over to another NMS service has occurred (if the deployment has multiple Admin Nodes).

Related information

[StorageGRID Webscale 10.2 Administrator Guide](#)

Customize alarms

The StorageGRID Webscale system is configured with a set of default alarms. In addition to these alarms, you can create custom alarms at the service, component, or system level.

The **Configuration > Alarms page** for each service or component is used to view configured Default alarms and Global Custom alarms and to create Custom alarms for a service. Access is restricted to user accounts that have Maintenance permissions such as the Admin and Vendor accounts.

The **Grid Management > NMS Management page** is used to create Global Custom alarms and to enable or globally disable Default alarms. Access is restricted to user accounts that have Grid Management permissions such as the Vendor account.

For more information about custom alarms, see the *Administrator Guide*.

Related information

[StorageGRID Webscale 10.2 Administrator Guide](#)

Reviewing alarms

You can view all alarms, view propagated alarms in the Grid Topology Tree, and show or hide acknowledged alarms.

About this task

This information appears in the following locations:

- System Status page
- Alarms tab for each component and service
- Overview tab for each component and service

Steps

1. To get a list of all alarms, complete the following steps:
 - a. Click **System Status** in the header to display alarms. Alarms are sorted by severity.
 - b. To show all acknowledged alarms, click **Show Acknowledged Alarms**.

The screenshot shows the 'System Status' page with a table of alarms. The table has columns for Severity, Attribute, Service, Description, Alarm Time, Trigger Value, Current Value, and Acknowledge Time. There are 7 rows listed.

Severity	Attribute	Service	Description	Alarm Time	Trigger Value	Current Value	Acknowledge Time
Warning	ORISU (Outbound Replication Status)	Data Center ZDC2-S3LDR/Replicated	Storage Unavailable	2014-04-15 14:29:05 EDT	Storage Unavailable	Storage Unavailable	
Warning	ORISU (Outbound Replication Status)	Data Center ZDC2-ABC1ARC/Replicated	Storage Unavailable	2014-04-15 14:21:49 EDT	Storage Unavailable	Storage Unavailable	
Warning	ATE (Archive Retrieve State)	Data Center ZDC2-ABC1ARC/Retrieval	Offline	2014-04-15 14:21:48 EDT	Offline	Offline	
Warning	ATE (Archive Store State)	Data Center ZDC2-ABC1ARC/Store	Offline	2014-04-15 14:21:32 EDT	Offline	Offline	2014-04-15 15:25:01 EDT
Normal	HSTE (HTTP/CDM State)	Data Center 1/DC1-S1A/LDB	Online (Read-Only)	2014-04-15 14:52:51 EDT	Online (Read-Only)	Online (Read-Only)	
Normal	VSTU (Object Verification Status)	Data Center ZDC2-S3LDR/Verification	Not Started	2014-04-15 14:26:05 EDT	Not Started	Not Started	
Normal	HSTE (HTTP/CDM State)	Data Center 2/DC2-S3LDR	Redirect	2014-04-15 14:29:05 EDT	Redirect	Redirect	

Show 50 Records Per Page Refresh Previous x 1 x Next

- c. Review the system through the System Status indicator. If there is an issue with the StorageGRID Webscale system, you are immediately directed to the problem.
2. To get a list of all alarms triggered over a period of time, complete the following steps:
 - a. Click **System Status** in the header.
 - b. Click the History page.

The screenshot shows the 'System History' page. It includes fields for Attribute (set to All), Quick Query (with options for Last 5 Minutes, Last Hour, Last Day, Last Week, and Last Month), and Custom Query (with Start Date set to 2010/07/10 13:28:56 and End Date set to 2010/07/19 13:28:56). A 'Custom Query' button is also present.

Select an attribute and then either a Quick Query or a Custom Query:

Attribute: All

Quick Query: Last 5 Minutes, Last Hour, Last Day, Last Week, Last Month

Custom Query: Start Date: 2010/07/10 13:28:56 YYYY/MM/DD HH:MM:SS
End Date: 2010/07/19 13:28:56 YYYY/MM/DD HH:MM:SS

Custom Query

- c. Do one of the following:
 - Click one of the time periods.
 - Enter a custom range and click **Custom Query**.

Acknowledging alarms

Depending on the situation, you can choose to acknowledge alarms while you are trying to resolve the underlying issue. To acknowledge alarms, users must have Alarm Acknowledgement permissions that come with higher-level accounts such as the Admin and Vendor.

About this task

An acknowledged alarm continues displaying as an alarm at the component level on the System Status page; however, once an alarm has been acknowledged, it no longer propagates up the Grid Topology tree. The Grid Topology tree is displayed as Normal (green) or the color of the next most severe unacknowledged alarm or more severe service state.

The screenshot shows two views of the StorageGRID Webscale Deployment interface. The top view is the 'Alarms' tab, titled 'Alarms: LDR (DC1-S1) - Replication'. It displays a table of alarms for the LDR component in Data Center 1. The table has columns for Severity, Attribute, Description, Alarm Time, Trigger Value, Current Value, Acknowledge Time, and Acknowledge status. One alarm is listed as Major (Storage Unavailable). The bottom view is the 'Inbound Replication' tab, which includes sections for Inbound Replication Status, Inbound Replications Summaries, and Outbound Replication Status.

Severity	Attribute	Description	Alarm Time	Trigger Value	Current Value	Acknowledge Time	Acknowledge
Normal	R5U (inbound Replication Status)						<input type="checkbox"/>
Normal	RIRQ (inbound Replications - Queued)						<input type="checkbox"/>
Normal	RIRF (inbound Replications Failed)						<input type="checkbox"/>
Major	ORSU (Outbound Replication Status)	Storage Unavailable	2014-03-28 13:31:24 PDT	Storage Unavailable	Storage Unavailable		<input checked="" type="checkbox"/>
Normal	RORQ (Outbound Replications - Queued)						<input type="checkbox"/>
Normal	RORF (Outbound Replications - Failed)						<input type="checkbox"/>

There are many reasons why you might want to acknowledge an alarm. For instance, while testing or troubleshooting the StorageGRID Webscale system, you might want to hide (by acknowledging) alarms in order to better track unknown issues. Or, you might, because of time constraints, want to acknowledge an alarm that you can more effectively attend to later.

When a service is in a state of Administratively Down, all attribute alarms for that service — including acknowledged alarms — are removed. The current attribute values at the time the service restarts will be used to determine if any new alarms are triggered.

Steps

1. Go to <service or component>> Alarms > Main.
2. Click on the box at right to Acknowledge the alarm.

Alarms: SSM (170-41) - Events
Updated: 2010-07-19 15:11:52 PDT

Severity	Attribute	Description	Alarm Time	Trigger Value	Current Value	Acknowledge Time	Acknowledge
Normal	SMST (Log Monitor State)					2010-07-19 15:11:36 PDT	<input type="checkbox"/>
Notice	SMTT (Total Events)	At least 1	2010-07-19 14:45:57 PDT	1	1	2010-07-19 15:11:36 PDT	<input checked="" type="checkbox"/>
Normal	AMQS (Audit Messages Queued)						<input type="checkbox"/>
Normal	NRLY (Available Audit Relays)						<input type="checkbox"/>
Normal	ABRL (Available Attribute Relays)						<input type="checkbox"/>

[Apply Changes](#)

3. Click **Apply Changes**.

The alarm is acknowledged and a notification is sent to designated personnel.

Unacknowledging an alarm

Steps

1. Go to <**service or component**> > **Alarms** > **Main**.
2. Clear on the box at right to unacknowledge the alarm.
3. Click **Apply Changes**.

The alarm is unacknowledged and a notification is sent to designated personnel.

Showing or hiding acknowledged alarms

After you acknowledge an alarm, it disappears from the System Status view. However, you can display all acknowledged alarms.

Steps

1. Click **System Status** in the header to display alarms. Alarms are sorted by severity.
2. To show all acknowledged alarms, click **Show Acknowledged Alarms**.

Reports

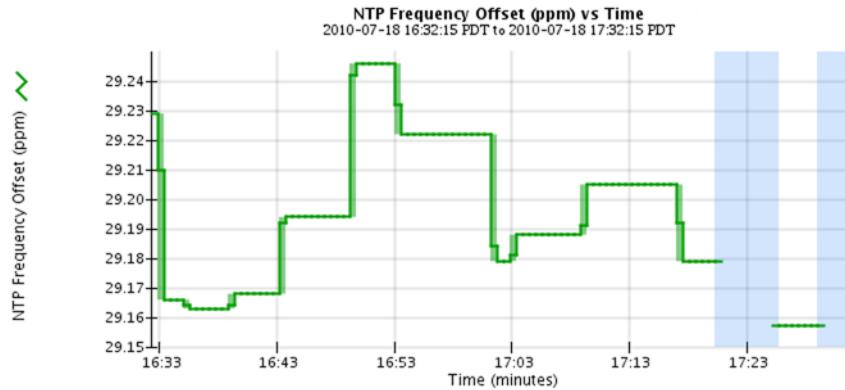
You can use reports to monitor the state of the StorageGRID Webscale system and troubleshoot problems. There are two types of reports: charts and text reports.

Types of charts

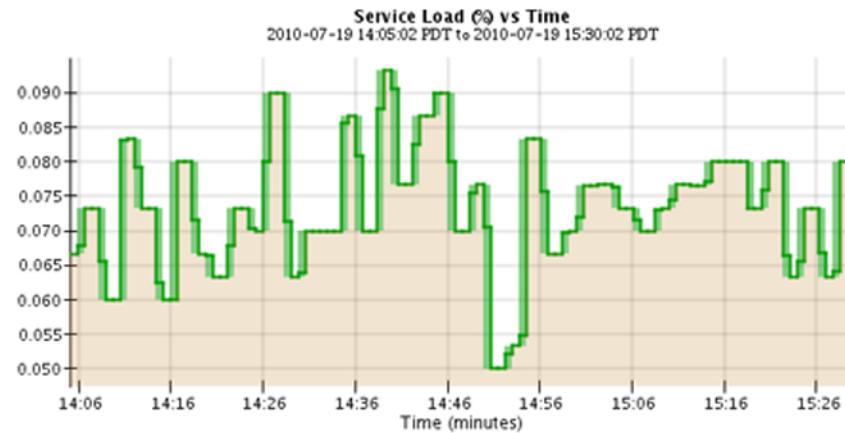
Charts present the data with the attribute value (vertical axis) over a specified time span (horizontal axis).

There are three types of charts:

- Line graph: Used to plot the values of an attribute that has a unit value (such as NTP Frequency Offset, in ppm). The changes in the value are plotted in bins at regular intervals over time.



- Area graph: Used to plot volumetric quantities, object count or service load values for instance. Area graphs are similar to line graphs, but include a light brown shading below the line. The changes in the value are plotted in bins at regular intervals over time.



- State graph: State graphs are used to plot values that represent distinct states such as a service state that can be online, standby, or offline. State graphs are similar to line graphs, but the transition is discontinuous, that is, the value jumps from one state value to another.

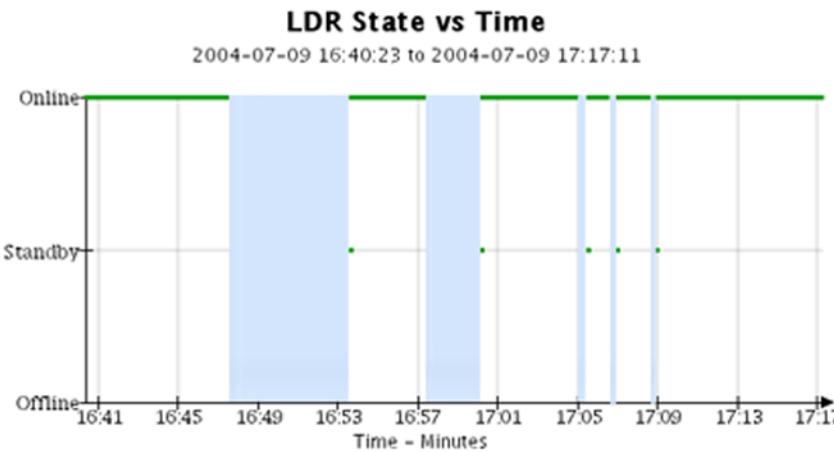


Chart legend

The lines and colors used to draw charts have specific meaning.

Sample	Meaning
	Reported attribute values are plotted using dark green lines.
	Light green shading around dark green lines indicates that the actual values in that time range vary and have been “binned” for faster plotting. The dark line represents the weighted average. The range in light green indicates the maximum and minimum values within the bin. Light brown shading is used for area graphs to indicate volumetric data.
	Blank areas (no data plotted) indicate that the attribute values were unavailable. The background can be blue, gray, or a mixture of gray and blue, depending on the state of the service reporting the attribute.
	Light blue shading indicates that some or all of the attribute values at that time were indeterminate; the attribute was not reporting values because the service was in an unknown state.
	Gray shading indicates that some or all of the attribute values at that time were not known because the service reporting the attributes was administratively down.
	A mixture of gray and blue shading indicates that some of the attribute values at the time were indeterminate (because the service was in an unknown state), while others were not known because the service reporting the attributes was administratively down.

Displaying charts

In most cases, the fastest way to create a chart is to go to an Overview page and click the chart icon next to the attribute. Clicking this chart icon takes you to the **Reports > Charts** page and displays a chart for the attribute. This is known as an immediate chart.

About this task

You can also manually create reports from the Report tab.

Note: It is not possible to create charts for all attributes; for example, text attributes such as Node ID, version number, and build number.

Steps

1. Go to **<component or service> > Overview > Main**.

Processors							
Processor #	Vendor	Type		Speed	Cache		
1	GenuineIntel	Intel(R) Xeon(R) CPU X5670 @ 2.93GHz		2.93 GHz	12 MiB		
2	GenuineIntel	Intel(R) Xeon(R) CPU X5670 @ 2.93GHz		2.93 GHz	12 MiB		
CPU Load:		30 %					
CPU I/O Blocking:		0.203 %					
CPU Load Average:		1.02					

Service Health							
Service Memory Accounting:		12.1 MB					
Service Memory Usage:		48.3 MB					
Service Memory Usage (Percent):		1.163 %					
Service Threads:		41					
Service Processes:		46					
Average Wait Time:		21 us					
Average Blocking:		611 us					
Worst-Case Blocking:		617 ms					
Peak Message Queue Size:		7					
Open File Descriptors:		19					

Volumes							
Mount Point	Device	Status	Size	Space Available	Total Entries	Entries Available	Write Cache
/	sda1	Online	10.6 GB	6.8 GB	655,360	554,473	
/var/local	sda3	Online	71.9 GB	67.3 GB	4,456,448	4,454,310	
/var/local/mysql_ibdata	sdb1	Online	21.3 GB	1.78 GB	655,360	655,348	
/var/local/rangedb/0	sdc	Online	107 GB	107 GB	104,857,600	104,856,652	
/var/local/rangedb/1	sdd	Online	53.4 GB	53.4 GB	52,428,800	52,427,936	
/var/local/rangedb/2	sde	Online	53.4 GB	53.4 GB	52,428,800	52,427,936	
/var/local/rangedb/3	sdf	Online	53.4 GB	53.4 GB	52,428,800	52,427,929	

- Click **Chart** next to the attribute.

The display automatically changes to the **Reports > Charts page**. The chart displays the attribute's data over the past day.

Displaying charts in a new window

When you generate a chart report, it is often useful to compare it to another chart.

About this task

You can also view chart data in a new window and open multiple windows.

Steps

- Click to display the current view in new window.
- Click to close the chart windows.

Generating charts

Charts display a graphical representation of attribute data values that have been processed by the NMS service.

Steps

- Select the item in the **Grid Topology** tree to report on.
You can report on a data center site, grid node, component, or service.
- Click the **Reports** tab.
- Click the **Charts** page selector link.
- Select the attribute to report on from the **Attribute** drop-down list.

5. To force the Y-axis to start at zero, deselect the **Vertical Scaling** check box.
6. To show values at full precision, select the **Raw Data** checkbox, or to round values to a maximum of three decimal places (for example, for attributes reported as percentages), deselect the **Raw Data** checkbox.
7. Select the time period to report on from the **Quick Query** drop-down list.
Select the **Custom Query** option to select a specific time range.
The chart appears after a few moments. Allow several minutes for tabulation of long time ranges.
8. If you selected **Custom Query**, you need to customize the time period to chart on by entering the **Start Date** and **End Date**.
Use the format YYYY/MM/DD HH:MM:SS in local time. Leading zeros are required to match the format. For example, 2015/4/8 7:30:00 fails validation. The correct format is: 2015/04/08 07:30:00.
9. Click **Update**.
A chart is generated after a few moments. Allow several minutes for tabulation of long time ranges. Depending on the length of time set for the query, either a raw text report or aggregate text report is displayed.
10. If you want to print the chart, right-click and select **Print**, and modify any necessary printer settings and click **Print**.

Types of text reports

Text reports display a textual representation of attribute data values that have been processed by the NMS service. There are two types of reports generated depending on the time period you are reporting on: raw text reports for periods less than a week, and aggregate text reports for time periods greater than a week.

Raw text reports

A raw text report displays details about the selected attribute:

- Time Received: Local date and time that a sample value of an attribute's data was processed by the NMS service.
- Sample Time: Local date and time that an attribute value was sampled or changed at the source.
- Value: Attribute value at sample time.

Text Results for Services: Load - System Logging

2010-07-18 15:58:39 PDT To 2010-07-19 15:58:39 PDT

Time Received	Sample Time	Value
2010-07-19 15:58:09	2010-07-19 15:58:09	0.016 %
2010-07-19 15:58:06	2010-07-19 15:58:06	0.024 %
2010-07-19 15:54:02	2010-07-19 15:54:02	0.033 %
2010-07-19 15:52:00	2010-07-19 15:52:00	0.016 %
2010-07-19 15:49:57	2010-07-19 15:49:57	0.008 %
2010-07-19 15:47:54	2010-07-19 15:47:54	0.024 %
2010-07-19 15:45:50	2010-07-19 15:45:50	0.016 %
2010-07-19 15:43:47	2010-07-19 15:43:47	0.024 %
2010-07-19 15:41:43	2010-07-19 15:41:43	0.032 %
2010-07-19 15:39:40	2010-07-19 15:39:40	0.024 %
2010-07-19 15:37:37	2010-07-19 15:37:37	0.008 %
2010-07-19 15:35:34	2010-07-19 15:35:34	0.016 %
2010-07-19 15:33:31	2010-07-19 15:33:31	0.024 %
2010-07-19 15:31:27	2010-07-19 15:31:27	0.032 %
2010-07-19 15:29:24	2010-07-19 15:29:24	0.032 %
2010-07-19 15:27:21	2010-07-19 15:27:21	0.049 %
2010-07-19 15:25:18	2010-07-19 15:25:18	0.024 %
2010-07-19 15:21:12	2010-07-19 15:21:12	0.016 %
2010-07-19 15:19:09	2010-07-19 15:19:09	0.008 %
2010-07-19 15:17:07	2010-07-19 15:17:07	0.016 %

Aggregate text reports

An aggregate text report displays data over a longer period of time (usually a week) than a raw text report. Each entry is the result of summarizing multiple attribute values (an aggregate of attribute values) by the NMS service over time into a single entry with an average, maximum and minimum value that is derived from the aggregation.

Each entry displays the following information:

- Aggregate Time: Last local date and time that the NMS service aggregated (collected) a set of changed attribute values.
- Average Value: The average of the attribute's value over the aggregated time period.
- Minimum Value: The minimum value processed over the aggregated time period.
- Maximum Value: The maximum value processed over the aggregated time period.

Text Results for Attribute Send to Relay Rate

2010-07-11 16:02:46 PDT To 2010-07-19 16:02:46 PDT

Aggregate Time	Average Value	Minimum Value	Maximum Value
2010-07-19 15:59:52	0.271072196 Messages/s	0.266649743 Messages/s	0.274983464 Messages/s
2010-07-19 15:53:52	0.275585378 Messages/s	0.266562352 Messages/s	0.283302736 Messages/s
2010-07-19 15:49:52	0.279315709 Messages/s	0.233318712 Messages/s	0.333313579 Messages/s
2010-07-19 15:43:52	0.28181323 Messages/s	0.241651024 Messages/s	0.374976601 Messages/s
2010-07-19 15:39:52	0.284233141 Messages/s	0.249982001 Messages/s	0.324971987 Messages/s
2010-07-19 15:33:52	0.325752083 Messages/s	0.266641993 Messages/s	0.358306197 Messages/s
2010-07-19 15:29:52	0.278531507 Messages/s	0.274984766 Messages/s	0.283320999 Messages/s
2010-07-19 15:23:52	0.281437642 Messages/s	0.274981961 Messages/s	0.291577735 Messages/s
2010-07-19 15:17:52	0.261563307 Messages/s	0.258318006 Messages/s	0.266655787 Messages/s
2010-07-19 15:13:52	0.265159147 Messages/s	0.258318557 Messages/s	0.26663986 Messages/s

Generating text reports

Text reports display a textual representation of attribute data values that have been processed by the NMS service.

About this task

For attribute data that is expected to be continuously changing, this attribute data is sampled by the NMS service (at the source) at regular intervals. For attribute data that changes infrequently (for example, data based on events such as state or status changes), an attribute value is sent to the NMS service when the value changes.

The type of report displayed depends on the configured time period. By default, aggregate text reports are generated for time periods longer than one week.

Grey text indicates the service was administratively down during the time it was sampled. Blue text indicates the service was in an unknown state.

Steps

1. Select the item in the **Grid Topology** tree to report on.

You can report on a data center site, grid node, component, or service.

2. Click the **Reports** tab.

3. Click the **Text** page selector link.

4. Select the attribute to report on from the **Attribute** drop-down list.

5. Select the number of results per page from the **Results per Page** drop-down list.

6. To round values to a maximum of three decimal places (for example, for attributes reported as percentages), deselect the **Raw Data** check box.

7. Select the time period to report on from the **Quick Query** drop-down list.

Select the **Custom Query** option to select a specific time range.

The report appears after a few moments. Allow several minutes for tabulation of long time ranges.

8. If you selected Custom Query, you need to customize the time period to report on by entering the **Start Date** and **End Date**.

Use the format YYYY/MM/DD HH:MM:SS in local time. Leading zeros are required to match the format. For example, 2015/4/8 7:30:00 fails validation. The correct format is: 2015/04/08 07:30:00.

9. Click **Update**.

A text report is generated after a few moments. Allow several minutes for tabulation of long time ranges. Depending on the length of time set for the query, either a raw text report or aggregate text report is displayed.

10. If you want to print the report, right-click and select **Print**, and modify any necessary printer settings and click **Print**.

Exporting text reports

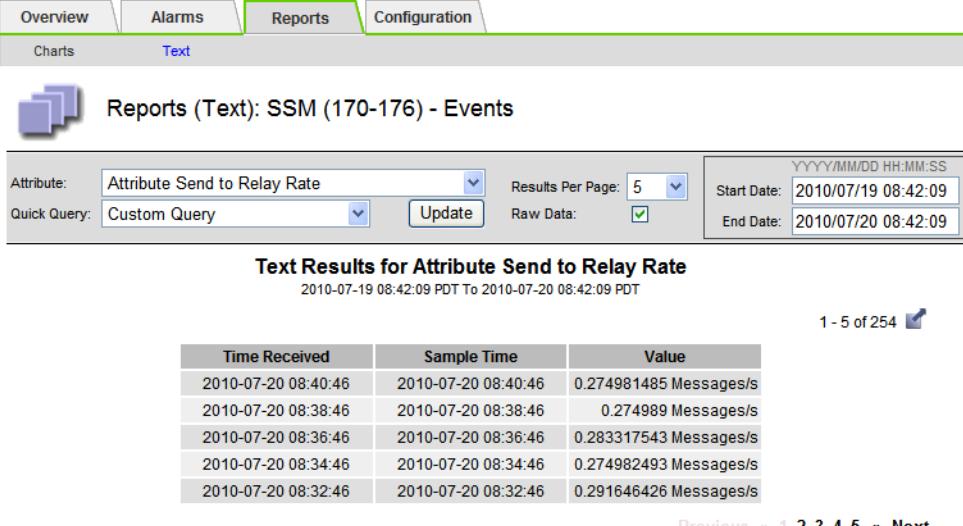
Exported text reports open a new browser tab, which allows you to select and copy the data.

About this task

The copied data can then be saved into a new document (for example, a spreadsheet) and used to analyze the performance of the StorageGRID Webscale system.

Steps

1. Create a text report.
2. Click Export .



Reports (Text): SSM (170-176) - Events

Attribute:	Attribute Send to Relay Rate	Results Per Page:	5
Quick Query:	Custom Query	Start Date:	2010/07/19 08:42:09
	Update	Raw Data:	<input checked="" type="checkbox"/>
		End Date:	2010/07/20 08:42:09

Text Results for Attribute Send to Relay Rate
2010-07-19 08:42:09 PDT To 2010-07-20 08:42:09 PDT

Time Received	Sample Time	Value
2010-07-20 08:40:46	2010-07-20 08:40:46	0.274981485 Messages/s
2010-07-20 08:38:46	2010-07-20 08:38:46	0.274989 Messages/s
2010-07-20 08:36:46	2010-07-20 08:36:46	0.283317543 Messages/s
2010-07-20 08:34:46	2010-07-20 08:34:46	0.274982493 Messages/s
2010-07-20 08:32:46	2010-07-20 08:32:46	0.291646426 Messages/s

1 - 5 of 254 

Previous « 1 2 3 4 5 » Next

The Export Text Report window opens displaying the report.

```

Grid ID: 000 000
OID: 2.16.124.113590.2.1.400019.1.1.1.16996732.200
Node Path: Site/170-176/SSM/Events
Attribute: Attribute Send to Relay Rate (ABSR)
Query Start Date: 2010-07-19 08:42:09 PDT
Query End Date: 2010-07-20 08:42:09 PDT
Time Received,Time Received (Epoch),Sample Time,Sample Time (Epoch),Value,Type
2010-07-20 08:40:46,1279640446559000,2010-07-20 08:40:46,1279640446537209,0.274981485 Messages/s,U
2010-07-20 08:38:46,1279640326561000,2010-07-20 08:38:46,1279640326529124,0.274989 Messages/s,U
2010-07-20 08:36:46,1279640206556000,2010-07-20 08:36:46,1279640206524330,0.283317543 Messages/s,U
2010-07-20 08:34:46,1279640086540000,2010-07-20 08:34:46,1279640086517645,0.274982493 Messages/s,U
2010-07-20 08:32:46,1279639966543000,2010-07-20 08:32:46,1279639966510022,0.291646426 Messages/s,U
2010-07-20 08:30:46,1279639846561000,2010-07-20 08:30:46,1279639846501672,0.308315369 Messages/s,U
2010-07-20 08:28:46,1279639726527000,2010-07-20 08:28:46,1279639726494673,0.291657509 Messages/s,U
2010-07-20 08:26:46,1279639606526000,2010-07-20 08:26:46,1279639606490890,0.266627739 Messages/s,U
2010-07-20 08:24:46,1279639486495000,2010-07-20 08:24:46,1279639486473368,0.258318523 Messages/s,U
2010-07-20 08:22:46,1279639366480000,2010-07-20 08:22:46,1279639366466497,0.274985902 Messages/s,U
2010-07-20 08:20:46,1279639246469000,2010-07-20 08:20:46,1279639246460346,0.283253871 Messages/s,U
2010-07-20 08:18:46,1279639126469000,2010-07-20 08:18:46,1279639126426669,0.274982804 Messages/s,U
2010-07-20 08:16:46,1279639006437000,2010-07-20 08:16:46,1279639006419168,0.283315503 Messages/s,U

```

3. Select and copy the contents of the **Export Text Report** window.

This data can now be pasted into a third-party document such as a spreadsheet.

What AutoSupport is

The AutoSupport mechanism allows you to automatically send NetApp information about the health of your StorageGRID Webscale system.

Each week the AutoSupport “call home” mechanism sends a message to technical support that includes current system and site level attribute information such as alarms, storage usage, and system events as listed on the **SSM > Events > Overview** page. For more information about AutoSupport, see the *Administrator Guide*.

Related information

[*StorageGRID Webscale 10.2 Administrator Guide*](#)

Data flow

Data flow here refers to the flow of data as objects are ingested, replicated, retrieved, and purged.

As you begin working with the StorageGRID Webscale system, it is helpful to understand some key concepts, such as:

- Objects
- Information lifecycle management
- Client connections and supported APIs
- Object identifier
- Topology queries

What an object is

An object is an artificial construct used to describe an approach to storage that divides content into data and metadata.

Object Data

Object data is the content of the object that is described by an object's metadata. Object data might be anything; for example, a cat picture, a movie, or a medical record. The protection from loss of object data is managed through the evaluation of objects against information lifecycle management (ILM) rules. Object data is sent to disk storage through a Storage Node's LDR service and archival storage through an Archive Node's ARC service.

Object Metadata

Object metadata is information describing an object. Object metadata might include such information as last access time, modification time, and storage location. Managed and protected from loss by a Storage Node's DDS service, object metadata is stored to disk through the distributed key value store that interfaces with the DDS service. The StorageGRID Webscale system's ILM rules use an object's metadata to determine what actions to perform on the object's data. Metadata is not archived along with object data, but rather stays on disk in the distributed key value store.

Each object is assigned a unique identifier that is stored as metadata and is used by the StorageGRID Webscale system and client applications to locate the object. Objects are created by client applications and sent to the StorageGRID Webscale system for ingest and storage to disk and archival media.

Information lifecycle management

Information lifecycle management is a set of rules that determine how an object's data is protected from loss over time. ILM rules do not manage object metadata, which is managed by the DDS service.

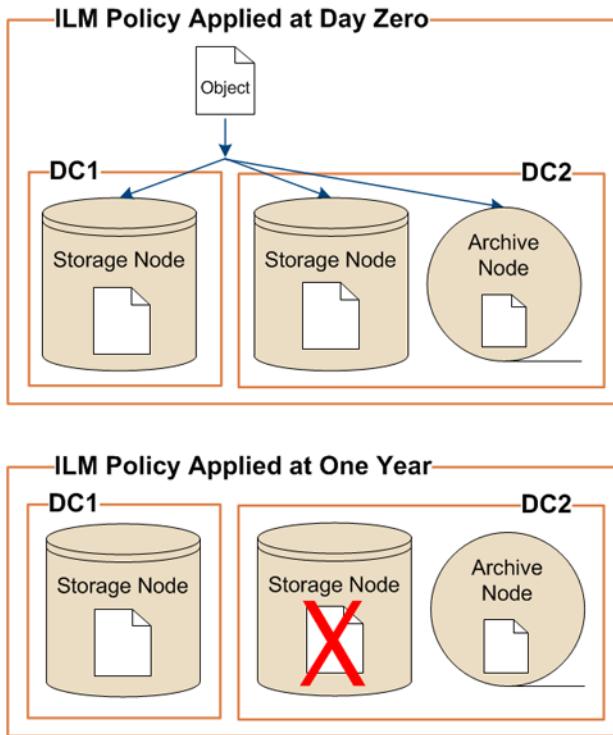
ILM rules define:

- The permanent location of object data
- The type of storage used
- The type of loss protection applied to an object's data
- The number of copies made

- The life of the object and changes over time to its location, storage, and loss protection

Information lifecycle management settings are implemented through an ILM policy that is made up of ILM rules. Every object ingested into the system is evaluated against the ILM policy and its ILM rules. ILM rules use an object's metadata to filter an object and determine what actions to take in storing and copying the object's data. For more information about configuring an ILM policy, see the *Administrator Guide*.

The following figure shows an ILM policy whose ILM rule determines that at ingest one replicated copy is stored at data center site one (DC1) on disk (Storage Nodes), one replicated copy is stored at data center site two (DC2) on disk (Storage Nodes), and that one replicated copy is stored at DC2 on tape (Archive Node). At the end of one year, the copy on disk at DC2 is deleted.



Related information

[StorageGRID Webscale 10.2 Administrator Guide](#)

Protecting object data from loss

ILM rules provide you with two mechanisms to protect object data from loss: replication and erasure coding.

Replication

Protecting object data from loss through replication means that exact copies of object data are made and stored to multiple Storage Nodes or Archive Nodes. ILM rules dictate the number of copies made, where those copies are made, and for how long they are retained by the system. If a copy is lost as a result of a Storage Node loss, the object is still available if a copy of it exists elsewhere in the StorageGRID Webscale system.

Erasure coding

Protecting object data from loss through erasure coding means that an erasure coding scheme is applied to object data. The erasure coding scheme breaks object data into data and parity fragments, which are distributed across multiple Storage Nodes. If fragments are lost, object data can still be recovered through the information encoded in the remaining fragments.

Client connections and supported APIs

To store, retrieve, and update objects, client applications interface with the StorageGRID Webscale system through one of supported APIs: Simple Storage Service (S3), OpenStack Swift, Cloud Data Management Interface (CDMI), or StorageGRID API (SGAPI).

Each of these APIs uses HTTP commands over a secure connection to communicate with the StorageGRID Webscale system to store, retrieve, and delete objects. For example, the client issues a PUT command to the LDR service to store an object, a GET command to retrieve the object, and a DELETE command to delete the object.

For details about each interface, see the *Simple Storage Service Implementation Guide*, *Swift Implementation Guide*, *Cloud Data Management Interface Implementation Guide* or *StorageGRID API Reference*.

Related information

[StorageGRID Webscale 10.2 Simple Storage Service Implementation Guide](#)

[StorageGRID Webscale 10.2 Swift Implementation Guide](#)

[StorageGRID Webscale 10.2 StorageGRID API Reference](#)

[StorageGRID Webscale 10.2 Cloud Data Management Interface Implementation Guide](#)

Topology queries

When a service needs information from another service or requires that an action be performed by another service, it contacts the ADC service to find the best service to process the request. This is known as a topology query.

The ADC service responds to topology queries with the latest information received from the StorageGRID Webscale system. The information maintained by the ADC service includes CPU load, amount of available disk space, supported services, and location.

Object identifier

The StorageGRID Webscale system assigns a unique identifier (UUID) to each ingested object. This UUID is sometimes referred to as an object’s “content handle.”

The StorageGRID Webscale system uses the content handle to refer to the object. As long as the object is referenced by the client application, it is said to have a content handle. When the client application deletes the object, the object’s content handle is said to be released.

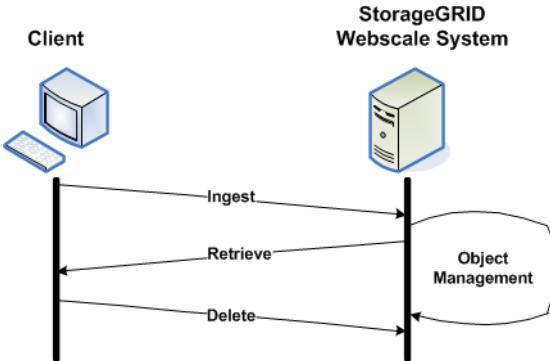
Object lifecycle

The life of an object begins at the moment of ingest and is affected by object operations.

The life of an object is affected by:

- Ingest: The client application creates the object over HTTP.
- Object management: How the ILM policy and its ILM rules protect an object from loss.
- Retrieve: When the client reads the object, the object is retrieved from a Storage Node or Archive Node through HTTP.

- Delete: When a client deletes the object, an HTTP removal command is sent to all object locations.

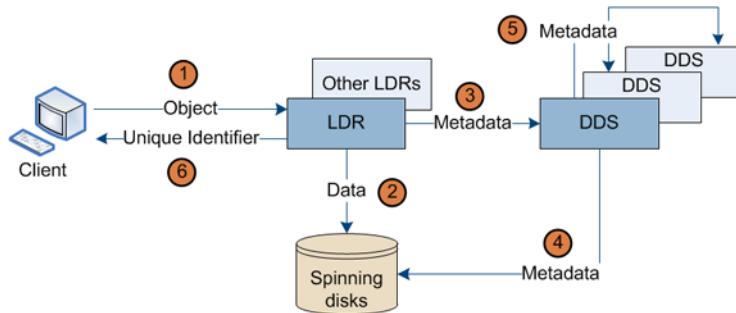


Ingest

Ingest refers to the process of a client application saving an object to the StorageGRID Webscale system.

Data flow

When a client saves an object to the StorageGRID Webscale system, the Storage Node's LDR service assigns it a unique identifier, which is returned to the client to use for later retrieval or delete operations. The object is evaluated against the active ILM policy, and then copies are made and distributed according to the ILM policy's ILM rules. The LDR service sends object data to spinning disks for storage and object metadata to the DDS service for management.



1. The client application creates the object and sends it to the StorageGRID Webscale system through an HTTP request. The object is evaluated against the system's ILM policy. Copies of object data are made and LDR services chosen as a result of an ADC topology query to other Storage Node's that make up the storage pool.
2. The LDR service saves the object data to spinning disk.
3. The LDR service sends the object metadata to a DDS service.
4. The DDS service saves the object metadata to spinning disk.
5. The DDS service propagates copies of object metadata to other DDS services via the underlying distributed key-value store. These copies are also saved to disk.
6. The LDR service returns a unique identifier for the object to the client. The identifier type depends on the interface used by the client (S3, Swift, CDMI, or SGAPI).

Ingest related attributes

The primary attributes used to track the ingest of an object to the StorageGRID Webscale system:

Component	Attribute changes
LDR > Storage	<p>Total Usable Space (STAS): The total amount of object storage space that is currently available to be used to store objects decreases by an amount roughly equivalent to the newly ingested object's size.</p> <p>Total Usable Space (Percent) (SAVP): The total amount of object storage space (displayed as a percentage) that is currently available decreases by an amount roughly equivalent to the newly ingested object's size.</p> <p>Total Persistent Data (SPSD): The estimate of the size of the persistently stored data increases by an amount roughly equivalent to the object's size.</p> <p>Objects Committed (OCOM): The number of object store operations for replicated copies that have been processed by the LDR service increases by one.</p>
DDS > Data Store	<p>Total Objects (DATC): The total number of objects that are known by this DDS service increases by one.</p> <p>Named Objects (CDNC): When a named data object is ingested by a client application that interfaces to the StorageGRID Webscale system through CDMI, the total number of named data objects known by this DDS service increases by one.</p> <p>Nameless Objects (CNLC): When a nameless data object is ingested by a client application that interfaces to the StorageGRID Webscale system through either CDMI or SGAPI, the total number of nameless data objects known by this DDS service increases by one.</p> <p>S3 and Swift Objects (SDOC): When a data object is ingested by a client application that interfaces to the StorageGRID Webscale system through the S3 or Swift REST API, the total number of data objects known by this DDS service increases by one.</p>

Object data management

Object data is managed through the active ILM policy and its ILM rules. Through ILM rules, object data is protected from loss through replicated and erasure coded copies.

Object metadata is managed by the DDS service.

Related concepts

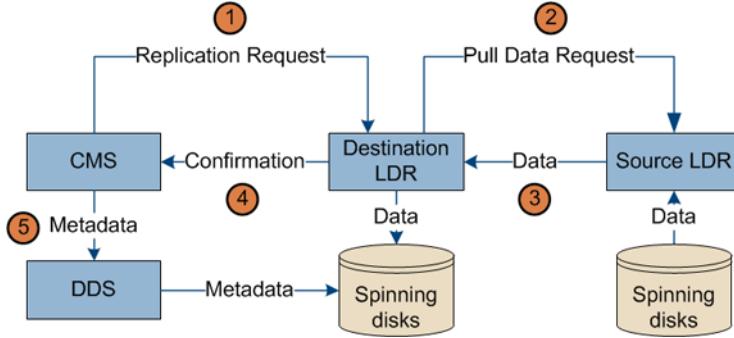
[Content protection: erasure coding](#) on page 52

Content protection: replication

Following ingest, if an ILM rule's Content Placement instructions are configured to make replicated copies of object data, copies are made and stored to disc through the LDR services of Storage Nodes that make up the configured storage pool.

Data flow

The CMS service controls replication and ensures that the correct number of copies are stored in the correct locations and for the correct amount of time.



1. The CMS service queries the ADC service to determine the best destination LDR service within the storage pool as defined by the ILM policy, and sends that LDR service a command to initiate replication.
2. The destination LDR service queries the ADC service for the best source location and sends a replication request to the source LDR service.
3. The source LDR service sends a copy to the destination LDR service.
4. The destination LDR service notifies the CMS service that the object data has been stored.
5. The CMS service updates the DDS service with object location metadata.

Replication related attributes

The primary attributes used to track a replicated object:

Component	Attribute changes
CMS > Content	<p>ILM Evaluations (ILev): The total number of ILM evaluations that have been performed to date increases when the object is evaluated after ingest and again when a copy of object data is made.</p> <p>Note: The number of evaluations is dependent on the StorageGRID Webscale system's ILM rules.</p> <p>Total Transfers (DCdT): The total number of object transfers performed by the CMS service since system start-up increases by one each time a copy of object data is made.</p>

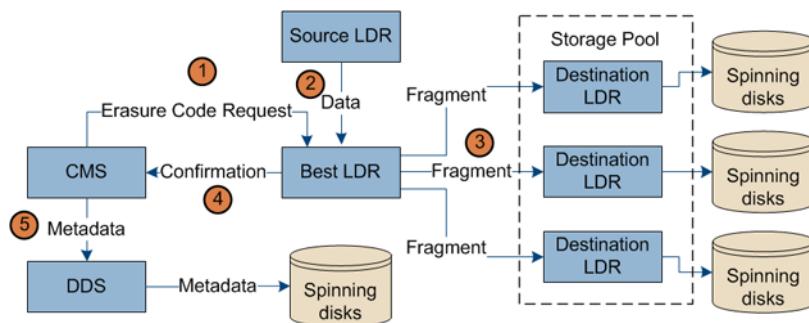
Component	Attribute changes
LDR > Storage	<p>Total Usable Space (STAS): The total amount of object storage space that is currently available to be used to store objects decreases by an amount roughly equivalent to the object's size.</p> <p>Total Usable Space (Percent) (SAVP): The total amount of object storage space (displayed as a percentage) that is currently available to be used to store objects decreases by an amount roughly equivalent to the object's size.</p> <p>Total Persistent Data (Percent) (SPSD): The estimate of the size of the persistently stored data increases by an amount roughly equivalent to the object's size.</p> <p>Total Persistent Data (Percent) (SPDP): The percentage of the total storage space used by persistent data on each destination LDR service increases by an amount roughly equivalent to the size of the replicated object.</p> <p>Objects Retrieved (ORET): The number of persistent objects retrieved from the source LDR service increases by one.</p> <p>Objects Committed (OCOM): The number of persistent objects stored on each destination LDR service increases by one each time a replicated copy is made.</p>
destination LDR > Replication	Inbound Replications Completed (RIRC): The total number of objects replicated to the destination LDR service increases by one.
source LDR > Replication	Outbound Replications Completed (RORC): The total number of objects replicated from the source LDR service increases by one.

Content protection: erasure coding

Following ingest, if an ILM rule's content placement instructions are configured to make erasure coded copies of object data, object data is erasure coded (broken into data and parity fragments) and distributed to the LDR services of the various Storage Nodes that make up the configured storage pool for the applicable Erasure Coding profile.

Data flow

The CMS service controls erasure coding and ensures that the correct Erasure Coding profile is applied to object data.



1. The CMS service queries the ADC service to determine the best LDR service within the deployment to perform the erasure coding operation on the object data. A request is sent to that LDR service to initiate erasure coding. The erasure coding scheme to be used is based on the Erasure Coding profile configured in the matching ILM rule.

2. The “best” LDR service pulls object data from the source LDR service (the LDR service that handled the initial ingest) and erasure codes the object data.
3. Once broken into the appropriate number of parity and data fragments, the LDR service distributes these fragments across the LDR services that make up the Erasure Coding profile’s storage pool.
4. The LDR service notifies the CMS service that the object data has been stored.
5. The CMS service updates the DDS service with object location metadata.

Erasure coding related attributes

The following table lists the primary attributes used to track an erasure coded object.

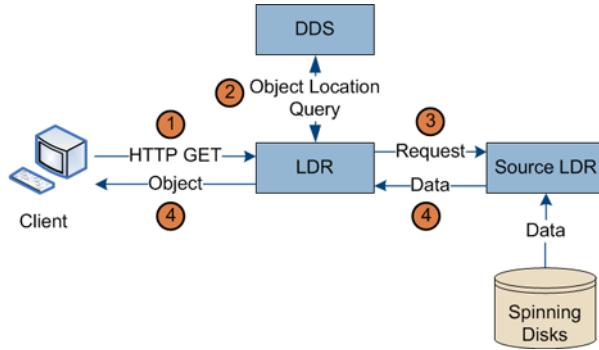
Component	Attribute changes
CMS > Content	ILM Evaluations (ILev): The total number of ILM evaluations that have been performed to date increases when the object is evaluated after ingest and again when an erasure coded copy of object data is made. Note: The number of evaluations is dependent on ILM rules.
LDR > Storage	Total Usable Space (STAS): The total amount of storage space that is currently available for the storage of object data decreases by an amount roughly equivalent to the size of the erasure coded fragment (data or parity) stored to this Storage Node. Total Usable Space (Percent) (SAVP): The total amount of storage space (displayed as a percentage) that is currently available to be used to store object data decreases by an amount roughly equivalent to the size of the erasure coded fragment (data or parity) stored to this Storage Node. Total Persistent Data (SPSD): The estimate of the size of the persistently stored data increases by an amount roughly equivalent to the size of the erasure coded fragment (data or parity) stored to this Storage Node. Total Data (Percent) (SPDP): The percentage of the total storage space used by persistent data on each destination LDR service increases by an amount roughly equivalent to the size of the erasure coded fragment (data or parity) stored to this Storage Node.
LDR > Erasure Coding	Writes - Completed (ECWC): Total number of objects written in an erasure-coded form increases by one.

Retrieve

Retrieval refers to process of a client application accessing an object stored by the StorageGRID Webscale system.

Data flow

The LDR service queries the DDS service for the location of the object data and retrieves it from the source LDR service after obtaining the location from the DDS service. Preferentially, retrieval is from disk. When there is no higher grade copy accessible, the retrieval request is directed to the Archive Node.



1. The LDR service receives a retrieval request from the client application.
2. The LDR service queries the DDS service for the object data location.
3. LDR service forwards the retrieval request to the source LDR service.
4. The source LDR service returns the object data from the queried LDR service and the object is returned to the client application.

Retrieval related attributes

The primary attributes used to track the retrieval of an object from the StorageGRID Webscale system:

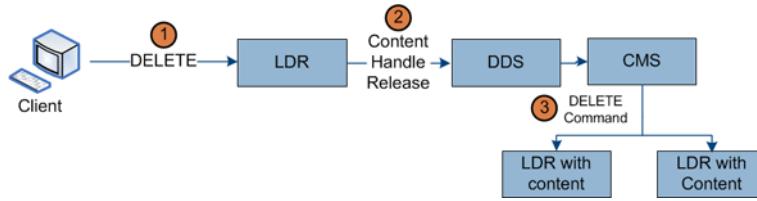
Component	Attribute changes
LDR > HTTP	Inbound GETs – Successful (HIGC): The total number of SGAPI HTTP GET (“content retrieve”) requests that have completed successfully increases by one. Inbound GETs – Attempted (HAIG): The total number of HTTP GET (content retrieve) requests that have been received by the LDR service also increases by one. Note: CDMI transactions update attributes in LDR > CDMI , S3 transactions update attributes in LDR > S3 , and Swift transactions update attributes in LDR > Swift , instead of LDR > HTTP .
LDR > Storage	Objects Retrieved (ORET): The number of persistent replicated objects retrieved from the source LDR service increases by one.
ARC > Retrieve	Client Requests (ARCR): The total number of requests received from clients for object data stored on the ARC increases by one with each attempt to retrieve object data from this Archive Node. This occurs only if the object is not stored on a Storage Node. Active Retrieves (ARAR): The number of object retrievals in progress increases by one while retrieval is taking place on this Archive Node and then decreases by one once retrieval is complete.

Delete

A client application can send a delete request to the StorageGRID Webscale system at any time. This results in a content handle release action in which the client application loses knowledge of the object; however, the object is not removed from disk.

Data flow

When a client or ILM rule triggers a delete, all copies of an object are deleted from the system. The client cannot access the object.



Note: To remove an object from disk requires a purge of the object, which is only permitted if the system's ILM policy includes an ILM rule to purge content. An object can be purged regardless of a client application's delete request.

1. The LDR service receives a delete command from the client application.
2. The LDR service queries the DDS service for object locations. Object location metadata is returned from the DDS service.
3. The object is deleted. The object remains on disc, but is no longer known by the client.

Delete related attributes

The primary attributes used to track the deletion of an object from the StorageGRID Webscale system:

Component	Attribute changes
LDR > HTTP	<p>Inbound DELETEs – Successful (HIDC): The total number of objects for which the content handle has been released increases by one after the SGAPI HTTP DELETE command has been successfully completed.</p> <p>Inbound DELETEs – Attempted (HAID): The total number of HTTP DELETE (content handle release) requests that have been received by the LDR service also increases by one.</p> <p>Note: CDMI transactions update attributes in LDR > CDMI, S3 transactions update attributes in LDR > S3, and Swift transactions update attributes in LDR > Swift, instead of LDR > HTTP.</p>
CMS > Content	<p>ILM Evaluations (ILev): Because an ILM evaluation is triggered each time a content handle is released, the total number of ILM evaluations increases when an object is deleted.</p> <p>Purges (DCpT): The number of object copies deleted increases by one on the CMS service for each copy of the object deleted from the LDR and ARC services.</p>

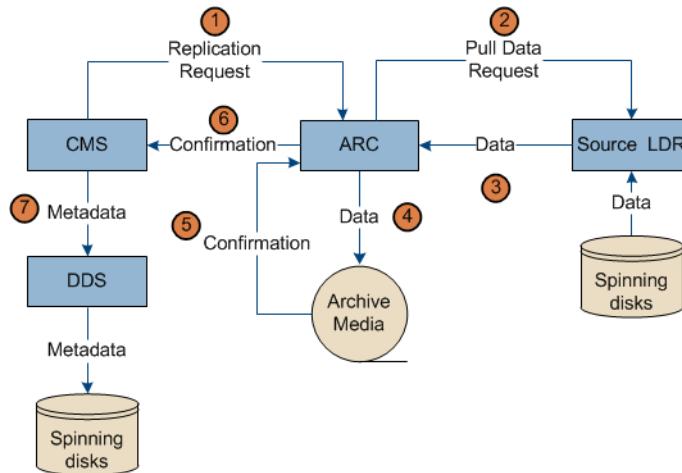
Component	Attribute changes
DDS > Data Store	<p>Total Objects (DATC): The total number of data objects in the StorageGRID Webscale system that are known by this DDS service decreases by one.</p> <p>Named Objects (CDNC): When a named data object is deleted by a client application that interfaces to the StorageGRID Webscale system through CDMI, the total number of named data objects known by this DDS service decreases by one.</p> <p>Nameless Objects (CNLC): When a nameless data object is deleted by a client application that interfaces to the StorageGRID Webscale system through either CDMI or SGAPI, the total number of nameless data objects known by this DDS service decreases by one.</p> <p>S3 and Swift Objects (SDOC): When a data object is deleted by a client application that interfaces to the StorageGRID Webscale system through the S3 or Swift REST API, the total number of data objects known by this DDS service decreases by one.</p>

Archive

The Archive Node provides an interface through which object data can be sent to an external archival storage system (tape or the cloud) for long term storage.

Data flow

If the ILM policy requires that a copy of object data be archived, the CMS service sends a request to the Archive Node, which in turn sends the object data to the targeted archival storage system.



1. The CMS service sends a request to the ARC service to store a copy on archive media.
2. The ARC service queries the ADC service for the best source location and sends a request to the source LDR service.
3. The ARC service retrieves object data from the LDR service.
4. The ARC service sends the object data to the archive media destination.
5. The archive media notifies the ARC service that the object data has been stored.
6. The ARC service notifies the CMS service that the object data has been stored.
7. The CMS service sends metadata to the DDS service.

7. The CMS service sends object location metadata to the DDS service.

Archive related attributes

This table lists the primary attributes used to track object data sent to the targeted external archival storage system:

Component	Attribute changes
ARC > Store Note: The StorageGRID Webscale system cannot detect how much available storage is attached to the Archive Node.	Active Objects (AROP): The number of copies of object data in the process of being written to the archival storage system increases by one as the object is being archived and decreases by one once the object is archived. Archived Objects (AROA): The total number of copies of object data written to the archival storage system by this ARC service increases by one. Archived Bytes (ARBA): The total amount of content written to the archival storage system increases by an amount equivalent to the object size.
ARC > Replication	Inbound Replications Completed (RIRC): The total number of copies of object data replicated to the destination ARC service increases by one.
LDR > Storage	Objects Retrieved (ORET): The number of persistent objects retrieved from the storage system of the source LDR increases by one each time the object is replicated from this source LDR to the Archive Node.
LDR > Replication	Outbound Replications – Completed (RORC): The total number of copies of object data replicated from the source Storage Node increases by one each time the object is replicated from this source Storage Node service to the Archive Node.

Monitoring operations

You can monitor your StorageGRID Webscale system, its sites, grid nodes, services, and components by viewing attribute values. The Network Management System (NMS) Management Interface (MI), StorageGRID Webscale system's graphical interface, displays these values. Attributes and the values they report form the basis for monitoring your site using the StorageGRID Webscale system.

Attribute values

Attributes are reported by services on a best-effort basis. Attribute updates can be lost under some circumstances, such as the crash of a service or the failure and rebuild of a grid node. For example, if an LDR service crashes after it has registered the ingest of a number of objects, but before it has committed the updated attribute value to disk, any attribute updates since the last commit are lost.

Propagation delays might slow the reporting of attributes within the StorageGRID Webscale system. Updated values for most attributes, except for state attributes, are sent to the NMS MI at fixed intervals. Therefore, it can take a few moments before an update is visible in the NMS MI, and two attributes that change more or less simultaneously can be reported at slightly different times.

Attribute values reported in the NMS MI should therefore be understood as being approximately correct, particularly for "count" attributes such as object count or HTTP connection attempts. Use the NMS MI for troubleshooting, analyzing trends, and obtaining a general picture of the state of the StorageGRID Webscale system.

Attribute types

The StorageGRID Webscale system includes the following attribute types, summary and individual.

Summary attributes

Provide a convenient synopsis of information about the deployment, data center site, or grid node.

Summary attributes provide an overview of capacities and operations, including storage capacity, ILM activity, API operations, and Archive Node object counts. Summary attributes appear on the NMS MI's **Overview > Main pages** for the deployment, data center site, or grid node.

Summary attributes are calculated at fixed intervals from the values of attributes for individual grid nodes and services, and provide a convenient means to review information about the deployment, data center site, or grid node. The values of summary attributes should be taken as estimates as they are calculated based on the current attribute's value known at the time of calculation. Note that the reporting of summary attributes is subject to propagation delays within the StorageGRID Webscale system and it can take a few moments before an update is visible in the NMS MI.

Individual attributes

Provide information about specific data center sites, grid nodes, services, and components.

Attribute units of measure

For units of "Seconds" or "Bytes," attribute values displayed in the NMS MI are scaled to a suitable unit. For example, durations scale to microseconds, milliseconds, seconds, minutes, hours, or days; bytes scale to kilobytes, megabytes, or gigabytes.

When scaled, the value of bytes displayed on overview pages and in charts uses the "natural" measure of powers of 10. For example $3 \text{ MB} = 3 \times 10^6 = 3,000,000 \text{ bytes}$. This is not the same as powers of 2 normally used for computing, where $3 \text{ MiB} = 3 \times 2^{20} = 3,145,728 \text{ bytes}$.

Note: In the NMS MI, scaled byte values are presented in kb, MB or GB (powers of 10), not KiB, MiB, or GiB (powers of 2).

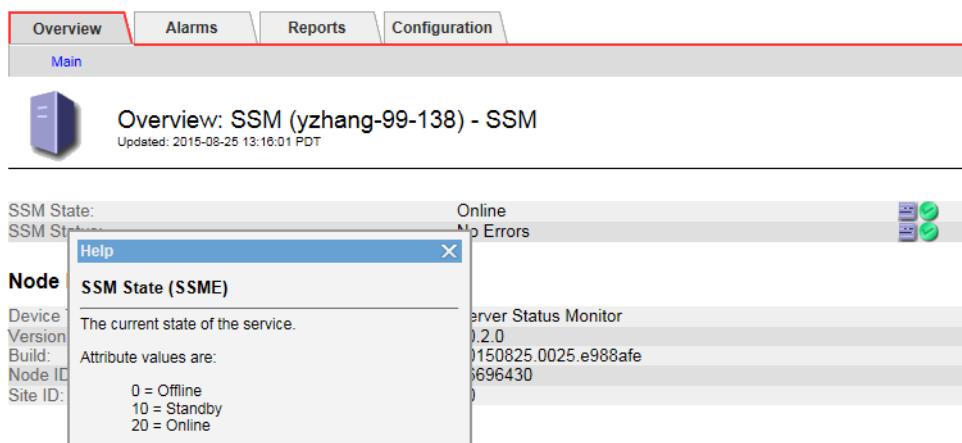
To see unscaled values at full accuracy, generate a text report.

Viewing an attribute description displayed in Tooltips

The NMS MI provides a description of each attribute or field on each page. You might want to view descriptions of a particular field to understand the meaning of the data.

Steps

1. Click the attribute name to display its description.



2. Click to close the description.

Key attributes to monitor

The NMS MI displays hundreds of attributes, most of which are only used for troubleshooting.

The list of attributes to monitor routinely, shown in the following table, is much shorter.

Category	Component	Attributes	See
LDR content storage capacity	System Overview	Percentage Storage Capacity Used (PSCU): The percentage of installed storage capacity that has been consumed for the entire StorageGRID Webscalesystem.	
	LDR > Storage	Total Usable Space (STAS): Object storage capacity that is currently available for storage on the Storage Node.	
Archived content	ARC > Store	Archived Bytes (ARBA): The total amount of content sent to the targeted external archival storage system.	

Information that you should monitor regularly

Monitor the StorageGRID Webscale system's key attributes regularly. Become familiar with system operations and spot trends before they turn into problems.

The following table lists the tasks to be performed on a regular basis.

Task	Frequency
Monitor system status. Note what has changed from previous day.	Daily
Monitor the rate at which Storage Node capacity is being consumed.	Weekly
Check capacity of the targeted external archival storage system.	Weekly

The important attributes to monitor relate to:

- Storage capacity
- Object management related activities

In the case of the capacity attributes you must not only look at the absolute value, but also at the rate at which capacity is being consumed. For example, Storage Node content storage space.

Monitoring storage capacity

A Storage Node's LDR services are responsible for managing storage. Monitor the total usable space available on Storage Nodes to ensure that the StorageGRID Webscale system does not run out of storage space. This information is available at the deployment level, at the site level, and at the grid node level.

Steps

1. In the NMS MI, go to **Grid Topology > deployment > Overview > Main page**.
2. Review storage capacity attributes.

The screenshot shows the StorageGRID Webscale Deployment Overview page. The left sidebar shows 'Grid Management' and 'Grid Topology'. Under 'Grid Topology', there is a tree view with 'StorageGRID Webscale Deployment' at the root, which branches into 'Data Center 1' and 'Data Center 2'. The main content area has tabs: 'Overview' (selected), 'Alarms', 'Reports', and 'Configuration'. Below the tabs, it says 'Main' and 'Tasks'. The 'Overview: Summary - StorageGRID Webscale Deployment' section shows a summary icon and an 'Updated: undefined' message. The 'Storage Capacity' section contains the following data:

Attribute	Value
Storage Nodes Installed	7
Storage Nodes Readable	7
Storage Nodes Writable	7
Installed Storage Capacity	1,122 GB
Used Storage Capacity	719 MB
Used Storage Capacity for Data	718 MB
Used Storage Capacity for Metadata	1.21 MB
Usable Storage Capacity	1,121 GB
Percentage Storage Capacity Used	0.064 %
Percentage Usable Storage Capacity	99.936 %

The 'Current ILM Activity' section shows the following CMS services and their activity levels:

CMS Service	Number of Objects	ILM Evaluation Rate
Data Center 1/DC1-S1/CMS	0	0 Objects/s
Data Center 1/DC1-S2/CMS	0	0 Objects/s
Data Center 2/DC2-S2/CMS	0	0 Objects/s
Data Center 2/DC2-S3/CMS	0	0 Objects/s
Data Center 1/DC1-S3/CMS	0	0 Objects/s
Data Center 2/DC2-S1/CMS	0	0 Objects/s
Data Center 1/DC1-S4/CMS	0	0 Objects/s

3. Go to **Grid Topology > data_center > Storage_Node > LDR > Storage > Overview > Overview** page.

Utilization

Total Space:	321 GB
Total Usable Space:	311 GB
Total Usable Space (Percent):	96.634 %
Total Persistent Data:	10.7 GB
Total Persistent Data (Percent):	3.333 %
Total Cached Data:	654 B

Replication

Block Reads:	2
Block Writes:	2
Objects Retrieved:	1
Objects Committed:	1
Objects Purged:	1
Purge Service State:	Enabled

Object Stores

ID	Total	Available	Stored Data	Stored (%)	Cached Data	Cached (%)	Health
0000	107 GB	96.4 GB	10.7 GB	10 %	654 B	0 %	No Errors
0001	107 GB	107 GB	0 B	0 %	0 B	0 %	No Errors
0002	107 GB	107 GB	0 B	0 %	0 B	0 %	No Errors

4. Monitor the Total Usable Space (STAS) attribute over time to estimate the rate at which usable storage space is being consumed.

Usable space is the actual real amount of storage space available to store objects. For more information about storage space, see the *Administrator Guide*.

To maintain normal system operations, you have to add Storage Nodes, add storage volumes, or archive object data before the storage disks' usable space is consumed.

In the following example, usable storage space is being consumed at a rate of approximately 4% per month, which means that there are eight months left before this Storage Node runs out of space.



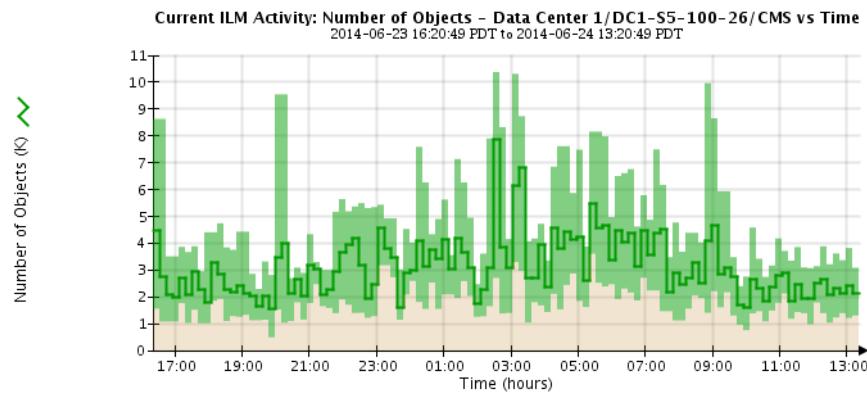
Related information

[StorageGRID Webscale 10.2 Administrator Guide](#)

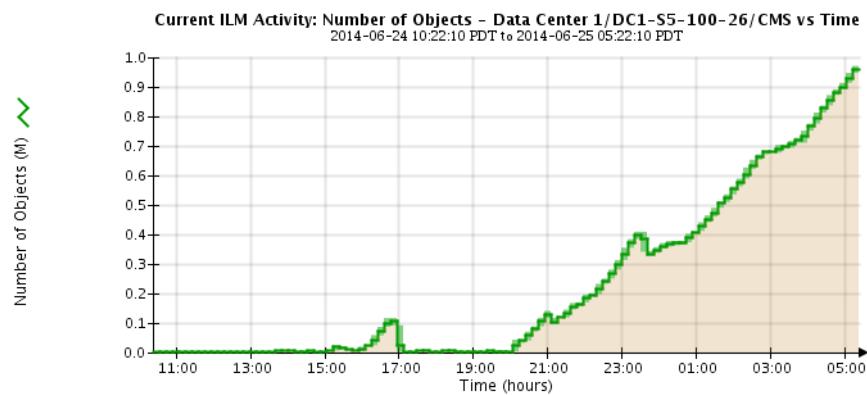
Monitor ingest load

To monitor the ingest load on the StorageGRID Webscale system, analyze the trends of the ingest attributes. During normal operations, it is possible for the ingest load to exceed the rate at which services process objects. When this scenario occurs, services might queue operations that can no longer be fulfilled in real time.

In the example shown in the following table, the number of objects waiting to be stored increases and decreases, but remains fairly low. Such a trend could indicate that there was a short term overload due to network throughput, disk I/O performance, service availability, and so on.



In contrast, the trend shown in the following table is not sustainable. If the number of objects waiting to be stored to the StorageGRID Webscale system starts to increase, ensure that all CMS and LDR services are operating normally. It is also possible that the ingest rate is exceeding the throughput of the StorageGRID Webscale system and that it requires expansion.



Monitoring ILM evaluations

You can track ILM evaluation attributes to monitor how objects are being managed by the StorageGRID Webscale system.

About this task

Objects are managed by applying the ILM policy defined for your StorageGRID Webscale system. The ILM policy and associated ILM rules determine how many copies are made, how those copies are made, the appropriate placement, and the length of time each copy is retained.

Steps

1. Select **Grid Topology > data center > Storage Node > CMS > Content**.
2. Click the **Overview** tab.
3. Review the key attributes for ILM evaluations:

The screenshot shows the CMS Overview page with the 'Overview' tab selected. The main content area displays the following information:

Information Lifecycle Management	
ILM Implementation:	Baseline 2 Copy Rule
ILM Version:	1.0
ILM Evaluations:	51
ILM Evaluation Rate:	0 Objects/s
Average ILM Evaluation Time:	0 us

- **ILM Evaluations:** Total number of ILM evaluations that have been performed to date. The value is incremented whenever an object is evaluated against the ILM. For example, when an object is ingested, when that object's evaluation is complete, or if an LDR service is lost and the StorageGRID Webscale system must assess each object from that LDR service to decide what must be recovered.
- **ILM Evaluation Rate:** Provides an indication of how busy the CMS service is by listing the rate at which the CMS service is evaluating objects against ILM rules.
- **Average ILM Evaluation Time:** The average time it takes to perform the ILM evaluation for a given object. This allows an administrator to track the amount of work per object over time as ILM rules or system topology change.

Monitoring replicated object verification operations

The StorageGRID Webscale system monitors, both automatically and manually, the integrity of replicated object data. Background verification checks for corrupt replicated objects, while foreground verification checks that object data is located on the correct Storage Nodes as determined by the system's ILM rules.

About this task

The background verification process is an automated health check performed by the StorageGRID Webscale system, which monitors the integrity of replicated object data on Storage Nodes. If the background verification process detects corrupt replicated object data, the object is quarantined and

replaced with an uncorrupted copy from another Storage Node. Corrupt object data can indicate disk corruption or data tampering.

The foreground verification process is a manual check you can perform to verify the existence on a Storage Node of replicated object data. If a copy is found to be missing, a replacement copy is automatically created by the system and stored to a location that satisfies the active ILM policy. The replacement copy is not necessarily stored on the Storage Node from which it originally went missing.

Like background verification, foreground verification can help you in determining if there are integrity problems with a storage device. Missing objects might indicate an issue with storage. The LDR - Verification page enables you to review results from background and foreground verifications, such as corrupt or missing objects detected on the Verification component of the LDR service. You should investigate any instances of corrupt or missing object data immediately, to determine the root cause.

Step

1. Go to **Storage Node > LDR > Verification > Overview > Main** page.

The screenshot displays the 'Overview' tab of the LDR Verification page. At the top, there are tabs for Overview, Alarms, Reports, and Configuration, with 'Overview' being the active tab. Below the tabs, a banner indicates 'Main'.

Object Verification Status: No Errors

Background Verification

Verification Rate:	Adaptive
Verification Coverage:	Full
Percentage Complete:	0 %
Average Object Stat Time:	10 us
Objects Verified:	261,006
Object Verification Rate:	3.567 Objects/s
Bytes Verified:	30.1 GB
Byte Verification Rate:	414 KB/s

Verification Results

Missing Objects Detected:	2
Corrupt Objects Detected:	6
Objects Quarantined:	6

For more information, see the *Administrator Guide*.

Related information

[StorageGRID Webscale 10.2 Administrator Guide](#)

Monitoring archival capacity

You cannot directly monitor an external archival storage system's capacity through the StorageGRID Webscale system. However, you can monitor whether the Archive Node is still able to send object data to the archival destination, which may be an indication that an expansion of archival media is required.

About this task

You can monitor the Store component to check if the Archive Node can still send object data to the targeted archival storage system. As well, the triggering of the Store Failures (ARVF) alarm may be

an indication that the targeted archival storage system has reached capacity and can no longer accept object data.

Steps

1. Go to **Archive Node > ARC > Overview > Main**.
2. Check the Store State and Store Status attributes to confirm that the Store component is Online with No Errors.

The screenshot shows the 'Overview: ARC' page for node DC1-ARC1-98-165. The 'Main' tab is selected. The page displays various component states and statuses:

ARC State:	Online	
ARC Status:	No Errors	
Tivoli Storage Manager State:	Online	
Tivoli Storage Manager Status:	No Errors	
Store State:	Online	
Store Status:	No Errors	
Retrieve State:	Online	
Retrieve Status:	No Errors	
Inbound Replication Status:	No Errors	
Outbound Replication Status:	No Errors	

An offline Store component or one with errors may be an indication that targeted archival storage system can no longer accept object data because it has reached capacity.

NMS database usage rates

Attribute values are saved to the NMS database. As attribute data is saved to the NMS database, the size of the NMS database grows and the amount of free tablespace decreases.

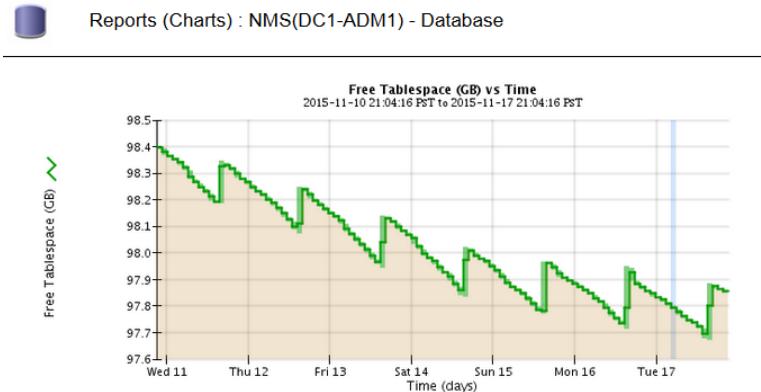
The screenshot shows the 'Overview: NMS' page for node Phx-DC-AN1. The 'Main' tab is selected. The page displays database configuration and tablespace usage:

Database Type:	MySQL
Database Version:	5.1.51-log
Database Engine:	InnoDB

Tablespace

Allocated Tablespace:	18.3 GB	
Free Tablespace:	17.8 GB	

In the following example, database rate usage is a steady 0.3 GBs per day.



You might notice spikes in the Free Tablespace chart. At regular intervals, raw data and downsampled data is purged from the NMS database. This reclaims some tablespace. Note that not all attribute data is purged from the NMS database.

Monitoring grid tasks

Grid tasks are system-wide scripts used to trigger various actions that implement specific changes to the StorageGRID Webscale system. For example, most maintenance and expansion procedures involve running grid tasks.

About this task

Grid tasks are automatically generated either through user requests in the NMS, such as starting a Foreground Verification, or during the provisioning process for maintenance and expansion procedures. An administrator must manually start and monitor the grid tasks. Running grid tasks is restricted to accounts with Maintenance permissions such as the Admin and Vendor accounts.

Grid task phases

Grid tasks go through three distinct phases:

- Pending: The grid task has been submitted, but not yet started.
- Active: The grid task has been started. It can be either actively running or temporarily paused. If a grid tasks status changes to Error, it will continuously retry until it is able to complete successfully or is aborted.
- Historical: A historical grid task is a task that has been submitted, but is no longer active. This includes grid tasks that completed successfully, were canceled, aborted, or that have failed.

Steps

1. Select **Grid Topology > data center > primary Admin Node > CMN > Grid Tasks > Overview > Main** page.
2. Review information in the following fields:
 - Task ID: Unique identifier assigned when the grid task is created
 - Description: Describes the grid task's purpose and can include a revision number, which is used to determine the order in which grid tasks have been created and must be run.
 - Valid From: Date from which the grid task is valid. The grid task will be rejected if it is submitted before this date.

- Valid To: Date until which the grid task is valid. The grid task will be rejected if it is submitted after this date.
- Source: The author of the grid task
- Start Time: Date and time on which the grid task was started
- Duration: Amount of time since the grid task was started
- Stage: Description of the current stage of the active grid task
- % Complete: Progress indicator for active grid tasks
- Status: Current status of the active or historical grid task.
For active grid tasks, one of:
 - Starting
 - Running
 - Pausing
 - Paused (either paused by the user or automatically paused by the task)
 - Error: An error has been encountered. User action may be required. Grid task retries until successful or aborted.
 - Aborting
 - Abort Paused: Task failed to be aborted and is paused in error
 - Retrying
- For historical tasks, one of:
 - Successful
 - Rollback Failed
 - Expired
 - Aborted
 - Canceled
 - Unauthorized
 - Duplicate
 - Invalid
- Message: Information about the last stage of the active grid task
- Completion time: The date and time on which the grid task completed (or failed or expired or was aborted)

For more information about grid tasks, see the *Administrator Guide*.

Related information

[StorageGRID Webscale 10.2 Administrator Guide](#)

Monitor the Total events alarm

When the Total events alarm is raised, monitor the situation and act accordingly.

Category	Code	Service	Notes
Total events	SMTT	SSM	<p>The total number of logged error or fault events (Total Events SMTT) includes errors such as network errors. Unless these errors have been cleared (that is, the count has been reset to 0), total events alarms can be triggered.</p> <p>Note: This alarm is safe to ignore only if the events that triggered the alarm have been investigated.</p>

Alarms: SSM (CSN1-A-1) - Events
Updated: 2010-03-27 12:49:00 PDT

Severity	Attribute	Description	Alarm Time	Trigger Value	Current Value	Acknowledge Time	Acknowledge
Normal	SMST (Log Monitor State)						<input type="checkbox"/>
Notice	SMTT (Total Events)	At least 1	2010-03-26 22:11:01 PDT	1	1		<input type="checkbox"/>
Normal	AMQS (Audit Messages Queued)						<input type="checkbox"/>
Normal	NRLY (Available Audit Relays)						<input type="checkbox"/>
Normal	ABRL (Available Attribute Relays)						<input type="checkbox"/>

For more information about alarms, see the *Troubleshooting Guide*.

Related information

[StorageGRID Webscale 10.2 Troubleshooting Guide](#)

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