

Dell PowerMax 10.4.0

REST API Changelog

Revision: 01

April 2026

Revision History

Version	Date	Description
01	April 2026	Initial release of document

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1 Design Overview

This document describes the changes in the 10.4 release of the public PowerMax REST (Representational State Transfer) API. This overview gives a concise description of the changes. Details for each of the changes are provided in the relevant resource sections. For common REST API behavior, see the [Appendix](#).

1.1 System

- Add new endpoint to enable “Connected Registration” option for licensing.

2 Design Details

2.1 System

2.1.1 license/entitlements

2.1.1.1 PUT

Resource	license/entitlements	
Request Type:	PUT	
New Endpoint Description:	This endpoint enables the “Connected Registration” option for licensing.	
Modify Endpoint Description:	Added in this Release	
	Not applicable	
	Modified in this Release	
	Not applicable	
	Removed in this Release	
	Not applicable	
URL:	{{protocol}}://{{server}}/{{port}}/univmax/restapi/104/system/symmetrix/{symmetrixId}/license/entitlements/connected-registration/enable	
User Roles:	StorAdmin and above	
Prerequisite:	None	
Path Parameters:	symmetrixId – identifier for the storage array	
Query Parameters:	Not applicable	
Request Parameters:	Not applicable	
Response Parameters:	Not applicable	

3 Appendix

3.1 Authentication

3.1.1 Basic Authentication

Unisphere for VMAX REST API authorization is implemented using HTTP Basic Access Authentication. Basic Access Authentication allows the user to send an unencrypted Base64-encoded string that contains a username and password to the Unisphere for VMAX server.

Anonymous requests for a protected resource are rejected with a 401 (Access Denied) status code.

Known requests are validated against the existing Unisphere for VMAX users:

- Administrator
- Storage administrator
- Security administrator
- Monitor
- Auditor
- Performance monitor

3.1.2 Microsoft Entra ID Single Sign-On (SSO)

In addition to Basic Authentication, the PowerMax REST API can also be accessed using Microsoft Entra ID (formerly Azure Active Directory) Single Sign-On. When SSO is enabled, clients authenticate by presenting a valid OAuth 2.0 bearer access token issued by Microsoft Entra ID. The PowerMax server validates the token and maps the authenticated identity to the appropriate user role before granting access to protected resources. Requests with missing, expired, or invalid tokens are rejected with a 401 (Unauthorized) status code.

3.2 Request Types

3.2.1 GET (OBJECT)

3.2.1.1 Sample

Resource	storagegroup
Request Type:	GET
New Endpoint Description:	Get a storage group object
Modify Endpoint Description:	Added in this Release

	Not applicable			
	Modified in this Release			
	Not applicable			
	Removed in this Release			
	Not applicable			
URL:	... /103/sloprovisioning/symmetrix/{symmetrixId}/storagegroup/{storagegroupId}			
User Roles:	Administrator/Storage Administrator/Security Administrator/Monitor/Auditor/Performance Monitor			
Prerequisite:	Not applicable			
Path Parameters:	Attribute Name	Type	Optional	Description
	symmetrixId	String	No	Unique identifier of the symmetrix
	storageGroupId	String	No	The Storage Group Name
Query Parameters:	Not applicable			
Header Parameters:	Not Applicable			
Request Parameters:	Not applicable			
Response Parameters:				
	Object	storageGroup		
	Attribute Name	Type	Optional	Description
	storageGroupId	String	No	Unique identifier of the storage group instance
	slo	String	Yes	SLO that is associated with the storage group
	srp	String	Yes	SRP that is associated with the storage group
	hostIOLimit	HostIOLimitType	Yes	SRP that is associated with the storage group
	Object	HostIOLimitType		
	Attribute Name	Type	Optional	Description
	host_io_limit_mb_sec	String	No	The Host MB/s limit for the storage group

	host_io_limit_io_sec	String	Yes	The Host IO/s limit for the storage group
	dynamicDistribution	String	Yes	The dynamic distribution type, which can have "never", "always", or "on_failure" values

3.2.1.2 Response Codes

Response status code	Description
200	OK. The request is successful
401	Returned if an incorrect username, password, or both are specified
403	Returned if the specified username and password are correct, but the user is not authorized to make this request
404	Returned if the storage group [storageGroupId] on the Symmetrix [SymmetrixId] system cannot be found.
500	Returned if a problem occurred when the system was retrieving the <STORAGE_GROUP> resource: <STORAGE_GROUP_Name>
503	Returned if the server was unable to fulfill the request

3.2.2 GET (LIST)

3.2.2.1 Sample

Resource	storagegroup		
Request Type:	GET		
New Endpoint Description:	Get a list of storage group names		
Modify Endpoint Description:			
	Added in this Release		
	Not applicable		
	Modified in this Release		
	Not applicable		
	Removed in this Release		
	Not applicable		
URL:	... /103/sloprovisioning/symmetrix/{symmetrixId}/storagegroup		
User Roles:	Administrator/Storage Administrator/Security Administrator/Monitor/Auditor/Performance Monitor		
Prerequisite:	Not applicable		
Path Parameters:	Attribute Name	Type	Description

	symmetrixId	String	Unique identifier of the symmetrix	
Query Parameters:	Attribute Name	Type	Description	
	storageGroupId	String	An optional value that filters the returned list so it displays storage group names that contain the specified volume names only, for example, equal to "storageGroupId=gold_SG" or contain "storageGroupId=< like>gold"	
	sym_vol_name	String	An optional value that filters the returned list so it displays storage group names that contain the specified volumes names only, for example, equal to "sym_vol_name=00123" or contain "sym_vol_name=< like>12"	
	And so on			
Header Parameters:	Not Applicable			
Request Parameters:	Not applicable			
Response Parameters:	Object	ListStorageGroupResult		
	Attribute Name	Type	Optional	Description
	storageGroupId	String array	No	A list of storage group names

3.2.2.2 Response Codes

Response status code	Description
200	OK. The request is successful
401	Returned if an incorrect username, password, or both are specified
403	Returned if the specified username and password are correct, but the user is not authorized to make this request
500	Returned if a problem occurred when the system was retrieving the <STORAGE_GROUP> resource: <STORAGE_GROUP Name>
503	Returned if the server was unable to fulfill the request

3.2.3 POST

3.2.3.1 Sample

Resource	storagegroup
Request Type:	POST

New Endpoint Description:	Create a storage group				
Modify Endpoint Description:					
	Added in this Release				
	Not applicable				
	Modified in this Release				
	Not applicable				
	Removed in this Release				
	Not applicable				
URL:	... /103/sloprovisioning/symmetrix/{symmetrixId}/storagegroup				
User Roles:	Administrator/Storage Administrator				
Prerequisite :	Not applicable				
Path Parameters:	Attribute Name	Type	Description		
	symmetrixId	String	Unique identifier of the symmetrix		
Query Parameters:	Not applicable				
Header Parameters:	Not Applicable				
Request Parameters:	Object		createStorageGroupParam		
	Attribute Name		Type	Optional	Description
	storageGroupId		String	No	Unique identifier of the new storage group instance
	create_empty_storage_group		boolean	Yes	An empty storage group is created if

				you set this parameter to true. This parameter overrides any other create setting.																				
	sloBasedStorageGroupParam	SloBasedStorageGroupParamType	Yes	This parameter is required to create a SLO-based storage group. Multiple occurrences create multiple child storage groups.																				
<table><tr><td>Object</td><td colspan="4">SloBasedStorageGroupParamType</td></tr><tr><td>Attribute Name</td><td>Type</td><td>Optional</td><td colspan="2">Description</td></tr><tr><td>slold</td><td>String</td><td>No</td><td colspan="2">The SLO that is to be associated with the storage group</td></tr><tr><td>volumeAttribute</td><td>VolumeAttributeType</td><td>No</td><td colspan="2">Size of each volume that is to be added to the storage group</td></tr></table>					Object	SloBasedStorageGroupParamType				Attribute Name	Type	Optional	Description		slold	String	No	The SLO that is to be associated with the storage group		volumeAttribute	VolumeAttributeType	No	Size of each volume that is to be added to the storage group	
Object	SloBasedStorageGroupParamType																							
Attribute Name	Type	Optional	Description																					
slold	String	No	The SLO that is to be associated with the storage group																					
volumeAttribute	VolumeAttributeType	No	Size of each volume that is to be added to the storage group																					
<table><tr><td>Object</td><td colspan="4">VolumeAttributeType</td></tr><tr><td>Attribute Name</td><td>Type</td><td>Optional</td><td colspan="2">Description</td></tr><tr><td>volume_size</td><td>String</td><td>No</td><td colspan="2">The size of the volume</td></tr><tr><td>capacityUnit</td><td>String enum: CYL MB GB</td><td>No</td><td colspan="2">Unit of capacity</td></tr></table>					Object	VolumeAttributeType				Attribute Name	Type	Optional	Description		volume_size	String	No	The size of the volume		capacityUnit	String enum: CYL MB GB	No	Unit of capacity	
Object	VolumeAttributeType																							
Attribute Name	Type	Optional	Description																					
volume_size	String	No	The size of the volume																					
capacityUnit	String enum: CYL MB GB	No	Unit of capacity																					

		TB		
Response Parameters:	SYNCHRONOUS:			
	Object	storageGroup		
	Attribute Name	Type	Optional	Description
	<Insert the noun or noun phrase that describes what is detailed> is detailed in the GET method.			
	ASYNCHRONOUS:			
	Object	job		
	Attribute Name	Type	Optional	Description
	<Insert the noun or noun phrase that describes what is detailed> is detailed in the Appendix.			

3.2.3.2 Response Codes

Response status code	Description
200	OK, returned when endpoint is used for operations that do NOT create a Resource using SYNCHRONOUS execution option.
201	Created, returned when Resource is created using SYNCHRONOUS execution option.
202	Accepted, returned when the request to create the resource is accepted using the ASYNCHRONOUS execution option.
207	Multi-Status, indicates that a request involving multiple operations or resources has returned various results.
400	Returned when an error occurs with the validation of the Request payload , for example:<STORAGE_GROUP> must be 1-64 alphanumeric, '_', or '-' characters
401	Returned if an incorrect username, password, or both are specified
403	Returned if the specified username and password are correct, but the user is not authorized to make this request
409	Returned if the requested <STORAGE_GROUP> resource already exists.
412	Returned if preconditions in the request cannot be met
500	Returned if a problem occurred when the system was creating the <STORAGE_GROUP> resource: <STORAGE_GROUP_Name>
503	Returned if the server was unable to fulfill the request

3.2.3.3 Response Header

Asynchronous

The URL of the job

- Example: restapi/103/system/job/{jobId}

Synchronous:

The URL of the resource that is being created:

- Example:restapi/103/sloprovisioning/symmetrix/{symmetrixId}/storagegroup/{storageGroupId}

3.2.4 PUT

3.2.4.1 Sample

Resource	storagegroup																											
Request Type:	PUT																											
New Endpoint Description:	Modifies a storage group																											
Modify Endpoint Description:	<table><tr><td colspan="4">Added in this Release</td></tr><tr><td colspan="4">Not applicable</td></tr><tr><td colspan="4">Modified in this Release</td></tr><tr><td colspan="4">Not applicable</td></tr><tr><td colspan="4">Removed in this Release</td></tr><tr><td colspan="4">Not applicable</td></tr></table>				Added in this Release				Not applicable				Modified in this Release				Not applicable				Removed in this Release				Not applicable			
Added in this Release																												
Not applicable																												
Modified in this Release																												
Not applicable																												
Removed in this Release																												
Not applicable																												
URL:	... /103/sloprovisioning/symmetrix/{symmetrixId}/storagegroup/{storageGroupID}																											
User Roles:	Administrator/Storage Administrator																											
Prerequisite :	Not applicable																											
Path Parameters:	<table><tr><th>Attribute Name</th><th>Type</th><th>Description</th></tr><tr><td>symmetrixId</td><td>String</td><td>Unique identifier of the symmetrix</td></tr><tr><td>storageGroupId</td><td>String</td><td>The Storage Group Name</td></tr></table>	Attribute Name	Type	Description	symmetrixId	String	Unique identifier of the symmetrix	storageGroupId	String	The Storage Group Name																		
Attribute Name	Type	Description																										
symmetrixId	String	Unique identifier of the symmetrix																										
storageGroupId	String	The Storage Group Name																										
Query Parameters:	Not applicable																											
Header Parameters:	Not Applicable																											
Request Parameters:	<table><tr><td colspan="2">Object</td><td colspan="2">editStorageGroupParam</td></tr><tr><td colspan="2">Attribute Name</td><td>Type</td><td>Optional</td><td>Description</td></tr><tr><td colspan="2">editStorageGroupActionParam</td><td>EditStorageGroupParamType</td><td>No</td><td>Select one of the Edit</td></tr></table>				Object		editStorageGroupParam		Attribute Name		Type	Optional	Description	editStorageGroupActionParam		EditStorageGroupParamType	No	Select one of the Edit										
Object		editStorageGroupParam																										
Attribute Name		Type	Optional	Description																								
editStorageGroupActionParam		EditStorageGroupParamType	No	Select one of the Edit																								

				Options to modify the specified storage group
	Object	EditStorageGroupParamType		
	Attribute Name	Type	Optional	Description
	renameStorageGroupParam	RenameStorageGroupParamType	Yes	Renames the specified storage group
	editStorageGroupSLOParam	EditStorageGroupSLOParamType	Yes	Edit the SG SLO Applicable to stand-alone and child storage groups only
	Object	RenameStorageGroupParamType		
	Attribute Name	Type	Optional	Description
	new_storage_Group_name	String	No	The New Storage Group Name.
Response Parameters:	Object	EditStorageGroupSLOParamType		
	Attribute Name	Type	Optional	Description
	sold	String	No	The New SLO Selection
	Object	storageGroup		
	Attribute Name	Type	Optional	Description
	<Insert the noun or noun phrase that describes what is detailed> is detailed in the GET method.			

	ASYNCHRONOUS:			
	Object	job		
	Attribute Name	Type	Optional	Description
	<Insert the noun or noun phrase that describes what is detailed> is detailed in the Common Objects section.			

3.2.4.2 Response Codes

Response status code	Description
200	Ok, returned when Resource is edited using SYNCHRONOUS execution option.
202	Accepted, returned when the request to edit the resource is accepted using the ASYNCHRONOUS execution option. <u>Note:</u> In some rare circumstances, such as unmapping all volumes from a cu image, the cu image no longer exists; hence, there is no object or content to be returned. In these circumstances, a 204: No content will be returned after the job completes
207	Multi-Status, indicates that a request involving multiple operations or resources has returned various results.
400	Returned when an error occurs with the validation of the Request payload , for example:<STORAGE_GROUP> must be 1-64 alphanumeric, '_', or '-' characters
401	Returned if an incorrect username, password, or both are specified
403	Returned if the specified username and password are correct, but the user is not authorized to make this request
409	Returned if the requested <STORAGE_GROUP> resource already exists.
500	Returned if a problem occurred when the system was editing the <STORAGE_GROUP> resource: <STORAGE_GROUP_Name>
503	Returned if the server was unable to fulfill the request

3.2.4.3 Response Header:

Asynchronous:

The URL of the job

- For example, restapi/103/system/job/{jobId}

Synchronous:

A URI Header cannot be passed back in a 200(ok) Response

3.2.5 DELETE

3.2.5.1 Sample

Resource	storagegroup
Request Type:	DELETE

New Endpoint Description:	Deletes a storage group			
Modify Endpoint Description:				
	Added in this Release			
	Not applicable			
	Modified in this Release			
	Not applicable			
	Removed in this Release			
	Not applicable			
URL:	... /103/sloprovisioning/symmetrix/{symmetrixId}/storagegroup/{storagegroupId}			
User Roles:	Administrator/Storage Administrator			
Prerequisite:	Not applicable			
Path Parameters:	Attribute Name	Type	Optional	Description
	symmetrixId	String	No	Unique identifier of the symmetrix
	storageGroupId	String	No	The Storage Group Name
Query Parameters:	Not applicable			
Header Parameters:	Not Applicable			
Request Parameters:	Not applicable			
Response Parameters:	No content			

3.2.5.2 Response Codes:

Response status code	Description
204	No Content, returned when Resource is deleted successfully
401	Returned if an incorrect username, password, or both are specified
403	Returned if the specified username and password are correct, but the user is not authorized to make this request
404	Returned if the requested <STORAGE_GROUP> resource cannot be found
500	Returned if a problem occurred when the system was deleting the <STORAGE_GROUP> resource: <STORAGE_GROUP_Name>
503	Returned if the server was unable to fulfill the request

3.3 Common Objects

3.3.1 Iterator

An Iterator is a paged list of objects that is cached for a set period of time. Until the expiry time has been reached, the list of objects can be queried by page from the following locations:

.../restapi/common/Iterator/{iteratorId}

.../restapi/common/Iterator/{iteratorId}/page?from=1050&to=1100

Object	iterator		
Attribute Name	Type	Optional	Description
id	String	No	Unique iterator identifier that is used to look up the result until the expiry time is reached
count	int	No	Total number of result objects
ExpirationTime	String	No	Unix timestamp that shows when the result will be removed from cache and no longer queryable
maxPageSize	int	No	Maximum number of results that is allowed per result list page
result	Object Array	No	Array of objects that is returned

3.3.1.1 Sample Object Array:

Object	Iterator that contains list of: daysToFullResultType		
Attribute Name	Type	Optional	Description
projectionDaysToFull	float	Yes	Number of days until the specified category will be full, - to a maximum of 180 days
ProjectionMaxProjectedData	float	Yes	Maximum number of days that will be projected
ProjectionCapacityTrend	float	Yes	Projected capacity
PercentUsedCapacity	double	Yes	Current percentage of used capacity
TotalPoolCapacityGB	double	Yes	Current total capacity
instanceId	String	No	The unique identifier of the returned category object

3.3.1.1.1 Sample JSON Response:

```
{
  "resultList": {
    "result": [
      {
        "ProjectionDaysToFull": 181,
        "ProjectionMaxProjectedData": 180,
        "ProjectionCapacityTrend": 0,
        "PercentUsedCapacity": 35.10973774908589,
        "TotalPoolCapacityGB": 45727.2,
        "instanceId": "0000000000001"
      }
    ],
    "from": 1,
    "to": 1
  },
  "id": "31d90275-c8d3-42d2-ab98-0343a3b3b16e_0",
  "count": 1,
  "expirationTime": 1474474773510,
  "maxPageSize": 1000
}
```

3.3.2 Job

Object	job		
Attribute Name	Type	Optional	Description
jobId	String	No	Unique identifier of the job instance
name	String	Yes	Name of the job
status	JobStatus enum: CREATED SCHEDULED RUNNING SUCCEEDED FAILED ABORTED UNKNOWN VALIDATING VALIDATED VALIDATE_FAILED INVALID RETRIEVING_PICTURE	No	Current status of the job

username	string	No	User who initiated the job
last_modified_date	String	Yes	Date the job was last modified
last_modified_date_milliseconds	String	Yes	Date the job was last modified in milliseconds
scheduled_date	String	No	Date the job was last scheduled
scheduled_date_milliseconds	String	Yes	Date the job was last scheduled in milliseconds
completed_date	String	Yes	Date the job was completed
completed_date_milliseconds	String	Yes	Date the job was last completed in milliseconds
task	<u>TaskType</u>	Yes	Current status of the job
resourceLink	String	Yes	URL of the object that is created, when applicable
result	String	Yes	Description of the job outcome, its failure or success

Object	TaskType		
Attribute Name	Type	Optional	Description
execution_order	int	Yes	Order of the task
description	String	Yes	Description of the task

3.3.2.1 Sample JSON Response:

```
{
  "jobId": "1476181321815",
  "name": "Create SAMPLE_REST_PG ",
  "status": " SUCCEEDED ",
  "username": "smc",
  "last_modified_date": "Oct-11-2016 11:22:01.817",
  "last_modified_date_milliseconds": 1476181321817,
  "scheduled_date": "",
  "scheduled_date_milliseconds": 0,
  "completed_date": " Oct-11-2016 11:22:01.817",
  "completed_date_milliseconds": 1476181321817,
  "task": [
```

```

{
  "execution_order": 1,
  "description": "Create Port Group : SAMPLE_REST_PG"
}
],
"resourceLink":
https://IP_ADDRESS:8443/univmax/restapi/103/sloprovisioning/symmetrix/{symmetrixId}/portgroup/SAMP
LE_REST_PG,
  "result": "SUCCEEDED - Started job execution on Fri 27 Jan 2017 07:57:59 AM GMT
Finished job execution on Fri 27 Jan 2017 07:58:49 AM GMT
Successfully created volume(s): 01076",
}

```

3.3.2.2 Response Codes:

Response status code	Description
200	Ok, returned when Resource is retrieved successfully
401	Returned if an incorrect username, password, or both are specified
403	Returned if the specified username and password are correct, but the user is not authorized to make this request
404	Returned if the requested resource cannot be found
500	Returned if a problem occurred when the system was retrieving the resource: <RESOURCE_NAME>
503	Returned if the server was unable to fulfill the request

3.3.3 Configuration Management Type

Object	ConfigurationManagementParamType		
Attribute Name	Type	Optional	Description
executionOption	String enum: SYNCHRONOUS ASYNCHRONOUS	Yes	Indicates whether the requested configuration management request should run synchronously or asynchronously

3.4 Automatic Cleanup of REST API jobs

All asynchronous and synchronous configuration change requests that are made through the REST API create a Job resource. Over time, the number of completed jobs accumulates and, without a mechanism to delete those jobs via the REST API, system performance might be impacted.

Because REST API jobs can be considered temporary resources that are relevant only while jobs run and to preempt any performance degradation, an automatic REST API cleanup task could perform a valuable function by deleting completed jobs.

The following list provides the functional requirements for implementing the automatic cleanup of REST API jobs:

- Only jobs that are created for REST API requests are eligible for automatic deletion.
- A cleanup task runs at a default of every 1 hour and deletes any eligible REST API jobs.
- A REST API job is eligible for deletion if it meets the following requirements:
 - Its status is one of SUCCEEDED, FAILED, or ABORTED.
 - At least the 1-hour default has passed since the job completed.
- The minimum time that must pass before a job is eligible for deletion is specified in hours, with a default value of 1. The valid range of values is from 1 to 32,767. The interval is configurable, and a new configuration requires an offline change to become active.
- Automatic cleanup of REST API jobs is enabled by default, but it is configurable. Cleanup can be disabled, and any new configuration requires an offline change to become active.
- If the Unisphere server is shutdown for any reason the REST API jobs on the system do not persist and will be deleted.

3.5 Enhanced Endpoints

PowerAPI style endpoints return all defined attributes in a single call instead of the traditional approach of querying for the id(s) of an object and then issuing another request to get the complete list of defined attributes.

It also allows for a common approach to filtering, sorting and selecting the desired attributes of the object, see below example and details of this Query approach.

Old style (using 2 requests):

```
../storagegroup?cap_gb=>100
{
    "storageGroupId": [
        "SG1",
        "SG2",
    ]
}
../storage/SG1
{
    "storageGroupId": "SG1",
    "cap_gb": 100.01,
}
```

New PowerAPI style:

```
../storage-groups?select=cap_gb&filter=cap_gb gt 100&order=id.asc
```

```
{
  "storage_groups":[
    {
      "id":"SG1",
      "cap_gb":101
    },
    {
      "id":"SG2",
      "cap_gb":150
    }
  ]
}
```

3.5.1 Base URL

3.5.1.1 <https://{ipaddress}:{port}/univmax/rest/>

3.5.2 Query Details:

3.5.2.1 Filtering:

filter (<i>row filtering</i>)	<attribute> <operator> <value>	?filter=age ge 13
---------------------------------	--------------------------------	-------------------

Operator	Meaning	Notes	Numeric	String	Enum
eq	equal		y	y	y
ne	not equal		y	y	y
gt	greater than		y	y	y
ge	greater than or equal		y	y	y
lt	less than		y	y	y
le	less than or equal		y	y	y
like	Simple substring match			y	
ilike	case insensitive substring match			y	

3.5.2.2 Ordering:

order (<i>sorting</i>)	<property>[.asc .dsc]	?order=last_name,age.dsc
--------------------------	-----------------------	--------------------------

3.5.2.3 Selecting:

select (<i>column filtering</i>)	<property>,<property>.<nested_property>	?select=id,name,volumes.id
------------------------------------	---	----------------------------

3.5.2.4 Sample

Below is a sample definition of how all query params will be handled, this will be used as the reference point for each query param.

Attribute Name	Optional	Type	Description
object_id	NO	String	this Attribute is <u>mandatory</u>, therefore there is no need to define it in the 'select' statement An optional value that can be used to 'filter' the response list ?filter=object_id eq string_value (see other options in the filter table defined above) An optional value that can be used to 'order' the response list: ?order=object_id.dsc
attribute_name	YES	String	An optional value that <u>must</u> be defined in the 'select' to be included in the response objects: ?select=attribute_name An optional value that can be used to 'filter' the response list: ?filter=attribute_name eq attribute_value (see other options in the filter table defined above) An optional value that can be used to 'order' the response list: ?order= attribute_name.dsc
nested_attribute_name	YES	Nested String	An optional value that <u>must</u> be defined in the 'select' to be included in the response objects: ?select=attribute_name. nested_attribute_name An optional value that can be used to 'filter' the response list: ?filter=attribute_name. nested_attribute_name eq attribute_value (see other options in the filter table defined above)

			// todo: should we only sort on top level attributes ? An optional value that can be used to 'order' the response list: ?order= attribute_name.dsc
--	--	--	--

3.5.2.4.1 Example query

3.5.2.4.1.1 URL

../storage-groups?**select**=snapshots.num_of_volumes,cap_gb&**filter**=cap_gb gt 100&**order**=id.asc

3.5.2.4.1.2 Response:

```
{
  "storage_groups":[
    {
      "id":"SG1",
      "cap_gb":101,
      "snapshots": {
        "num_of_volumes":12
      }
    },
    {
      "id":"SG2",
      "cap_gb":150,
      "snapshots": {
        "num_of_volumes":3
      }
    }
  ]
}
```

3.5.3 Pagination

3.5.3.1 Description:

Starting from 10.3 Unisphere for PowerMAX, the ability to "page" the response from enhanced endpoints was added.

This feature allows users to break down or limit the response result set into customizable page sizes.

A user can do this by simply adding one of the following query params to any of the existing enhanced endpoints (expect performance):

- **limit:** Number of instances per page
 - <https://localhost:8443/univmax/rest/v1/systems/xxxxxxxxxxx/storage-groups?limit=2>
- or
- **limit_kb:** Total size of the response in KBs per page

- https://localhost:8443/univmax/rest/v1/systems/xxxxxxxxxxx/storage-groups?limit_kb=200

A response “resume_token” is then returned to the user which is the identifier of the next page in the list, a user can then iterate through each page using subsequent resume tokens until the end of the list is reached i.e.:

- https://localhost:8443/univmax/rest/v1/systems/xxxxxxxxxxx/storage-groups?resume_token=5e7fe55e-80b6-40b1-8c51-d8e80322847a&limit=2

Users have a default of 10 seconds to query the next page once the response has been sent from the server, but this can be increased by adding the following query parameter:

- **expiration_delay_secs** (delays the date a resume token will expire in seconds)
 - https://localhost:8443/univmax/rest/v1/systems/xxxxxxxxxxx/storage-groups?limit=2&expiration_delay_secs=30

3.5.3.2 Request Query Params

Attribute Name	Optional	Type	Description
limit	NO	Number	The number of instances that the page should be limited to.
limit_kb	NO	Number	The total size of the response in KBs that the page should be limited to.
resume_token	NO	String	The unique identifier for the page
expiration_delay_secs	NO	Number	The default expiry time of the response resume token is 10secs, if this is not enough time, the user can delay the expiry time up to the max defined below.

3.5.3.2.1 Sample

- https://localhost:8443/univmax/rest/v1/systems/xxxxxxxxxxx/storage-groups?resume_token=5e7fe55e-80b6-40b1-8c51-d8e80322847a&limit=2

3.5.3.3 Response

Paging			
Attribute Name	Optional	Type	Description
total_instances	NO	Number	The Total Number of instances in the Response.

remaining_instances	NO	Number	The Total Number of instances remaining in the result list
resume_token	NO	String	The unique identifier for the next page, where applicable
resume_token_expiration_date_ms	NO	Number	The Date, in milliseconds from EPOCH, when the resume token will expire, hence no longer available to be queried.
next	NO	String	The URL of the next page, which will include the resume token and any other inputs.

3.5.3.3.1 Sample

```
{
  "storage_groups": [
    {
      "id": "Bulk_Test_StorageGroup"
    },
    {
      "id": "Bulk_Test_StorageGroup2"
    }
  ],
  "paging": {
    "total_instances": 466,
    "remaining_instances": 464,
    "resume_token_expiration_date_ms": 1720689041688,
    "resume_token": "5e7fe55e-80b6-40b1-8c51-d8e80322847a",
    "next": "/rest/v1/systems/xxxxxxxxxxxx/storage-groups?resume_token=5e7fe55e-80b6-40b1-8c51-d8e80322847a&limit=2&expiration_delay_secs=10"
  }
}
```

3.5.3.3.2 Sample Expired Token Error:

```
{
  "message": "A problem occurred retrieving the Storage Groups resource: No entry found for specified resume token, token could be expired",
  "http_status_code": 400,
  "messages": [
    {
      "code": "0x0309",
      "timestamp_ms": 1720615449598,
      "severity": "ERROR",
    }
  ]
}
```

```

    "message": "A problem occurred retrieving the Storage Groups resource: No entry found for specified resume token, token could be expired"
  }
]
}

```

3.5.3.4 Limits:

- limit
 - Min: **0**
 - Max: **none**,
- limit_kb
 - Min: **50kb**
 - Max: **none**,
- expiration_delay_secs
 - Min: **10**
 - Max: **120 (2 mins)**

3.5.3.4.1 Edge Case:

There may be a scenario where the first instance of the result set is bigger than the limit_kb defined; in this edge case where we cannot return any item or instance in the list, we will return the following error.

```

{
  "message": "A problem occurred retrieving the Storage Groups resource: Invalid 'limit_kb' input, first instance size[60] is greater than min limit_kb[50]",
  "http_status_code": 400,
  "messages": [
    {
      "code": "0x0310",
      "timestamp_ms": 1720432301836,
      "severity": "ERROR",
      "message": "A problem occurred retrieving the Storage Groups resource: Invalid 'limit_kb' input, first instance size[60] is greater than min limit_kb[50]"
    }
  ]
}

```

3.5.3.5 Sample Behavioural Use Case:

- Limit response to generate a resume token (paging mode enabled)
 - https://localhost:8443/univmax/rest/v1/systems/xxxxxxxxxxx/storage-groups?limit=2&expiration_delay_secs=30
 - Gives you resume token to next page e.g. 111111111
- Then use token 111111111 to get “next” page
 - https://localhost:8443/univmax/rest/v1/systems/xxxxxxxxxxx/storage-groups?resume_token=111111111&limit=2&expiration_delay_secs=30
 - should give you token to next page e.g. 22222222
- Run the same endpoint again without changing any query params
 - https://localhost:8443/univmax/rest/v1/systems/xxxxxxxxxxx/storage-groups?resume_token=111111111&limit=2&expiration_delay_secs=30
 - Considering no inputs (limit, limit_kb and expiration_delay_secs) have changed it should give you back the same token as above: 22222222, but the expiry date gets pushed on to whatever you specify.
- Run the same endpoint again with changes to any query params

- https://localhost:8443/univmax/rest/v1/systems/xxxxxxxxxxx/storage-groups?resume_token=11111111&limit=4&expiration_delay_secs=30
 - Considering inputs (limit, limit_kb and expiration_dealy_secs) have changed it should give you back a new token, 33333333, and expiry date gets pushed on to whatever you specify
- Get next page using new token 33333333
 - https://localhost:8443/univmax/rest/v1/systems/xxxxxxxxxxx/storage-groups?resume_token=33333333&limit=4&expiration_delay_secs=30
 - tokens 11111111 and 22222222 are deleted.
 - new token 44444444 is created for the remainder of 33333333

3.5.4 Enhanced Error Messages

3.5.4.1 Description:

Starting from 10.3 Unisphere for PowerMAX, the error messages returned from the Enhanced endpoints will include more details, specifically error codes that will be permanently associated with a particular error i.e.:

- **0x0309:**
A problem occurred retrieving the Storage Groups resource: No entry found for specified resume token, token could be expired
- **0x0310:**
A problem occurred retrieving the Storage Groups resource: Invalid 'limit_kb' input, first instance size [60] is greater than min limit_kb[50]

The complete list of available error codes can be seen on:

- https://developer.dell.com/apis/4458/versions/10.3.0/docs/Getting%20Started/6.enhanced_endpoints.md

3.5.4.2 Response

Attribute Name	Optional	Type	Description
message	NO	String	The description of the error message. (This is duplicated here for backward compatibility)
http_status_code	NO	Number	The HTTP status code associated with the error messages
messages	NO	Array[ErrorMessage]	An Array of error messages associated with the error.

	ErrorMessage		
Attribute Name	Optional	Type	Description
code	NO	String	The unique code associated with this error
timestamp_ms	NO	Number	The date in milliseconds from EPOCH of when the error occurred
severity	NO	String	The severity of the error: ERROR, WARN,INFO
message	NO	String	The description of the error message.

3.5.4.2.1 Sample

```
{
  "message": "A problem occurred retrieving the Storage Groups resource: No entry found for specified resume token, token could be expired",
  "http_status_code": 400,
  "messages": [
    {
      "code": "0x0309",
      "timestamp_ms": 1720615449598,
      "severity": "ERROR",
      "message": "A problem occurred retrieving the Storage Groups resource: No entry found for specified resume token, token could be expired"
    }
  ]
}
```