

# z/OS 3.1 IBM Education Assistant

Solution Name: Storage Management REST API: Add volume to storage group

Solution Element(s): Storage Management REST API

July 2023



# Agenda

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- Trademarks
- Objectives
- Overview
- Usage & Invocation
- Interactions & Dependencies
- Upgrade & Coexistence Considerations
- Installation & Configuration
- Summary
- Appendix

# Trademarks

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- See url <http://www.ibm.com/legal/copytrade.shtml> for a list of trademarks.
- Additional Trademarks:
  - None.

# Objectives

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- Zach (Senior storage administrator) and Alice (Entry level storage administrator) can drive REST APIs to add volumes to a SMS storage group so that the space of storage group can be easily expanded in modernized programming language-based solution.

# Overview

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- Who (Audience)  
z/OSMF Storage Management users
- What (Solution)  
Add four new REST APIs to add volumes to storage group, validate a SCDS, activate a SCDS and get the activation result.
- Wow (Benefit / Value, Need Addressed)  
z/OSMF Storage Management users who want to expand the space of storage group

# Usage & Invocation – Enable Storage Management Plugin

- In General Settings, enable storage management plugin

General Settings	
Capacity Provisioning	<input checked="" type="checkbox"/> Enabled
IBM z/OS Encryption Readiness Technology (zERT) Network Analyzer	<input type="checkbox"/> Disabled
ISPF	<input checked="" type="checkbox"/> Enabled
Incident Log	<input checked="" type="checkbox"/> Enabled
Network Configuration Assistant	<input checked="" type="checkbox"/> Enabled
Resource Monitoring	<input checked="" type="checkbox"/> Enabled
Software Management	<input checked="" type="checkbox"/> Enabled
Storage Management	<input checked="" type="checkbox"/> Enabled
Sysplex Management	<input checked="" type="checkbox"/> Enabled
Workload Management	<input checked="" type="checkbox"/> Enabled
z/OS Data Gatherer: SMF REST Services	<input type="checkbox"/> Disabled
z/OS Management Services Catalog	<input checked="" type="checkbox"/> Enabled

# Usage & Invocation – Go to Swagger UI

- Open z/OSMF Swagger UI by `https://{host}:{port}/zosmf/api/explorer/`, go to Storage Management APIs tab. The following four new REST APIs are added in this epic.

## Storage Management APIs

GET	/zosmf/storage/rest/v1/cds/{scds-name}	API4
POST	/zosmf/storage/rest/v1/cds/{scds-name}	API3
PUT	/zosmf/storage/rest/v1/cds/{scds-name}	API2
GET	/zosmf/storage/rest/v1/dataclasses	
GET	/zosmf/storage/rest/v1/dataclasses/{dc-name}	
GET	/zosmf/storage/rest/v1/storageclasses	
GET	/zosmf/storage/rest/v1/storageclasses/{sc-name}	
GET	/zosmf/storage/rest/v1/storagegroups	
GET	/zosmf/storage/rest/v1/storagegroups/{stg-name}	
POST	/zosmf/storage/rest/v1/storagegroups/{stg-name}/volumes	API1
GET	/zosmf/storage/rest/v1/volumes	
GET	/zosmf/storage/rest/v1/volumes/{volume-ser}	

API1: As a z/OSMF storage management user, I can add new volumes to a SMS storage group

API2: As a z/OSMF storage management user, I can validate a SCDS.

API3: As a z/OSMF storage management user, I can activate a SCDS.

API4: As a z/OSMF storage management user, I can get the activate result if the result is unsure when invoking the POST activate API

# Usage & Invocation - REST Service to add volumes to a storage group - 1

Request			
URI path	/zosmf/storage/rest/<version>/storagegroups/<sg-name>/volumes		
Method	POST		
Request Parameters			
Field name	Type	Required or optional	Description
sg-name	String	Required	The target storage group which is used to define volumes. Only three types(POOL, DUMMY, COPY POOL BACKUP) of storage groups are supported to add volumes. Provide storage group name, ignore case sensitive. it should be 1 to 8 alphameric, starting with an alphabetic or national (\$, @ or #) character
validate	String	Optional	<ul style="list-style-type: none"><li>Specifies whether to validate the SCDS after adding volume list to a storage group</li><li>Valid values are Y and N.Y value requests to validate the SCDS. N value requests not to validate SCDS.</li><li>The default value is N if the parameter is not specified.</li></ul>
activate	String	Optional	<ul style="list-style-type: none"><li>Specifies whether to activate SCDS after adding volume list to a storage group.</li><li>Valid values are Y and N. Y value requests to activate SCDS. N value requests not to activate SCDS.</li><li>If activate is Y, the REST API will always validate the SCDS before activation, regardless of the value defined for validate.</li><li>The default value is N if the parameter is not specified.</li></ul>
Request Body			
Field name	Type	Required or optional	Description
SCDS	String	Required	The data set name of SCDS. The SCDS name can be up to 42 characters, including delimiters (periods).
range	JSON Array	Required	<ul style="list-style-type: none"><li><b>Prefix</b> can contain either a volume serial number or the first common characters in a range of volume serial numbers. If part of a range, enter the remaining distinctive characters of the volume serial numbers in the FROM and TO fields, and if you want, the SUFFIX field. Enter up to six characters.</li><li><b>From</b> is to specify the characters unique to the first volume serial number in a range. Use the PREFIX and SUFFIX fields to select leading and trailing characters. Valid entries are decimal or hexadecimal numbers or alphabet.</li><li><b>To</b> is to specify the characters unique to the last volume serial number in a range. Use the PREFIX and SUFFIX fields to select leading and trailing characters. Valid entries are decimal or hexadecimal numbers or alphabet.</li><li><b>Suffix</b> is to used when you specify values in the FROM and TO fields, you can specify in this field the common trailing characters in a range of volume serial numbers. Enter up to five characters.</li><li><b>Type</b> is to used when you specify hexadecimal numbers in the FROM and TO fields, you must enter X in this field. When you specify alphabets in the FROM and TO fields, you must enter A in this field. The default is decimal</li></ul>



# Usage & Invocation - REST Service to add volumes to a storage group - 2

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Request Body			
Field name	Type	Required or optional	Description
validationType	String	Optional	validationType can be SG(Storage Group) or * (Entire SCDS). If query parameter validate is Y or activate is Y, the validationType is required, otherwise it can be optional.

# Usage & Invocation - REST Service to add volumes to a storage group - 3

## Request Example

URI path	/zosmf/storage/rest/<version>/storagegroups/<sg-name>/volumes
Method	POST

## Request Body

```
{
  "SCDS": "ZOSMF.DGQ.SCDs",
  "range": [{
    "prefix": "VOL",
    "from": "1",
    "to": "2",
    "suffix": "C"
  }]
}
```

## Response

On completion, the z/OS storage management REST interface returns an HTTP response, 201 means success  
If success, an object which contains new volumes will be returned as below:

```
{
  "volumes": [
    {
      "volumeSerial": "VOL1C"
    },
    {
      "volumeSerial": "VOL2C"
    }
  ]
}
```

Otherwise, a JSON data with error message will be returned as below:

```
{
  "rc": 8,
  "reason": 6003,
  "category": 4,
  "message": "Dataset not accessed."
}
```

# Usage & Invocation - REST Service to add volumes to a storage group - 4

Request Example	
URI path	/zosmf/storage/rest/<version>/storagegroups/<sg-name>/volumes?validate=Y&activate=N
Method	POST
Request Body	
<pre>{   "SCDS": "ZOSMF.DGQ.SCDs",   "range": {     "prefix": "VOL",     "from": "1",     "to": "2",     "suffix": "C"   },   "validationType": "*" }</pre>	
Response	
<p>On completion, the z/OS storage management REST interface returns an HTTP response, 201 means success (the validation is scheduled successfully). If success, an object which contains new volumes will be returned as below:</p> <pre>{   "volumes": [     {       "volumeSerial": "VOL1C"     },     {       "volumeSerial": "VOL2C"     }   ] }</pre> <p>Otherwise, a JSON data with error message will be returned as below:</p> <pre>{   "volumes": [     {       "volumeSerial": "VOL1C"     },     {       "volumeSerial": "VOL2C"     }   ],   "rc": 8,   "reason": 6080,   "category": 4,   "message": "Data set is in use. " }</pre>	

# Usage & Invocation - REST Service to add volumes to a storage group - 5

Request Example	
URI path	/zosmf/storage/rest/<version>/storagegroups/<sg-name>/volumes?validate=Y&activate=Y
Method	POST
Request Body	
<pre>{   "SCDS": "ZOSMF.DGQ.SCDs",   "range": [{     "prefix": "VOL",     "from": "1",     "to": "2"     "suffix": "C"   }],   "validationType": "" }</pre>	
Response	
<p>On completion, the z/OS storage management REST interface returns an HTTP response, 200 means success (the validation and activation is scheduled successfully).</p> <p>If success, an object which contains new volumes will be returned as below:</p> <pre>{   "volumes": [     {       "volumeSerial": "VOL1C"     },     {       "volumeSerial": "VOL2C"     }   ],   "activateRes": "IGD008I NEW CONFIGURATION ACTIVATED FROM SCDS ZOSMF.DGQ.SCDs BY CONS TEST\r\n IGD403I CURRENT SYSTEM CONFIGURATION\r ACTIVATION LEVEL: 120\r ACTIVATION TIME(UTC): 04:15:55.96\r ACTIVATION DATE: 2022/07/04\r ACTIVATION SOURCE: SETSMS" }</pre> <p>The following is the response body for the request when the HTTP response code is 200 and activateResURI and activateResURL are returned, the activation result is not available yet. You can invoke the activation result URL to get the activation result later.</p> <pre>{   "volumes": [     {       "volumeSerial": "VOL1C"     },     {       "volumeSerial": "VOL2C"     }   ],   "activateResURI": "/zosmf/storage/rest/v1/cds/ZOSMF.DGQ.SCDs?console-name="test"&amp;Ckey-number="C1405322", "activateResURL": "https://host:port/zosmf/storage/rest/v1/cds/ZOSMF.DGQ.SCDs?console- name="test"&amp;Ckey-number="C1405322" }</pre>	

# Usage & Invocation - REST Service to add volumes to a storage group - 6

Request Example	
URI path	/zosmf/storage/rest/<version>/storagegroups/<sg-name>/volumes?validate=Y&activate=Y
Method	POST
Request Body	
<pre>{   "SCDS": "ZOSMF.DGQ.SCDs",   "range": [{     "prefix": "VOL",     "from": "1",     "to": "2",     "suffix": "C"   }],   "validationType": "*" }</pre>	
Response	
<p>The following is the response body when adding the volumes succeeds, but activation step fails.</p> <pre>{   "volumes": [     {       "volumeSerial": "VOL1C"     },     {       "volumeSerial": "VOL2C"     }   ],   "rc": 1,   "reason": 9999,   "category": 5,   "message": "IGD414I SMS DETECTED count DUPLICATE VOLUME(S) WITHIN THE SMS CONFIGURATION. FIRST DUPLICATE VOLUME IS VOL1C              ATTEMPTING TO REPAIR ACDS" }</pre>	

# Usage & Invocation - REST Service to validate a SCDS - 1

Request			
URI path	/zosmf/storage/rest/<version>/cds/<scds-name>		
Method	PUT		
Request Parameters			
Field name	Type	Required or optional	Description
scds-name	String	Required	The data set name of SCDS. The CDS name can be up to 42 characters, including delimiters (periods).
Request Body			
Field name	Type	Required or optional	Description
validationType	String	Required	validationType can be SG, SM, SC, DC or * (Entire SCDS).

# Usage & Invocation - REST Service to validate a SCDS - 2

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## Request Example

URI path	/zosmf/storage/rest/<version>/cds/<scds-name>
Method	PUT

## Request Body

```
{
  validationType: "SG"
}
```

## Response

On completion, the z/OS storage management REST interface returns an HTTP response, 204 means success.  
If success, no response will be returned.

Otherwise, a JSON data with error message will be returned like below:

```
{
  "rc": 8,
  "reason": 1,
  "category": 4,
  "message": "Validation failed. The validation result can be found in ZOSMF.DGQ.VAL"
}
```

# Usage & Invocation - REST Service to activate a SCDS - 1

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Request			
URI path	/zosmf/storage/rest/<version>/cds/<scds-name>		
Method	POST		
Request Parameters			
Field name	Type	Required or optional	Description
scds-name	String	Required	The SCDS name to be activated. The CDS name can be up to 42 characters and should be a valid data set name. This property is not case sensitive.



# Usage & Invocation - REST Service to activate a SCDS - 2

Request	
URI path	/zosmf/storage/rest/<version>/cds/<scds-name>
Method	POST
Response	
<p>On completion, the z/OS storage management REST interface returns an HTTP response.</p> <p>1) If response status code is 200 and the response activateRes not empty, indicate that the activation successful.</p> <pre>{   "activateRes": " IGD008I NEW CONFIGURATION ACTIVATED FROM SCDS                   ZOSMF.DGQ.SCDS BY CONS TEST\r\n IGD403I CURRENT SYSTEM CONFIGURATION\r                   ACTIVATION  LEVEL: 120\r ACTIVATION TIME(UTC): 04:15:55.96\r ACTIVATION                   DATE: 2022/07/04\r ACTIVATION SOURCE: SETSMS" }</pre> <p>2) If the HTTP response code is 200 and activateResURI and activateResURL are returned, it means the activation result is not available yet. You can invoke the activation result URL to get the activation result later.</p> <pre>{   "activateResURI": "/zosmf/storage/rest/v1/cds/ZOSMF.DGQ.SCDS?console-name="test"&amp;Ckey-number="C1405322",   "activateResURL": "https://host:port/zosmf/storage/rest/v1/cds/ZOSMF.DGQ.SCDS?console-name="test"&amp;Ckey-number="C1405322" }</pre> <p>3) Otherwise, an error report will be returned as below</p> <pre>{   "rc": 1,   "reason": 8,   "category": 5,   "message": "Can not get solicited message C0502238, Console TEST can not be found. " }</pre>	

# Usage & Invocation - REST Service to get the activation result - 1

Request			
URI path	/zosmf/storage/rest/<version>/cds/<scds-name>?[console-name=<console-name>&[Ckey-number=<Ckey-number>]		
Method	GET		
Request Parameters			
Field name	Type	Required or optional	Description
scds-name	String	Required	The activated SCDS name in previous POST API. The user doesn't need to specify it. It returned by previous POST activate API. The SCDS name can be up to 42 characters and should be a valid data set name. This property is not case sensitive.
console-name	String	Required	The name of the console used to activate SCDS. The user doesn't need to specify it. It returned by previous POST activate API. The name must be 2 - 8 characters long and cannot start with a digit, characters are alphanumeric and can also include the characters #, \$, and @. The name cannot be defcn, which is reserved
Ckey-number	String	Required	The command response key from the activate SCDS request. It returned by previous POST activate API. The user doesn't need to specify it. CkeyNumber should begin with c C and consist of 7 digits of 0-9.

# Usage & Invocation - REST Service to get the activation result - 2

Request Example	
URI path	/zosmf/storage/rest/<version>/cds/<scds-name>?[console-name=<console-name>&[Ckey-number=<Ckey-number>]
Method	GET
Response	

On completion, the z/OS storage management REST interface returns an HTTP response.

1) If the status code is 200 and and activateRes is not empty, indicate that the activation successful.

```
{
  "activateRes": " IGD008I NEW CONFIGURATION ACTIVATED FROM SCDS
                  ZOSMF.DGQ.SCDs BY CONS TEST\r\n IGD403I CURRENT SYSTEM CONFIGURATION\r
                  ACTIVATION  LEVEL: 120\r ACTIVATION TIME(UTC): 04:15:55.96\r ACTIVATION
                  DATE: 2022/07/04\r ACTIVATION SOURCE: SETSMS"
}
```

2) Otherwise, an error report will be returned as below.

```
{
  "rc": 1,
  "reason": 8,
  "category": 5,
  "message": "Can not get solicited message C0502238, Console TEST can not be found. "
}
```

# Interactions & Dependencies

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- Software Dependencies
  - None
- Hardware Dependencies
  - None
- Exploiters
  - z/OSMF Storage Management users

# Upgrade & Coexistence Considerations

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- None

# Installation & Configuration

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- The sample job IZUSGSEC in SYS1.SAMPLIB should be run to do the security settings. For more details, please refer to “Configure the Storage Management service” chapter in z/OSMF Configuration Guide.

# Summary

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- The following four REST APIs in Storage Management have been explained:
  - As a z/OSMF storage management user, I can add new volumes to a SMS storage group
  - As a z/OSMF storage management user, I can validate a SCDS.
  - As a z/OSMF storage management user, I can activate a SCDS.
  - As a z/OSMF storage management user, I can get the activate result if the result is unsure when invoking the POST activate API

# Appendix

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- Book updates
  - IBM z/OS Management Facility Programming Guide
  - IBM z/OS Management Facility Configuration Guide