EMC Unisphere for VMAX

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REST API Concepts and Programmer's Guide

EMC²

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PREFACE

As part of an effort to improve its product lines, EMC periodically releases revisions of its software and hardware. Therefore, some functions described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features.

Contact your EMC technical support professional if a product does not function properly or does not function as described in this document.

Note

This document was accurate at publication time. Go to EMC Online Support (https://support.emc.com) to ensure that you are using the latest version of this document.

Purpose

This document describes how to configure and use EMC Unisphere for VMAX REST API.

Audience

This guide is intended for programmers who want to create interfaces, using these API's, in any of the programming environments that support standard REST clients such as web browsers and programming platforms that can issue HTTP requests.

Related documentation

The following EMC publications provide additional information:

- EMC Unisphere for VMAX Release Notes
- EMC Unisphere for VMAX Installation Guide
- EMC Unisphere for VMAX REST API Concepts and Programmer's Guide

Special notice conventions used in this document

EMC uses the following conventions for special notices:

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Addresses practices not related to personal injury.

Note

Presents information that is important, but not hazard-related.

Typographical conventions

EMC uses the following type style conventions in this document:

Bold	Used for names of interface elements, such as names of windows, dialog boxes, buttons, fields, tab names, key names, and menu paths (what the user specifically selects or clicks)
Italic	Used for full titles of publications referenced in text
`Monospace`	Used for: • System code • System output, such as an error message or script • Pathnames, filenames, prompts, and syntax • Commands and options
Monospace italic	Used for variables
`Monospace bold`	Used for user input
[ ]	Square brackets enclose optional values
|	Vertical bar indicates alternate selections - the bar means “or”
{ }	Braces enclose content that the user must specify, such as x or y or z
...	Ellipses indicate nonessential information omitted from the example

Where to get help

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Product information

For documentation, release notes, software updates, or information about EMC products, go to EMC Online Support at https://support.emc.com.

Technical support

Go to EMC Online Support and click Service Center. You will see several options for contacting EMC Technical Support. Note that to open a service request, you must have a valid support agreement. Contact your EMC sales representative for details about obtaining a valid support agreement or with questions about your account.

Your comments

Your suggestions will help us continue to improve the accuracy, organization, and overall quality of the user publications. Send your opinions of this document to VMAXContentFeedback@emc.com.

CHAPTER 1

Introduction

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Product overview

The EMC Unisphere for VMAX REST (Representational State Transfer) API allows for accessing diagnostic performance data, accessing configuration data, and performing storage provisioning operations for VMAX hardware through robust APIs. These API's can be used in any of the programming environments that support standard REST clients such as web browsers and programming platforms that can issue HTTP requests. The Unisphere for VMAX REST API supports both XML and JavaScript Object Notation (JSON) MIME types.

REST model

REST is a manner of building networked software systems that allows merging of documents, data and information services into an ecosystem of named resources.

- Resource - Anything important enough to be referenced as a noun.
- Resource name - Unique identification of the resource.
- Resource representation - Useful information about the current state of resource. Resource representation is what is used to transfer its information to the client using the HTTP protocol.
- Resource link - Link to another representation of the same resource.
- Resource interface - Uniform interface for accessing the resource and manipulating its state.

The following table describes the standard resource methods.

Table 1 REST resource methods

HTTP operation	Description	Access to Method
PUT	Modify resource	Administrator Storage Administrator Performance Monitor
GET	Retrieve state of resource	All users
POST	Create a new resource	Administrator Storage Administrator
DELETE	Delete resource	Administrator Storage Administrator

For assigning user roles for each array, refer to Setting up user authentication.

Downloading schemas

Procedure

1. Download the UNIVMAX REST API schemas by pointing the browser to: **`https://{UNIVMAX_IP}:{UNIVMAX_PORT}/univmax/restapi/<version>/<end point>`**

Where, *UNIVMAX_IP* is the IP address, *UNIVMAX_PORT* is the port of the host running Unisphere for VMAX, *version* is the version associated with the release and *end point* is the end point associated with the release.

CHAPTER 2

Documentation

This chapter contains the following:

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- Transport protocol 14
- Product version and compatibility 14
- Making the JSON root element backwards compatible 15

Downloading documentation

Clients can download the UNIVMAX REST API documentation (URLs, required parameters, and returned results) as follows:

Before you begin

Prior to downloading REST API documentation, Unisphere for VMAX must be installed and user access roles must be setup (see Setting up user authentication on page 20).

Procedure

1. Point the browser to: **`https://{UNIVMAX_IP}:{UNIVMAX_PORT}/univmax/restapi/docs`**

   Where, *UNIVMAX_IP* is the IP address and *UNIVMAX_PORT* is the port of the host running Unisphere for VMAX.

2. Copy the zip file (restapi-docs.zip) locally, unzip the file, and navigate to target/docs/index.html.
3. Open the html file to access the documented resources.

Transport protocol

REST API uses the Hypertext Transfer Protocol Secure (HTTPS) version 1.1 as the transport for API requests. For POST requests, method arguments are passed in the HTTP Request message body. API methods return standard HTTP status codes and result content in the HTTP Response message body.

Unisphere for VMAX REST API supports two media-types:

- application/xml — Allows marshalling/un-marshalling using XML
- application/json —Allows marshalling/ un-marshalling using JSON

Product version and compatibility

The Unisphere REST API is the same version as the Unisphere for VMAX application.

Backward compatibility

Since the REST API is a method-based API, the methods will remain backwards compatible with older versions as long as the argument and result types have only optional properties added to newer versions of the API.

If additional properties are required or existing properties require modification, an additional method should be created. Deprecated methods will be maintained to service older clients, and eventually removed. New REST API methods are backwards compatible.

REST API guarantees backwards compatibility for two major releases. For example if the server REST API version is 8.0.x, then it is backward compatible with REST API version 7.6.x or 7.5.x on the client.

Client/Server compatibility

If the client REST API version is older than the server version, interaction proceeds as designed. If the client REST API version is newer than the server version, the server delivers an HTTP status 400 or HTTP status 404, indicating an illegal request.

Making the JSON root element backwards compatible

For prior versions of the Unisphere for VMAX REST API, the JSON root is included in the API request and response. The current version of Unisphere for VMAX REST API does not include the JSON root in the API request and response. To make the server backwards compatible, the property that controls this must be modified as follows:

Procedure

1. Locate the `web.xml` file at:

   `<location of Unisphere installation>\jboss\domain\deploy0\smc0ear\smc.war\WEB-INF\web.xml`

2. Open the file and set the property `com.emc.em.restapi.WrapJsonRoot` to True.
3. Save the file and restart the server.

Example 1 REST API request and response example

The following example shows a REST API request and response with and without the JSON root:

Request:

`https://<UnimaxIP:UnimaxPort>/univmax/restapi/provisioning/symmetrix/000195900063/storagegroup`

Where *UNIVMAX_IP* is the IP address and *UNIVMAX_PORT* is the port of the host running Unisphere for VMAX.

Response without JSON root (default):

```
{
"num_of_storage_groups": 64,
"storageGroupId":
[
"appEng",
"appEng2",
],
"success": true
}
```

Response with JSON root:

```
{
"listStorageGroupResult":
{
"num_of_storage_groups": 64,
"storageGroupId":
[
```

Example 1 REST API request and response example (continued)

```
"appEng",
"appEng2",
],
"success": true
}
}
```

CHAPTER 3

Iterators

This chapter contains the following:

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How iterators are used in REST API

An iterator is an object that allows you to cycle through the elements in a collection and display each element. Unisphere for VMAX REST API uses iterators to retrieve a collection of performance data only when the API interface defines that there are unbounded instances in the result. For example, the method to retrieve array metrics takes an ArrayParamType argument and returns an unbounded number of ArrayResultType results.

See Downloading documentation on page 14 for instructions on how to access the REST resources. From the EMC Unisphere for VMAX RESTAPI Home page, select Performance, then any /metrics resource, and under Response Body select Iterator to view how the iterator cycles through the elements in a collection results.

The Unisphere for VMAX REST API also uses iterators to control resource consumption on the server when multiple clients are querying for large sets of data. Each iterator has a unique ID and provides two ways to control excess server consumption: maximum page size, and an expiration time for the iterator instance. The page size and expiration time are dependent on server load and resource availability. In addition, Unisphere for VMAX imposes limits on the number of concurrent requests it will accept. See Sample iterator methods and typical use case.

Sample iterator methods and typical use case

The infrastructure provides three method endpoints for clients to interact with the iterators.

- Get iterator info
- Get iterator page
- Delete iterator

A typical use case is as follows:

Note

If a client becomes unresponsive, or disconnects from the Unisphere for VMAX server, the iterator expires, based on a pre-configured timeout. When the iterator expires, server resources are released. If the iterator expires before the client has finished paging over all the results, the client must reissue the request.

1. The client invokes a REST API method that returns an iterator.
2. The client pages over the results of an existing iterator until all results are retrieved by issuing Get common /Iterator/{iteratorId}/page.
3. If the iterator has not expired, the client deletes the iterator by issuing Delete common/Iterator/{iteratorId}.

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Sample

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Setting up user authentication

Prior to using the Unisphere for VMAX REST API, user authorization must be assigned for each VMAX array the user is permitted to access.

Procedure

1. Log into Unisphere for VMAX.
2. From the system selector, select **All Symmetrix**.
3. Select **Home › Administration › Security › Authorized Users and Groups** to open the **Authorized Users and Groups** list view.
4. Click **Add** to open the **Add Authorization Rule** dialog box.
5. Select the **Roles** tab and create a user login profile for each VMAX array to be accessed by the user, and assign them to any of the following roles:
   - Users that are allowed VMAX access:
     - Administrator — Can initiate GET, POST, PUT, and DELETE methods.
     - Storage Administrator — Can initiate GET, POST, PUT, and DELETE methods.
     - Performance Monitor — Can initiate GET and POST methods.
     - Monitor — Can initiate GET methods.
     - Auditor — Can initiate GET methods.
     - Security Administrator — Can initiate GET methods.
   - Users that are not allowed VMAX access:
     - None
6. Click **OK**.

Using the sample REST API client

Before you begin

Download the RESTApi.zip file from http://support.EMC.com. The zip file contains all the jar files needed to build the sample client.

This procedure explains how to use the sample REST API client to test and verify REST API calls to Unisphere for VMAX.

Procedure

1. Builld the client:

```
javac -classpath lib\httpclient-4.2.1.jar;lib\httpcore-4.2.1.jar
RESTApiTest.java
```

2. Run the client:

```
java -classpath .;lib\httpclient-4.2.1.jar;lib
\httpcore-4.2.1.jar;lib\commons-logging-1.1.1.jar;lib\commons-
codec-1.6.jar RESTApiTest <fully_qualified_hostname or ip_address>
<username> <password> <startDate> <endDate> <symmID>
```

Results

```
java -classpath .;lib\httpclient-4.2.1.jar;lib\httpcore-4.2.1.jar;lib
\commons-logging-1.1.1.jar;lib\commons-codec-1.6.jar RESTApiTest
<fully_qualified_hostname or ip_address> <username> <password>
<startDate> <endDate> <symmID>
```

Where startDate and endDate are time expressed as the number of milliseconds, using the "epoch" (Januaray 1, 1970, 00:00:00 GMT)" as the reference point from which time is measured. This allows the date and time of events to be specified as an integer value rather than a calendar representation. Epoch converter tools are available on the internet.

Client authentication

REST API uses HTTP Basic Access Authentication to authenticate API clients, described in RFC 2617. HTTP Basic Access Authentication is simple, since it does not require cookies, session handling, or login pages. Instead, HTTP Basic Access Authentication uses static headers, requiring no handshakes.

Users of the REST API are assigned user credentials for associated VMAX arrays within Unisphere for VMAX. A username and password is supplied with every request to REST API in the “Authorization” header, as specified in RFC 2617. Every request to REST API is authenticated and authorized.

Note

If X509 certificate-based client authentication is enabled, the username/password REST basic authentication credential is ignored by Unisphere. However, to meet REST standard’s basic authentication requirement, REST clients must provide non-empty username/password “dummy” credential.

Sample client request and response examples

For sample client request and response examples, refer to the REST API documentation. Downloading documentation on page 14 describes how to obtain the documentation.