



Hewlett Packard
Enterprise

HPE 3PAR Web Services API 1.5 Developer's Guide

Abstract

This guide provides the details needed to write a client that uses the HPE 3PAR Web Services API to manage HPE 3PAR storage systems. HPE 3PAR storage systems include both hardware components that store data and software applications to manage data.

Part Number: QL226-98198R
Published: November 2015
Edition: 2

© Copyright 2012, 2015 Hewlett Packard Enterprise Development LP

The information contained herein is subject to change without notice. The only warranties for Hewlett Packard Enterprise products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. Hewlett Packard Enterprise shall not be liable for technical or editorial errors or omissions contained herein.

Confidential computer software. Valid license from Hewlett Packard Enterprise required for possession, use, or copying. Consistent with FAR 12.211 and 12.212, Commercial Computer Software, Computer Software Documentation, and Technical Data for Commercial Items are licensed to the U.S. Government under vendor's standard commercial license.

Links to third-party websites take you outside the Hewlett Packard Enterprise website. Hewlett Packard Enterprise has no control over and is not responsible for information outside the Hewlett Packard Enterprise website.

License information

To enable licensed features on HPE 3PAR Storage systems, you must obtain license keys. See the 3PAR Command Line Interface Administrator's Guide for information on activating software licenses.

You can use the 3PAR StoreServ Management Console (SSMC) to add licenses to connected storage systems. For more information see 3PAR StoreServ Management Console user guide.

Printed license certificates for 3PAR storage systems include an Entitlement Order Number (EON).

To register licenses and receive license keys:

1. Open the following link in your browser:

<http://www.hpe.com/info/HPE-licensing-sw>

2. Log in to HP Passport, and then enter the EON shown on the Hewlett Packard Enterprise license certificate.

For assistance, contact the License Support Center using the telephone numbers and e-mail addresses shown on the license certificate. Contact your Hewlett Packard Enterprise representative for more information.

Acknowledgments

Java® and Oracle® are registered trademarks of Oracle and/or its affiliates.

Contents

1 Introduction.....	18
2 Configuring and using the WSAPI.....	19
Starting and configuring the server.....	19
Client code samples.....	20
Java client code samples.....	20
Perl client code samples.....	20
3 Accessing the WSAPI.....	21
Protocol and message format.....	22
URI format.....	22
HTTP requests and responses.....	22
Supported HTTP methods.....	22
Client HTTP headers.....	22
Server HTTP headers.....	24
Request input.....	24
Required and optional members.....	24
Null members.....	25
Enumerations.....	25
JSON types and API types.....	26
Filtering in Queries.....	27
JSON Character Encoding.....	28
HTTP Status and error codes.....	28
The code Member.....	28
The desc Member.....	54
The ref Member.....	55
HTTP error codes.....	55
System Access.....	55
Creating Credentials.....	56
Creating a Session Key.....	56
Using a Session Key.....	57
Session Key Security.....	57
Multiple Session Keys.....	57
Maximum Number of WSAPI Sessions.....	57
Deleting a Session Key.....	59
Session key deletion success.....	59
Session key deletion errors.....	59
Session timeout.....	59
4 Working with Common Provisioning Groups (CPGs).....	60
CPG enumeration and configuration objects.....	60
CPG LDLayout JSON objects.....	60
CPG RAIDType enumeration.....	60
CPG HA enumeration.....	61
CPG chunkletPosPref enumeration.....	61
CPG diskPatterns JSON object.....	61
CPG diskType enumeration.....	62
CPG space usage objects.....	63
Growth objects.....	63
CPG state enumeration.....	63
CPG DetailedState enumeration.....	63
Creating a CPG.....	64
CPG creation success.....	65
CPG creation errors.....	65

Modifying a CPG.....	66
CPG modification success.....	67
CPG modification errors.....	67
Removing a CPG.....	67
CPG removal success.....	67
CPG removal errors.....	67
Querying CPG information.....	68
Querying all CPGs.....	68
CPG query success.....	69
CPG query errors.....	69
Querying a single CPG.....	69
Single-CPG query success.....	69
Single-CPG query errors.....	69
5 Working with storage volumes.....	70
Licensing information.....	70
Volume enumeration and configuration objects.....	70
Volume provisioningType enumeration types.....	70
Volume CopyType enumeration types.....	71
Volume state enumeration types.....	71
Volume DetailedState enumeration types.....	71
Volume policies configuration object.....	72
Volume space objects.....	73
Creating a storage volume.....	73
Creating base volumes.....	73
Volume creation success.....	75
Volume creation errors.....	75
Modifying a virtual volume.....	76
Volume modification success.....	78
Virtual-volume modification errors.....	78
Growing volumes.....	79
Volume growth success.....	80
Volume growth error codes.....	80
Tuning a virtual volume.....	82
Virtual volume tuning success.....	83
Virtual volume tuning errors.....	84
Displaying virtual volume space distribution.....	86
Volume space distribution success.....	86
Volume space distribution response.....	86
Error Mapping for volume space distribution queries.....	87
Removing a storage volume.....	87
Storage volume removal success.....	87
Storage volume removal errors.....	88
Querying volume information.....	88
Querying all volumes.....	88
All-volumes query success.....	88
All-volumes query errors.....	90
Querying a single volume.....	91
Single-volume query success.....	91
Single-volume query errors.....	91
Querying volume information with multiple WWNs.....	92
Volume query with WWN filtering success.....	92
Errors for volume query with WWN filtering.....	92
Querying volume information with multiple volume filters.....	92
Volume query with multiple-volumes filters success.....	93

Errors for volume query with multiple-volumes filters.....	93
6 Working with hosts.....	94
Creating a host.....	94
Host creation success.....	95
Host creation errors.....	95
Modifying a host.....	96
Host modification success.....	98
Host modification errors.....	98
Removing a host.....	100
Host removal success.....	100
Host removal errors.....	100
Querying host information.....	100
Querying all hosts.....	100
Querying a single host.....	100
Host query success.....	100
Host query errors.....	104
Querying host information with WWN filtering.....	104
Host query with WWN filtering success.....	105
Host query with WWN filtering errors.....	105
Querying host personas	105
Querying multiple host personas.....	105
Multiple host persona query success.....	106
Multiple host persona query errors.....	106
Querying persona information with wsapiAssignedId filtering.....	106
Host persona query with wsapiAssignedId filtering success.....	106
Host persona query with wsapiAssignedId filtering errors.....	106
Querying a single host persona.....	106
Single host persona query success.....	107
Single host persona query errors.....	107
7 Working with host sets and VV sets.....	108
Creating a host set or VV set.....	108
Host-set or VV-set creation success.....	109
Host-set or VV-set creation errors.....	109
Modifying a host set or VV set.....	110
Host-set or VV-set modification success.....	111
Host-set or VV-set modification errors.....	111
Removing a host set or VV set.....	111
Host-set or VV-set removal success.....	112
Host-set or VV-set removal errors.....	112
Setting and querying a VV-set flash-cache policy.....	112
VV-set flash-cache policy setting success.....	113
VV-set flash-cache policy setting errors.....	113
Querying all host sets or all VV sets.....	113
All-host-sets or all-VV-sets query success.....	113
All-host-sets or all-VV-sets query errors.....	114
Querying a single host set or a single VV set.....	114
Single-host-set or single-VV-set query success.....	114
Single-host set or single-VV set query errors.....	114
8 Working with ports and switches.....	115
Port configuration and enumeration objects.....	115
Querying all ports.....	117
All-ports query success.....	117
All-ports query errors.....	120

Querying a single port.....	120
Single-port query success.....	120
Single-port query errors.....	120
Querying ports with type filtering.....	120
Type filtering success.....	121
Errors for Port Query with Type Filtering.....	121
Querying port devices.....	121
Port-device query success.....	121
Port-device query errors.....	122
Querying FC switches.....	122
FC-switches query success.....	122
FC switches query errors.....	123
9 Working with virtual LUNs.....	124
VLUN configuration and enumeration objects.....	124
VLUN portPos configuration object.....	124
VLUNtype enumeration.....	124
VLUN multipathing enumeration.....	124
VLUN failedPathPol enumeration.....	125
Creating a VLUN.....	125
VLUN creation success.....	126
VLUN creation errors.....	126
VLUN creation example.....	127
HTTP request.....	127
HTTP response.....	128
Removing a VLUN.....	128
VLUN removal success.....	129
VLUN removal errors.....	129
VLUN removal example.....	129
HTTP request.....	129
HTTP response.....	129
Querying VLUNs.....	130
Querying all VLUNs.....	130
All-VLUNs query success.....	130
All-VLUNs query example.....	131
All-VLUNs query errors.....	132
Querying a single VLUN.....	132
Single-VLUN query success.....	133
Single-VLUN query errors.....	134
Querying VLUNs using filters.....	135
Querying VLUNs using filters success.....	135
Errors for VLUN query using filters.....	135
10 Performing copy operations.....	137
Licensing information.....	137
Creating a volume snapshot.....	137
Creating group snapshots of a list of virtual volumes.....	138
Group snapshot success.....	139
Group snapshot errors.....	139
Creating a physical copy of a volume.....	139
Physical copy of volume creation success.....	141
Physical copy of volume errors.....	141
Resynchronizing a physical copy to its parent volume or stopping a physical copy.....	143
Successful resynchronization of a physical copy of a volume, or of stopping a physical copy....	143
Errors for resynchronizing a physical copy to its volume, or for stopping a physical copy.....	144
Promoting a virtual copy.....	144

Virtual copy promotion success.....	144
Virtual copy promotion errors.....	144
Creating a VV-set snapshot.....	146
VV-set snapshot creation success.....	146
VV-set snapshot creation errors.....	146
Creating a physical copy of a VV set.....	148
Physical copy of VV set creation success.....	148
Physical copy of VV set creation errors.....	149
Resynchronizing or stopping a physical copy of a VV set.....	149
Success response for resynchronizing a physical copy to its VV set, or stopping a physical copy of a VV set.....	150
Errors for resynchronizing a physical copy to its VV set, or stopping a physical copy of a VV set.....	150
Promoting a VV-set virtual copy.....	150
VV-set virtual copy promotion success.....	151
VV-set virtual-copy promotion errors.....	151
Querying the status of a VV-set physical copy.....	153
Updating virtual copies or VV-sets.....	153
Updating virtual copies or vvsets success.....	153
Updating virtual copies or vvsets error codes.....	153
11 Working with HPE 3PAR remote copy.....	154
Licensing information.....	154
Creating a remote-copy group.....	154
Remote-copy group creation success.....	155
Remote-copy group creation errors.....	155
Removing a remote-copy group.....	157
Remote-copy group removal success.....	157
Remote-copy group removal errors.....	158
Admitting a volume into a remote-copy group.....	158
Volume admission success.....	160
Volume admission errors.....	161
Dismissing a volume from a remote-copy group.....	163
Volume dismissal success.....	164
Volume dismissal errors.....	164
Starting a remote-copy group.....	165
Remote-copy group start success.....	165
Remote-copy group start errors.....	166
Stopping a remote-copy group.....	167
Remote-copy group Stop success.....	167
Remote-copy group Stop errors.....	167
Modifying a remote-copy group.....	168
Remote-copy group modification success.....	172
Remote-copy group modification errors.....	172
Modifying a remote-copy group target.....	173
Modifying a remote-copy group target success.....	174
Modifying a remote-copy group target errors.....	174
Synchronizing a remote-copy group.....	174
Remote-copy group synchronization success.....	175
Remote-copy group synchronization errors.....	176
Creating snapshots of remote copy group volumes.....	176
Create a coordinated snapshot of a single remote copy group volume.....	177
Successful remote-copy group coordinated snapshot.....	177
Creating coordinated snapshots across all remote copy group volumes.....	178
Coordinated snapshot success.....	178

Error mapping for coordinated snapshots.....	178
Recovering a remote-copy group.....	179
Remote-Copy Disaster Recovery success.....	180
Remote copy recovery errors.....	181
Querying remote-copy information.....	182
Querying overall remote copy information.....	182
Remote-copy information query success.....	182
Remote-copy information query errors.....	183
Querying remote-copy groups.....	183
Querying all remote-copy groups.....	183
All remote-copy groups query success.....	183
All remote-copy groups query errors.....	190
Querying a single remote copy group.....	190
Single remote-copy group query success.....	190
Single remote-copy group query errors.....	190
Querying remote-copy group subresource information.....	190
Query target information.....	190
Query target success.....	191
Query volume information.....	191
Query a single instance of a remote copy group target.....	191
Query a single instance of a remote copy group volume.....	191
12 Working with Flash cache.....	193
Creating flash cache.....	193
Flash cache creation success.....	193
Flash cache creation errors.....	193
Removing a flash cache.....	194
Flash cache removal success.....	194
Flash cache removal errors.....	194
Querying flash cache information.....	194
Flash-cache information query success.....	194
Flash-cache information query errors.....	195
13 Working with system, version, task, and flash-cache policy information.....	196
Getting storage system information.....	196
Storage-system query success.....	196
Storage-system query errors.....	200
Updating storage system parameters.....	200
Update storage system parameters success.....	201
Update storage system parameters error codes.....	201
Getting version information.....	201
Version information query success.....	201
Version information query errors.....	202
Getting WSAPI configuration information.....	202
WSAPI configuration query success.....	202
WSAPI configuration query errors.....	203
Getting task status.....	203
Querying the status of all tasks.....	203
Successful query of tasks status.....	204
All-tasks status query errors.....	204
Querying the status of a single task.....	204
Successful query of single-task status.....	204
Single copy task query errors.....	206
Canceling a task.....	206
Task cancellation success.....	207
Task cancellation errors.....	207

Setting and querying system flash-cache policy.....	207
System flash-cache policy setting success.....	207
System flash-cache policy setting errors.....	208
14 Querying available space.....	209
Querying overall system capacity.....	209
Overall system capacity success.....	209
Overall available space query errors.....	212
Querying available space for a CPG or LDLayout object.....	212
CPG space query members.....	212
LDLayout object space query members.....	212
Space query success.....	212
Space query errors.....	213
15 Querying WSAPI user and role information.....	215
Querying all users.....	215
WSAPI all-users query success.....	215
All-users query errors.....	215
Querying a single user.....	216
WSAPI single-user query success.....	216
Single-user query errors.....	216
Querying all roles.....	216
WSAPI all-roles query success.....	216
All-roles query errors.....	217
Querying a single role.....	217
WSAPI single-role query success.....	217
Single-role query errors.....	217
16 Querying AO configuration information.....	218
Querying a single AO configuration.....	219
17 Requesting information from HPE 3PAR System Reporter.....	220
License information.....	220
Requesting Versus Time or At Time reports.....	220
Versus Time and At Time common variable definitions.....	220
Mandatory sample frequency parameter.....	221
Optional parameter names and values.....	221
Query expression parameters.....	221
Query expression parameters for Versus Time reports	221
Query expression parameters for At Time reports.....	222
Versus Time and At Time error handling.....	223
Query expression error handling	223
Requesting cache memory statistics data	224
Requesting a Versus Time cache memory statistics report.....	224
Versus Time cache memory data report parameters.....	224
Requesting an At Time cache memory statistics report.....	224
At Time cache memory statistics report parameters.....	224
Using cache memory statistics query expression parameters.....	224
Cache memory statistics report response.....	225
Versus Time cache memory statistics report response.....	225
At Time cache memory statistics response.....	227
Cache memory statistics report error mapping.....	227
Requesting CPG space data reports	227
Requesting a Versus Time CPG space data report.....	227
Versus Time CPG space data report parameters.....	228
Requesting an At Time CPG space data report.....	228
At Time CPG space data report parameters.....	228

Using CPG space data query expression parameters.....	228
CPG space data report response.....	228
Versus Time CPG space data report response.....	229
At Time CPG space data response.....	229
CPG space data report error mapping.....	230
Requesting CPG statistical data.....	230
Requesting a Versus Time CPG statistical data report.....	230
Versus Time CPG statistical data report parameters.....	230
Requesting an At Time CPG statistical data report.....	231
At Time CPG statistical data report parameters.....	231
Using CPG statistical data query expression parameters.....	231
CPG statistical data report response.....	231
Versus Time CPG statistical data report response.....	231
At Time CPG statistical data response.....	232
CPG statistical data report error mapping.....	233
Requesting physical disk capacity.....	233
Requesting a Versus Time physical disk capacity report.....	233
Versus Time physical disk capacity data report parameters.....	233
Requesting an At Time physical disk capacity report.....	233
At Time physical disk capacity report parameters.....	233
Using physical disk capacity query expression parameters.....	234
Physical disk capacity report response.....	234
Versus Time physical disk capacity report response.....	234
At Time physical disk capacity response.....	235
Physical disk capacity report error mapping.....	235
Requesting physical disk statistics reports.....	235
Requesting a Versus Time physical disk statistics report.....	236
Versus Time physical disk statistics report parameters.....	236
Requesting an At Time physical disk statistics report.....	236
At Time physical disk statistics report parameters.....	236
Using physical disk performance query expression parameters.....	236
Physical disk statistics report response.....	237
Versus Time report response.....	237
At Time report response.....	238
Physical disk statistics report error mapping.....	238
Requesting physical disk space data reports.....	239
Requesting a Versus Time physical disk space data report.....	239
Versus Time physical disk space data report parameters.....	239
Requesting an At Time physical disk space data report.....	239
At Time physical disk space data report parameters.....	239
Using physical disk space data query expression parameters.....	239
Physical disk space data report response.....	240
Versus Time report response.....	240
At Time report response.....	241
Physical disk space data error mapping	241
Requesting port statistics reports.....	241
Requesting a Versus Time port performance report.....	241
Versus Time port statistics report parameters.....	242
Requesting an At Time port statistics report.....	242
At Time port statistics report parameters.....	242
Using port statistics query expression parameters.....	242
Port statistics report response.....	243
Versus Time port statistics response.....	243
At Time port statistics response.....	244
Port statistics report error mapping.....	245

Requesting VLUN statistics data	245
Requesting a Versus Time VLUN statistics report.....	245
Versus Time VLUN statistics data report parameters.....	245
At Time VLUN statistics report parameters.....	245
Using VLUN statistics report query expression parameters.....	246
VLUN statistics report response.....	246
Versus Time VLUN statistics report response.....	246
At Time VLUN statistics response.....	247
VLUN statistics report error mapping.....	248
Requesting volume space data reports.....	248
Requesting a Versus Time volume space data report.....	248
Versus Time volume space data report parameters.....	249
Requesting an At Time volume space data report.....	249
At Time volume space data parameters.....	249
Using volume space data query expression parameters.....	249
Volume space data report response.....	250
Versus Time volume space response.....	250
At Time volume space response.....	251
Volume space data report error mapping.....	252
18 WSAPI support for HPE 3PAR priority optimization.....	253
Licensing information.....	253
Creating QoS rules.....	253
QoS rule creation success.....	255
QoS rule creation and modification errors.....	255
Modifying QoS rules.....	256
QoS rule modification success.....	257
QoS rules modification errors.....	258
Deleting QoS rules.....	258
QoS rules deletion success.....	258
QoS rules deletion errors.....	258
Querying QoS rules.....	258
Querying all QoS rules.....	258
All-QoS rule query success.....	258
All-QoS rule query errors.....	260
Querying a single QoS rule.....	260
Single QoS-rule query success.....	260
Single QoS-rule query errors.....	260
19 Support and other resources.....	261
Accessing Hewlett Packard Enterprise Support.....	261
Accessing updates.....	261
Websites.....	261
Customer self repair.....	262
Remote support.....	262
Documentation feedback.....	262
Glossary.....	263
Index.....	266

Tables

1	WSAPI and HPE 3PAR OS versions.....	18
2	HPE 3PAR CLI Commands for the WSAPI Server.....	19
3	Supported client HTTP headers for requests.....	23
4	Server HTTP headers in the WSAPI.....	24
5	API types.....	26
6	Generic WSAPI code Member Status and error codes.....	29
7	Operation-specific API code Member Status and error codes.....	32
8	Session Key Message body Member JSON objects.....	56
9	Message body JSON objects for Session Key creation.....	57
10	Maximum WSAPI Sessions per Node.....	58
11	JSON objects for CPG LDDLayout.....	60
12	CPG RAIDType enumeration values for RAID type.....	60
13	CPG HA enumeration values.....	61
14	CPG chunkletPosPref enumeration values.....	61
15	CPG diskPatterns JSON object values.....	61
16	CPG diskType enumeration values.....	62
17	CPG SDUsage, SAUsage, and UsrUsage JSON objects.....	63
18	CPG SAGrowth and SDGrowth JSON objects.....	63
19	CPG state enumeration values.....	63
20	CPG DetailedState enumeration.....	64
21	Message body JSON objects for CPG creation and modification.....	64
22	CPG creation and modification error codes.....	65
23	CPG modification JSON objects.....	67
24	CPG removal error codes.....	67
25	Message body JSON objects for CPG query.....	68
26	CPG query members JSON objects.....	68
27	CPG query error codes.....	69
28	Single-CPG query error codes.....	69
29	Volume provisioningType enumeration.....	70
30	Volume CopyType enumeration.....	71
31	Volume state enumeration.....	71
32	Volume DetailedState enumeration.....	71
33	Volume policies JSON objects.....	72
34	Volume space JSON objects.....	73
35	Message body JSON objects for base-volume creation.....	74
36	Base-volume and snapshot creation error codes.....	75
37	Message body JSON objects for volume modification request.....	76
38	Volume modification request error codes.....	78
39	Message body JSON object members for growing volumes.....	80
40	Enumeration for the action JSON object.....	80
41	Volume growth error codes.....	80
42	JSON object members for a volume tune operation.....	82
43	tuneOperationEnum enumeration for tuning a volume.....	83
44	conversionOperationEnum enumeration for tuning a volume.....	83
45	Error codes for volume tuning.....	84
46	JSON object members for a query of all virtual volumes.....	86
47	JSON object members for a query of volume space distribution data.....	86
48	spaceDistribution objects.....	87
49	CPGSpace objects.....	87
50	Error codes for distributing volumes.....	87
51	Storage volume removal error codes.....	88
52	JSON object members in message body.....	88

53	Message body JSON objects for volume query.....	89
54	Single-volume query error codes.....	91
55	Message body JSON objects for volume query with WWN filtering.....	92
56	Volume query with WWN filtering error codes.....	92
57	Message body JSON objects for volume query with multiple volume filters.....	93
58	Volume query with multiple-volumes filters error codes.....	93
59	Message body JSON objects for host creation.....	94
60	Host creation error codes.....	95
61	Message body JSON objects for host modification request.....	96
62	Host <code>hostEditOperation</code> enumeration.....	97
63	Host <code>chapOperationMode</code> enumeration.....	97
64	Host <code>hostPersona</code> enumeration.....	97
65	Host modification error codes.....	98
66	Host removal error codes.....	100
67	Host query JSON objects.....	101
68	Host descriptors JSON objects.....	101
69	Host <code>FCPaths</code> JSON objects.....	102
70	Host <code>iSCSIPaths</code> JSON objects.....	102
71	Host <code>portPos</code> configuration JSON objects.....	103
72	Host <code>agent</code> JSON objects.....	103
73	Host query errors.....	104
74	Message body JSON objects for host query with a WWN filtering.....	105
75	Message body objects for host persona query.....	105
76	JSON objects for host persona queries.....	105
77	Host persona query errors.....	106
78	<code>wsapiAssignedID</code> filtering errors.....	106
79	Single host persona query errors.....	107
80	Message body JSON objects for host-set and VV-set creation.....	108
81	Host-set or VV-set creation error codes.....	109
82	Message body JSON objects modifying a host set or VV set.....	110
83	Host-set or VV-set modification error codes.....	111
84	Host-set or VV-set removal error codes.....	112
85	VV-set flash-cache policy setting JSON objects.....	112
86	VV-set flash-cache policy enumerations.....	112
87	Flash-cache policy setting error codes.....	113
88	Message body for all-host-set or all-VV-set query response.....	113
89	The <code>members</code> object of the <code>SetObjectProperty</code> JSON array for host-set or VV-set query response.....	113
90	Host-set or VV set removal error codes.....	114
91	Port <code>portMode</code> enumeration.....	115
92	Port <code>portLinkState</code> enumeration.....	115
93	Port <code>portConnType</code> enumeration.....	116
94	Port <code>portProtocol</code> enumeration.....	117
95	Port <code>portFailOverState</code> enumeration.....	117
96	Message body JSON objects for port collection.....	118
97	Message body <code>Port Property</code> JSON objects for all-ports query.....	118
98	iSCSI-port property JSON object members.....	119
99	Port collection message body for a single-port query.....	120
100	Single-port query error codes.....	120
101	Type filtering message body JSON object members.....	121
102	Error definitions for port query with type filtering.....	121
103	Message body JSON objects for <code>portDevices</code> query.....	121
104	Message body for <code>portDevices</code> JSON object.....	121
105	Message body JSON objects for <code>FCswitches</code> query.....	122

106	Message body JSON object for FCswitches query.....	123
107	fabricType enumeration for FCswitches query.....	123
108	VLUN portPos JSON objects.....	124
109	VLUNType enumeration.....	124
110	VLUN multipathing configuration enumeration	125
111	VLUN failedPathPol configuration enumeration.....	125
112	Message body JSON objects for VLUN template request.....	125
113	VLUN creation error codes.....	127
114	URI parameters for VLUN removal.....	128
115	VLUN removal error codes.....	129
116	All-VLUNs query JSON objects.....	130
117	JSON objects in members object for all-VLUNs query.....	130
118	Message body JSON objects for Single-VLUN query response.....	133
119	JSON objects for members object in single-VLUN query response.....	133
120	Single-VLUN query error codes.....	134
121	Message body JSON objects for VLUN query using filters response.....	135
122	VLUN query using filters error codes.....	136
123	Message body parameters JSON object members for snapshot creation.....	137
124	Members of the parameter object for volume physical copy creation.....	138
125	volumeSnap Objects.....	138
126	Message body JSON members for volume group snapshot.....	139
127	Group snapshot error definitions.....	139
128	Message body parameters JSON object members for physical copy creation.....	139
129	taskPriorityEnum enumeration for creating physical copy of a volume.....	141
130	Error codes for creation, resynchronization, or stopping of physical copies of volumes.....	141
131	Message body action JSON object.....	143
132	JSON object members of the parameter object for promoting a virtual copy.....	144
133	Virtual copy promotion error codes.....	144
134	VV-set snapshot creation error codes.....	146
135	parameters JSON object members for Creating a Physical Copy of a VV Set.....	148
136	Task ID JSON objects for creating a physical copy of a VV set or for resynchronizing a physical copy to a VV set.....	149
137	Error codes for creating a physical copy of a VV set.....	149
138	Message body resyncPhysicalCopy JSON object for resynchronizing a physical copy to its VV set.....	149
139	Enumeration for the action JSON object when resynchronizing or stopping physical copy of a VV set.....	150
140	JSON object members of the parameter object for promoting a VV-set virtual copy.....	151
141	VV-set virtual-copy promotion error codes.....	151
142	Members of the parameter object for promote virtual copy operation.....	153
143	Virtual copy update error codes.....	153
144	Message body JSON objects for creating a remote-copy group.....	154
145	Message body JSON objects for remoteCopyTarget.....	154
146	rcopyGroupModeEnum symbols and descriptions.....	155
147	Remote-copy group creation error codes.....	156
148	Remote-copy group removal error codes.....	158
149	Message body JSON objects for admitting a volume into a remote-copy group.....	158
150	targets JSON object members for admitting volumes to remote-copy groups.....	159
151	Enumeration for remotecopyGroupPUTOperation.....	160
152	Enumeration for remoteCopyGroupPOSTOperation.....	160
153	JSON objects in response for admitting a volume into a remote-copy group.....	161
154	Volume Admission into a remote-copy group error codes.....	161
155	Message body JSON objects for dismissing a volume from a remote-copy group using HTTP PUT.....	164

156	Volume dismissal from a remote-copy group error codes.....	164
157	Message body JSON objects for starting a remote-copy group.....	165
158	Members of <code>startingSnapshotPairs</code> while specifying the <code>startingSnapshots</code> field....	165
159	JSON objects for remote-copy group start response.....	166
160	Remote-copy group start error codes.....	166
161	Message body JSON objects for stopping a remote-copy group.....	167
162	JSON objects for remote-copy group Stop Response.....	167
163	Remote-copy group Stop error codes.....	168
164	Message body JSON objects for Modifying a remote-copy group.....	169
165	Members of <code>modifyRemoteCopyTarget</code> JSON object.....	169
166	Members of the Remote-Copy <code>policies</code> JSON object.....	171
167	JSON objects for Remote-Copy modification Request.....	172
168	Remote-copy group modification error codes.....	172
169	Remote-copy group target JSON object definitions.....	174
170	Modifying a remote-copy group target response message body.....	174
171	Message body JSON objects for Synchronizing a remote-copy group.....	175
172	JSON objects for remote-copy synchronization request.....	175
173	Remote-copy group synchronization error codes.....	176
174	JSON object members for parameters.....	177
175	<code>remoteCopyGroupVolumeOperation</code> definition.....	177
176	JSON object members for snapshots across all volumes.....	178
177	Remote copy group coordinated snapshot error messages.....	179
178	Message body JSON objects for recovering a remote copy group.....	179
179	JSON objects for Remote-Copy Disaster Recovery success.....	181
180	Remote-Copy Disaster Recover error codes.....	181
181	JSON objects for Remote-Copy Information query Response.....	182
182	Remote-Copy <code>rcopySysModeEnum</code> enumeration.....	183
183	Remote-Copy <code>rcopySysStatusEnum</code> enumeration.....	183
184	Remote-Copy Information query error codes.....	183
185	Querying remote-copy groups response JSON objects.....	184
186	<code>members</code> object JSON objects for querying remote-copy groups.....	184
187	Members of the JSON <code>volumes</code> object for querying remote-copy groups.....	185
188	Members of the JSON <code>remoteVolumes</code> object for querying remote-copy groups.....	185
189	JSON object <code>targets</code> for querying Remote-Copy Groups.....	187
190	<code>rcopyGroupRoleEnum</code> enumeration for the remote-copy group Role.....	188
191	<code>rcopyGroupStateEnum</code> enumeration for the remote-copy group State.....	188
192	JSON object members for remote-copy group <code>policy</code> JSON object.....	189
193	<code>rcopyGroupVVStatusEnum</code> enumeration for the Remote-Copy volume State.....	189
194	Single remote-copy group query error codes.....	190
195	Remote-copy group target query message body.....	191
196	Remote-copy group volume query message body.....	191
197	Remote copy group query error codes.....	191
198	Error messages.....	192
199	Flash cache creation JSON objects.....	193
200	Flash cache creation error codes.....	193
201	Flash cache removal error codes.....	194
202	Message body for flash cache query response.....	194
203	JSON objects for storage-system query response.....	196
204	<code>licenseInfo</code> object members.....	197
205	<code>license</code> object members.....	197
206	<code>licenseState</code> object members.....	197
207	<code>systemParameter</code> JSON objects.....	198
208	Storage-system query error codes.....	200
209	Message body members for updating storage system parameters.....	200

210	systemParameter settings.....	200
211	API error messages for updating storage system parameters.....	201
212	JSON objects for version information response.....	202
213	Storage-system version query error codes.....	202
214	Message body JSON objects for WSAPI configuration query.....	202
215	WSAPI configuration query response error codes.....	203
216	Message body JSON objects for all-tasks status query.....	204
217	Message body JSON object members for copy single-task status query.....	204
218	taskTypeEnum enumeration for single-task query.....	205
219	taskStatusEnum enumeration for physical-copy task query.....	206
220	All-tasks status query error codes.....	206
221	JSON object member for canceling a task.....	207
222	taskAction enumeration for canceling a task.....	207
223	Task cancellation error codes.....	207
224	System flash-cache policy setting JSON objects.....	207
225	JSON objects for overall capacity response.....	209
226	DeviceCapacity JSON objects.....	209
227	AllocatedCapacity JSON objects.....	210
228	VolumeCapacity JSON objects.....	210
229	System JSON objects.....	211
230	JSON objects for cpg space query.....	212
231	JSON objects for cpg space query response.....	212
232	JSON objects for LDLayout space query response.....	213
233	JSON objects for LDLayoutCapacity query response.....	213
234	Members of capacityEfficiency JSON object	213
235	Space query API and HTTP error codes.....	213
236	Message body JSON objects for all-users query.....	215
237	Members of the users JSON object for all-users query.....	215
238	Members of the privileges JSON object for all-users query.....	215
239	Single-user query error codes.....	216
240	Message body JSON objects for all-roles query.....	216
241	Members of the role JSON objects for all-users query.....	217
242	Members of the rights JSON objects for all-roles query.....	217
243	Single-role query error codes.....	217
244	Members of the AOConfig collection message body.....	218
245	Members of the AOConfig JSON object.....	218
246	TierCpg object.....	218
247	Single AO configuration query error messages.....	219
248	Error messages for system reporter queries.....	223
249	Versus Time cache memory statistics response message body.....	225
250	Versus Time cache memory statistics performance JSON object members.....	225
251	Versus Time cache memory rwAccessCount objects.....	226
252	Versus Time cache memory pageStatistic objects.....	226
253	Versus Time cache memory pageStates objects.....	226
254	Versus Time pageInforPerDeviceType information by device type class.....	227
255	At Time cache memory statistics response message body.....	227
256	Versus Time CPG space data response message body.....	229
257	Versus Time CPG space data JSON object members.....	229
258	Versus Time CPG space data.....	229
259	At Time CPG space data response message body.....	229
260	At Time CPG space data members JSON objects.....	230
261	Versus Time CPG statistical data response message body.....	231
262	Versus Time CPG statistical data JSON object members.....	231
263	At Time CPG statical data response message body.....	232

264	At Time CPG statistical data members JSON objects.....	232
265	Versus Time physical disk capacity response message body.....	234
266	Versus Time physical disk capacity JSON object members.....	234
267	At Time physical disk capacity response message body.....	235
268	At Time Physical disk capacity performance group view members JSON objects.....	235
269	Versus Time physical disk statistics response message body.....	237
270	Versus Time physical disk statistics JSON object members.....	237
271	Versus Time physical disk statistics rwtAccessCount objects.....	237
272	At Time physical disk statistics response message body.....	238
273	At Time physical disk statistics group view members JSON objects.....	238
274	Versus Time physical disk space data response message body.....	240
275	Versus Time physical disk space data JSON object members.....	240
276	Versus Time physical disk space statistic chunklet data objects	240
277	At Time physical disk space data response message body.....	241
278	At Time physical disk space data JSON object members.....	241
279	Versus time port statistics <code>type</code> parameter enumeration.....	243
280	Versus Time port statistics response message body.....	243
281	Versus Time port statistics JSON object members.....	243
282	Versus Time port statistics data objects.....	244
283	At Time port statistics response message body.....	244
284	At Time port statistics members JSON objects.....	244
285	Versus Time VLUN statistics response message body.....	246
286	Versus Time VLUN statistics JSON object members.....	247
287	At Time VLUN statistics response message body.....	247
288	At Time VLUN statistics JSON objects.....	248
289	<code>provisioningType</code> parameter enumeration.....	249
290	Versus Time volume space response message body.....	250
291	Versus Time volume space JSON object members.....	250
292	Versus Time rawReservedSpace object members.....	251
293	Versus Time userSpaceData object members.....	251
294	Versus Time snapAdminData object members.....	251
295	Versus Time totalSpaceData object members.....	251
296	At Time volume space message body description.....	252
297	At Time volume space group view members JSON objects.....	252
298	Message body JSON object members for QoS rule creation.....	253
299	<code>ZeroNoneOperation</code> enumeration for QoS rule creation or modification.....	255
300	QoS rule creation and modification error codes.....	255
301	Message body JSON object members for QoS rule modification.....	256
302	QoS rules deletion error codes.....	258
303	Message body JSON objects for All-QoS rule query.....	258
304	JSON object members for <code>Members</code> object in all-QoS rule query.....	259
305	QoS <code>targetType</code> enumeration.....	259
306	QoS <code>priority</code> enumeration.....	260
307	QoS rule query error codes.....	260

1 Introduction

The Web Services API (WSAPI) consists of an application server (WSAPI server) and a definition of the WSAPI operations, inputs, and outputs. The WSAPI provides a more flexible and powerful way to perform storage management tasks than the HPE 3PAR Command Line Interface (CLI) or the 3PAR OS Management Console software. Use WSAPI to automate your management tasks for hosts, ports, volumes, and more.

The WSAPI SDK includes sample clients that you can reference to develop customer-defined clients. Clients of the WSAPI interact with the server through HTTPS.

For an overview of the supported HTTP methods, see [“Supported HTTP methods” \(page 22\)](#).

Unless otherwise stated, features, commands, and operations described in this guide are available in all versions of the WSAPI. Call outs within the text indicate any new operations provided in a given version of the WSAPI.

[Table 1 \(page 18\)](#) lists the WSAPI versions and their corresponding 3PAR OS versions.

Table 1 WSAPI and HPE 3PAR OS versions

HPE 3PAR OS	WSAPI	Introduction
3.1.2	1.1	March 2013
3.1.2 MU2	1.2	June 2013
3.1.3	1.3	March 2014
3.1.3 MU1	1.3.1	June 2014
3.2.1	1.4	September 2014
3.2.1 MU1	1.4.1	October 2014
3.2.1 MU2	1.4.2	December 2014
3.2.2	1.5	August 2015

2 Configuring and using the WSAPI

This section provides information on configuring the server, as well as an introduction to the WSAPI commands and a summary of the items included in the HPE 3PAR Web Services API Server SDK.

Starting and configuring the server

HPE 3PAR OS 3.1.2 and later includes the WSAPI server, which runs on 3PAR StoreServ Storage systems.

[Table 2 \(page 19\)](#) lists the 3PAR CLI commands used to manage the WSAPI server.

Table 2 HPE 3PAR CLI Commands for the WSAPI Server

Command	Description	Authority
<code>setwsapi</code>	Sets properties of the WSAPI server.	Super, Service Any role granted <code>wsapi_set</code> permission
<code>showwsapi</code>	Displays the WSAPI server service configuration state.	Any role in the system.
<code>startwsapi</code>	Starts the WSAPI server.	Super, Service Any role granted <code>wsapi_set</code> permission
<code>stopwsapi</code>	Stops the WSAPI server.	Super, Service Any role granted <code>wsapi_set</code> permission
<code>showwsapisession</code>	Shows the WSAPI server sessions information.	Any role in the system. (WSAPI 1.3 and later)
<code>removewsapisession</code>	Removes WSAPI user connections.	Super Any role granted <code>wsapisession_remove</code> permission. Before using the CLI <code>removeuser</code> command to remove a user connected through the WSAPI server, use <code>removewsapisession</code> to remove all sessions and connections associated with that WSAPI user. You can remove connections associated with the WSAPI server only through the <code>removewsapisession</code> command. (WSAPI 1.3 and later)

The WSAPI server does not run by default. You must start WSAPI, and then configure it using the 3PAR CLI.

To start and configure the WSAPI:

1. Enter `startwsapi` in the CLI to start the WSAPI.
2. Enter `setwsapi` in the CLI to configure WSAPI. You can use this command to modify parameters at any time.

For more information about using the CLI, see:

- 3PAR Command Line Interface administrator's guide
- 3PAR Command Line Interface reference

You can find all 3PAR documents at Hewlett Packard Enterprise website:

[HPE Storage Information Library](http://www.hpe.com/info/storage/docs) (<http://www.hpe.com/info/storage/docs>)

Client code samples

Hewlett Packard Enterprise includes an example code base, which demonstrates the use of the WSAPI. The code base is in Java and Perl as part of the WSAPI download. Download 3PAR Web Services API from the following website:

<http://www.hpe.com/support/softwaredepot>

Java client code samples

The Java client code samples included in the WSAPI download are:

- Core "storage-entity" classes representing the attributes of HPE 3PAR storage system objects, as well as input parameters (members) for creating objects.
- An example client interface that demonstrates the use of JavaScript Object Notation (JSON) processors with the base classes.
- Example programs to illustrate the creation and query of base entities. These examples rely on the accessory and base packages.

By default, the Java client code samples require certificate validation when using HTTPS (as opposed to HTTP). To modify this behavior, see the README.txt file in the `Java` folder of the Java client code samples. For additional information about changing the certificate used by the 3PAR StoreServ storage system, see the help for the 3PAR OS CLI command, `createcert`.

Perl client code samples

The Perl client code samples included in the WSAPI download contains the following:

- A module with methods for accessing the 3PAR storage system.
- Modules with mappings of the error codes and enumerated properties used by WSAPI.
- Example programs that demonstrate creation, querying, and deleting of base entities.

3 Accessing the WSAPI

Through a series of HTTP or HTTPS requests, you can use 3PAR WSAPI to manage many tasks, including the following:



TIP: For security reasons, Hewlett Packard Enterprise recommends using HTTPS. This document uses HTTP to refer to both HTTP and HTTPS. Both protocols produce the same behavior.

Because 3PAR CLI scripts need to process CLI-generated text, Hewlett Packard Enterprise recommends using WSAPI to automate tasks. WSAPI enables programmatic management of 3PAR storage servers and provides client access to Web services at specified HTTPS locations.

Protocol and message format

Clients communicate with the WSAPI server using HTTPS and data structures represented with JSON.

URI format

Perform all operations of the WSAPI using an HTTP method (GET, POST, PUT, or DELETE) and a URI. In the following example, the URI corresponds to the volume named `projectXvol`, which resides on the 3PAR storage system with the hostname `storsys1.example.com`:

```
https://storsys1.example.com:8080/api/v1/volumes/projectXvol
```

HTTP requests and responses

Because HTTP/1.0 does not support chunked transfer encoding, the WSAPI server does not support HTTP/1.0. If an HTTP/1.0 request comes in, the WSAPI server generates the following error message, indicating an unsupported HTTP version:

```
UNSUP_HTTP
```

Supported HTTP methods

The 3PAR WSAPI supports the following HTTP methods:

- GET—Retrieves information identified by the request URI.
- POST—Requests that an object described by the body of the request be created in the collection identified by the URI, or performs a customized action described in the body of the request.
- PUT—Requests that an entity identified by the request URI be modified.
- DELETE—Requests that the server delete the resource identified by the request URI

Client HTTP headers

The HTTP requests that clients make to the API server include HTTP headers. [Table 3 \(page 23\)](#) lists the required and optional HTTP headers. Optional headers, when present, must be one of the values listed in the **Values** column. For example:

```
Accept: application/json; charset=UTF-8
```

Table 3 Supported client HTTP headers for requests

Header	Description	Values	Required
Accept	Acceptable client response formats.	One of the following: <ul style="list-style-type: none"> • application/json • application/* • application/json* • application/<anything>+json • */json • */* • */json* • */<anything>+json where * is literally an asterisk (*) and <anything> is any string of characters.	No
Accept-Language	The response language the client can accept.	One of the following: <ul style="list-style-type: none"> • * • en • en* 	No
Content-Length	The length of the content in bytes.	Number of bytes	Yes, for requests with a message body.
Content-Type	The format of the body.	application/json	Yes, for requests with a message body.
X-HP3PAR-WSAPI-SessionKey	A key associated with the user that created credentials.	The result of a credentials creation request.	Yes, except for a request to create credentials.
Host	The host and port number of the resource being requested.	<hostname:http{s}_port>	No, if the request URI already contains the host name and port.

Client HTTP header examples

When querying the CPGs, the client sends the following information:

```
GET /api/v1/cpgs HTTP/1.1
Accept: application/json
Accept-Language: en
X-HP3PAR-WSAPI-SessionKey: 1-c86aedb2e7e98b4119cd74b624b8576b-b06d2d50
```

When creating a CPG, the client sends the following information:

```
POST /api/v1/cpgs HTTP/1.1
X-HP3PAR-WSAPI-SessionKey: 1-c86aedb2e7e98b4119cd74b624b8576b-b06d2d50
Accept: application/json
Content-Type: application/json
Content-Length: 27
{
  "name" : "t887-cpg"
}
```

- ❗ **IMPORTANT:** The `Host` header is optional if the request URI contains `<hostname>:<http{s}_port>`. If the request URI does not contain the host and port number, you must specify the `Host` header.

Server HTTP headers

Table 4 (page 24) shows HTTP headers included by the Web Services API responses.

Table 4 Server HTTP headers in the WSAPI

HTTP Header	Value	Description
Server	HP3PAR-WSAPI	The 3PAR Web Services API Server.
Cache-Control	no-cache	Disables caching by mechanisms between the Web Services API server software and client (HTTP RFC 2616), for HTTP/1.0 and 1.1.
Pragma	no-cache	Disables caching by mechanisms between the WSAPI server software and client (HTTP RFC 2616), for HTTP/1.0 and 1.1.
Connection	close	Indicates that the connection will be closed after completion of the response (HTTP RFC 2616).
Content-Type	application/json	Included when the message body, which is in JSON format, is non-empty.
Location	Varies. See the example in the Description column.	The path portion of the URI of a newly created or updated object, such as: <code>/api/v1/volumes/foo</code> Encoding is UTF-8 and percent-encoded per RFC 3986.
Date	Varies according to the date.	The date and time at which the message was originated, per RFC 2616.

Request input

Clients make HTTP requests to the server and receive HTTP replies. When clients use input methods such as the HTTP POST method, or when the system returns output, the body of the message uses JSON coding. HTTP GET and HTTP DELETE operations ignore the message body.

Required and optional members

For some API operations, such as HTTP POST, the client passes a JSON object as the message body. A message body consists of a single JSON object, enclosed in braces (`{...}`). The object may contain sub-objects, also enclosed in braces. For example:

```
{"action": "createSnapshot", "parameters":  
{"name": "t840-vv-ss", "id": null, "expirationHours": null, "retentionHours": null,  
"readOnly": true, "comment": "My first WSAPI-created snapshot."}}
```

The JSON object includes required parameters, or members, for the operation and may include optional members. Most operations have optional members.

For example, to create a volume, the only members required are the name of the volume, the name of the CPG that provides disk space for the volume, and the size of the volume. Optional members include the ID of the volume and a comment.

When constructing a JSON object, you can omit optional members or set them to values that indicate the server should ignore them. The client sets only the fields of interest. The JSON object

need not include all members. A client can perform one of two possible operations when creating the JSON object:

- Include only the members required for the operation, or
- Include a member that is not required, but with a value that means it should be ignored.
 - A JSON object that has only ignored fields or null fields is considered empty.
 - A JSON array with no elements is considered empty.
 - Objects and arrays composed of sub-objects or sub-arrays that are empty are themselves considered empty.
 - Although objects and arrays can be present and named in input, if they are considered empty, the server can respond as if the objects and arrays are not present, and might return an error stating that required members are missing.

When writing a client in a language that provides services for serializing a class into a JSON object, it is convenient to only have a single class that represents all required or optional members.

For more information about JSON object format, see the [JSON](https://json.org) (json.org) website. The following sections specify the special values to use to ignore a member.

Null members

The WSAPI supports properties with a null value. Clients written in languages that provide classes (or objects) as alternatives to primitives might generate JSON objects with a property value of null. The WSAPI ignores null properties.

For example, a client written in Java that uses the Jackson JSON processor, with uninitialized attributes cast as `Boolean` or `Integer` results in JSON properties with a value of null when using the Jackson JSON processor. Conversely, uninitialized attributes cast as `boolean` or `int` result in JSON properties with a value of 0 (zero)—which might not be meaningful for the property.

When the API server returns information, it does not include explicit null values in the JSON object for properties that have no value or that are unset. For example, if you query g a volume that is not in a domain returns a JSON object with the domain field omitted rather than containing `<domain>:null`.

Enumerations

Some properties have values from a fixed set of limited values. For example, the state property of a storage volume can be one of the following:

- Normal
- Degraded
- Failed

When properties like these are present in a JSON object, they are represented numerically.

In addition to the values shown in the definition of an enumeration, each enumeration can also have the value of -1, meaning that the API server has encountered a value that it does not recognize and therefore cannot assign a value from the valid set. This usually means that the user entered an invalid enumeration value, or the API server has a defect.

The values defined for an enumeration start with 1; the value 0 is unused.

Using tools that deserialize JSON into a class allows detection of an omitted enumeration property. Because the member is not assigned a non-zero value, the member retains its default or preset value of 0.

For enumerations, the symbols used in this document are for convenience in referring to values of enumerations, but are not part of the WSAPI. Integer values representing the symbols appear in JSON objects. Clients can use any symbols with the integers.

JSON types and API types

JSON uses primitive types defined by IETF RFC 4627, including:

- string
- number
- boolean
- null

The properties returned in JSON output objects and the members provided in JSON input objects use JSON primitive types with additional restrictions on valid values. Restrictions on values or format are given names that appear in the **Type** column in [Table 5 \(page 26\)](#). These API types are referenced in this guide in descriptions of JSON input and output.

Table 5 API types

Type	Description
8601	JSON string with time in ISO 8601 format: YYYY-MM-DDThh:mm:ssTZD, where TZD is one of the following: <ul style="list-style-type: none"> • Z • +hh:mm • -hh:mm For more information, see W3C (http://www.w3.org/TR/NOTE-datetime)
epoch	The number of seconds since 01/01/1970 GMT. Also known as “Unix epoch.”
float	JSON number
hex	JSON string containing a hexadecimal value.
igint32	JSON number restricted to a 32-bit signed integer where negative values are ignored by the server, and treated as if not present.
int32	JSON number restricted to a 32-bit signed integer.
MAC	JSON string containing six groups of two hexadecimal digits. The string may or may not be separated by a hyphen (-); for example, either of the following formats is possible: <ul style="list-style-type: none"> • AC-16-2D-36-06-F7 • AC162D3606F7
name16	JSON string of 16 or fewer characters.
name27	A string of 27 or fewer characters, where a character is ‘a’ ‘z’, ‘A’ ‘Z’, ‘0’ ‘9’, ‘.’, ‘_’, or ‘-’. <ul style="list-style-type: none"> • a– z • A– Z • 1– 9

Table 5 API types (continued)

Type	Description
	<ul style="list-style-type: none"> • . (period) • _ (underscore) • - (hyphen) <p>A hyphen (-) is disallowed as the first character.</p> <p>A name of zero characters is represented in JSON as the empty string (""). An unset name is represented in JSON as "null" (without the quotes).</p>
name31	<p>JSON string of 31 or fewer characters, in which the following characters are allowed:</p> <p>a-z A-Z 0-9 . (dot) - (dash) (You may not use dash as the first character)</p> <p>An empty string enclosed in quotation marks ("") represents a name with no characters. JSON represents an unset name as <code>null</code>.</p>
name223	JSON string of 223 or fewer characters.
print255	JSON string of 255 or fewer characters.
print511	JSON string of 511 or fewer characters.
uint32	JSON number restricted to a 32-bit unsigned number.
uuid string	<p>Canonical form of UUID, represented by 32 hexadecimal digits. The digits are displayed in five groups, separated by hyphens, in the following form:</p> <p>8-4-4-4-12</p> <p>In all, the uuid string consists of 36 characters—32 alphanumeric characters and four hyphens. For example:</p> <p>0453A945-2B96-404F-92E6-F62D12492042</p>
WWN	<p>JSON string of 16 or 32 characters.</p> <p>For port and FC host, the WWN is always 16 characters.</p> <p>Possible characters are:</p> <p>0-9 a-f A-F : (only in MAC addresses for host WWNs)</p> <p>For example:</p> <p>50014380231C647A</p> <p>or:</p> <p>50:01:43:80:23:1C:64:7A</p>
<p>JSON members suffixed with MiB represent size or space in mebibytes where 1 MiB = 1,048,576 bytes (2²⁰ bytes). Members suffixed with MB represent size or space in megabytes where 1 MB = 1,000,000 bytes (10⁶ bytes). JSON members suffixed with Pct mean percent.</p>	

Filtering in Queries

Use the query string in a request URI to return a subset of the members of a collection. The query string begins after the character ? and ends with the format of `query="<query_string>"`.

In WSAPI 1.3 and later, the server supports a basic query string with a finite number of attributes on which filtering can be applied, to hosts, virtual volumes, port devices, and FC switch collections only.

In WSAPI 1.4 and later, queries support volume filters such as `uuid`, `userCPG`, or `snapCPG`, and VLUN filters, such as `volumeWWN` or `remoteName`.

WSAPI 1.5 and later supports port queries based on port type, as well as queries for System Reporter objects.

The individual objects that support filtering by query include the allowed parameters and operators, as well as example expressions.

JSON Character Encoding

Supported JSON character encoding includes the following formats:

- ASCII
- ISO-8859-1
- US-ASCII
- UTF-8
- UTF-16
- UTF-32
- UTF-16BE
- UTF-32BE
- UTF-16LE
- UTF-32LE

HTTP Status and error codes

A successful operation returns one of the following HTTP status codes:

- 200 OK
- 201 Created
- 300 Multiple Choice

A failed operation fail returns one of several HTTP status codes and the message body contains a JSON object with information specific to the 3PAR WSAPI.

The JSON object contains the members `code`, `desc`, and, when relevant, `ref`. The `code` member is a number and the rest are strings.

The JSON object contains the members as described in the following sections.

The `code` Member

Just as is the case with CLI text, the text in the `desc` member (see [Table 6 \(page 29\)](#)) is subject to change and cannot be relied upon. To avoid that problem, the WSAPI provides a reliable code for an error.

The error code member is a JSON numeric type. Only codes that are defined in [Table 6 \(page 29\)](#) and in [Table 7 \(page 32\)](#) will be returned.

For applications that change behavior based on errors, only the `code` member should be relied on. For ease of reading documentation, a symbol is defined for each numeric code, but the symbol is not part of the API. The numeric value is the contract between client and server. The codes are described in [Table 6 \(page 29\)](#).

Generic codes for the WSAPI are described in [Table 6 \(page 29\)](#).

Table 6 Generic WSAPI code Member Status and error codes

API Error	API Error Code	HTTP Code	Description
INT_SERV_ERR	1	500 Internal Server Error	An internal error has occurred in the server. Memory allocation failure.
INV_SSL	2	400 Bad Request	An SSL protocol violation has occurred.
INPUT_EOF	3	400 Bad Request	The client has not sent a complete request.
INPUT_TOO_LONG	4	413 Request Entity Too Large	The client has sent a request that is too long.
INV_USER_PASS	5	403 Forbidden	The username or password is invalid.
INV_SESS_KEY	6	403 Forbidden	The client request has an invalid session key.
TIMEOUT	7	408 Request Timeout	The client did not send or receive data within the time limit.
UNSUP_HTTP	8	505 HTTP Version Not Supported	The client request uses an unsupported HTTP version.
UNSUP_OP	9	501 NOT IMPLEMENTED	The resource does not support the operation. The operation name is not specified in the URI.
	10		(Not used by the 3PAR OS.)
URI_RES_NOT_FOUND	11	404 Not Found	The requested resource does not exist.
INV_INPUT	12	400 Bad Request	The client request contains an invalid value.
PERM_DENIED	13	403 Forbidden	Permission denied; insufficient privileges.
NON_EXISTENT_HOST	17	404 Not Found	The host does not exist.
TOO_LARGE	28	400 Bad Request	The client request contains a value that is too large.
OTHER	29	400 Bad Request	A more specific error could not be determined. An operation that fails with the error OTHER will probably be assigned a more specific error code in a future version of the API. Client code that checks for specific error codes should treat an unrecognized code the same as OTHER, so an unchanged client will behave the same in the future even if

Table 6 Generic WSAPI code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
			the error code is changed to a new (and more specific) error code.
	30		(Not used by the 3PAR OS.)
SVC_UNAVAIL	31	503 Service Unavailable	The server has reached its maximum number of connections.
IN_USE	34	409 Conflict	The resource is in use.
UNSUP_REPRESENTATION	35	406 Not Acceptable	The representation specified in client's HTTP <code>Accept</code> header is not supported.
UNSUP_LANGUAGE	36	406 Not Acceptable	The language specified in client's HTTP <code>Accept-Language</code> header is not supported.
NON_EXISTENT_DOMAIN	38	404 Not Found	The domain does not exist.
INV_INPUT_WRONG_TYPE	39	400 Bad Request	A JSON input object contains a name-value pair where the type of the value differs from what is expected (for instance, a number is found where a string is expected). The HTTP <code>ref</code> member contains the name of the name-value pair.
INV_INPUT_MISSING_REQUIRED	40	400 Bad Request	A JSON input object is missing a required name-value pair. The HTTP <code>ref</code> member contains the expected name.
UNSUP_CONTENT	51	415 Unsupported Media Type	Unsupported content (as specified in the HTTP <code>Content-Type</code> header).
INV_INPUT_NOT_JSON_OBJ	52	400 Bad Request	A JSON object was expected but another JSON type was found.
INV_URL_PERCENT_ENCODING	56	400 Bad Request	Invalid URL percent-encoding.
INV_INPUT_EXCEEDS_LENGTH	57	400 Bad Request	Invalid input: string length exceeds limit.
JSON_SYNTAX_ERR	60	400 Bad Request	JSON syntax error. When the error is associated with an object member, the HTTP <code>ref</code> member contains the name of the member.
JSON_NOT_SUPPORTED	61	400 Bad Request	Too many levels of nesting in JSON; numbers too large to be represented; length restrictions exceeded. When the error is associated with an object member, the HTTP <code>ref</code>

Table 6 Generic WSAPI code Member Status and error codes (continued)

API Error	API Error Code	HTTP Code	Description
			member contains the name of the member.
INV_HTTP_HEADER	62	400 Bad Request	Invalid HTTP header syntax.
INV_UTF	63	400 Bad Request	A request body contains a sequence of characters that is invalid for the supported UTF encoding.
INV_INPUT_NO_REQ	64	400 Bad Request	A POST request is missing a JSON request body.
INV_HTTP_REQ	65	400 Bad Request	The request line (first line) of an HTTP request does not comply with the form specified for "Request-Line" in RFC 2616.
INV_URI	66	400 Bad Request	The URI is not absolute, contains characters not allowed in a URI, contains invalid percent-encoding, or, after percent decoding, contains an invalid UTF-8 character sequence.
INV_POST_ACTION	67	400 Bad Request	An HTTP POST request contains an action member with an invalid value.
SYS_SVC_NOT_READY	68	503 Service Unavailable	Services that the system depends on in order to process the requested operation are not ready.
INV_INPUT_ILLEGAL_CHAR	69	400 Bad Request	Input contains one or more illegal characters.
UNLICENSED_FEATURE	70	403 Forbidden	System is not licensed for this feature or functionality.
SYSTEM_ERR	95	500 Internal Server Error	A system service on which the API server depends has returned an unexpected error, preventing the API server from fulfilling the request. (WSAPI 1.2 and later)
INV_INPUT_ALL_WHITE_SPACES_STR	182	400 Bad Request	Invalid input: All-white-spaces string. (WSAPI 1.3.1 and later with HPE 3PAR OS 3.1.3 MU1)
EMPTY_HTTP_HOST_HDR	186	503 Service Unavailable	The HTTP Host header is empty or missing. (WSAPI 1.4 and later)
SYS_TOO_BUSY	270	400 Bad Request	The system is busy. Please try again later.

Table 6 Generic WSAPI code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
			(WSAPI 1.4.1 and later)
NO_HTTP_HDR	271	400 Bad Request	The HTTP header was not provided. (WSAPI 1.4.1 and later)

Operation-specific status and error codes for the WSAPI are described in [Table 7 \(page 32\)](#).

Table 7 Operation-specific API code Member Status and error codes

API Error	API Error Code	HTTP Code	Description
EXISTENT_CPG	14	409 Conflict	The CPG already exists.
NON_EXISTENT_CPG	15	404 Not Found	The CPG does not exist.
EXISTENT_HOST	16	409 Conflict	The host already exists.
EXISTENT_LUN	18	409 Conflict	The VLUN already exists.
NON_EXISTENT_VLUN	19	404 Not Found	The VLUN does not exist.
NON_EXISTENT_PORT	20	404 Not Found	The port does not exist.
BAD_PORT_TYPE	21	400 Bad Request	Attempt to create VLUN with invalid port type.
EXISTENT_VOL	22	409 Conflict	The storage volume already exists.
NON_EXISTENT_VOL	23	404 Not Found	The storage volume does not exist. Volume not found.
NO_SPACE	24	400 Bad Request	Not enough space is available for the operation. This varies based on the following circumstances: <ul style="list-style-type: none"> • In volume creation, when the CPG contains insufficient space for the specified volume size. • In CPG creation, when the storage system's hardware configuration does not support the requested LD layout. • In CPG creation, when the chunklets that are required for

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
			the requested LD layout are in the process of being cleaned.
HAS_RO_CHILD	25	409 Conflict	The volume has a read-only child.
EXPORTED_VLUN	26	409 Conflict	The VLUN is still exported.
RETAINED	27	409 Conflict	Volume retention time has not expired.
HAS_CHILD	32	409 Conflict	The volume has a child volume.
NO_SNAP_CPG	33	409 Conflict	No snapshot CPG has been configured for the volume.
INV_SET_SIZE	37	400 Bad Request	Invalid RAID set size.
INV_INPUT_DUP_NAME	41	400 Bad Request	A JSON input object contains more than one name-value pair with the same name. The HTTP <i>ref</i> member contains the name.
INV_INPUT_UNREC_NAME	42	400 Bad Request	A JSON input object contains a name-value pair with a name that is unrecognized. The HTTP <i>ref</i> member contains the name.
INV_INPUT_EXCEEDS_RANGE	43	400 Bad Request	A JSON input object contains a name-value pair with a numeric value that exceeds the expected range. The HTTP <i>ref</i> member contains the name.
INV_INPUT_PARAM_CONFLICT	44	400 Bad Request	A JSON input object contains a name-value pair that cannot be present with another name-value parameter that is present. The HTTP <i>ref</i> member contains the name.
INV_INPUT_EMPTY_STR	45	400 Bad Request	A JSON input object contains a name-value pair with an empty string (distinct from a null string) where a string of length greater than zero is required.

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
INV_INPUT_BAD_ENUM_VALUE	46	400 Bad Request	A JSON input object contains an <code>enum</code> property with a value that is not in the valid range.
INV_INPUT_WARN_GT_LIMIT	47	400 Bad Request	The allocation warning level is higher than the allocation limit.
INV_INPUT_USR_ALRT_NON_TPVV	48	400 Bad Request	User space allocation alerts are valid only with a TPVV.
INV_INPUT_RETAIN_GT_EXPIRE	49	400 Bad Request	The volume retention time is greater than the expiration time.
INV_INPUT_VV_POLICY	50	400 Bad Request	An invalid policy (for example, system or caching) is specified for the volume.
BAD_CPG_PATTERN	53	400 Bad Request	A pattern in a CPG specifies illegal values.
MISSING_VLUN_EXPORT_INFO	54	400 Bad Request	Missing both hostname and port position.
INV_INPUT_PORT_SPECIFICATION	55	400 Bad Request	Incorrect port specification.
INV_INPUT_TIME	58	400 Bad Request	Invalid time specified.
EXISTENT_ID	59	409 Conflict	An ID exists.
INV_INPUT_TOO_MANY_WWN_OR_ISCSI	71	400 Bad Request	Too many World Wide Names (WWNs) or iSCSI names are specified. (WSAPI 1.2 and later)
AUTO_LUN_ID_UNAVAILABLE	72	409 Conflict	LUN ID cannot be assigned within the specified range. (WSAPI 1.2 and later)
EXISTENT_PATH	73	409 Conflict	Host WWN/iSCSI name is already used by another host. (WSAPI 1.2 and later)
NON_EXISTENT_CHAP	74	404 Not Found	No CHAP has been configured for host. (WSAPI 1.2 and later)
NON_UNIQUE_CHAP_SECRET	75	409 Conflict	Target CHAP and initiator CHAP are the same.

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
			Target CHAP secret and initiator CHAP secret must be unique. (WSAPI 1.2 and later)
NO_INITIATOR_CHAP	76	404 Not Found	The host CHAP must be enabled before the target CHAP is set. (WSAPI 1.2 and later)
HOST_IN_SET	77	409 Conflict	Host is a member of a set. (WSAPI 1.2 and later)
INV_INPUT_ONE_REQUIRED	78	400 Bad Request	Invalid input: one of the parameters is required. The HTTP <code>ref</code> member contains a comma-separated list of parameters. (WSAPI 1.2 and later)
INV_INPUT_BAD_LENGTH	79	400 Bad Request	Invalid input: The string length is not within in valid range. (WSAPI 1.2 and later)
NON_EXISTENT_PATH	80	400 Bad Request	Path does not exist. (WSAPI 1.2 and later)
INV_OPERATION_VV_MODIFY_USR_CPG_TPVV	81	403 Forbidden	Cannot modify user CPG of a TPVV. (WSAPI 1.2 and later)
CPG_NOT_IN_SAME_DOMAIN	82	403 Forbidden	The snap CPG is not in the same domain as the user CPG. The CPG is not in the current domain. (WSAPI 1.2 and later) The CPG is not in the same domain as the remote-copy group. (WSAPI 1.4 and later)
INV_OPERATION_VV_PEER_VOLUME	83	403 Forbidden	Operation not allowed on peer volume. (WSAPI 1.2 and later)
INV_OPERATION_VV_INTERNAL_VOLUME	84	403 Forbidden	Operation not allowed on internal volume. (WSAPI 1.2 and later)
INV_OPERATION_VV_SYS_VOLUME	85	403 Forbidden	Operation not allowed on system volume. (WSAPI 1.2 and later)

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
INV_OPERATION_VV_VOLUME_NOT_DEFINED_ALL_NODES	86	409 Conflict	Invalid operation. Volume is not defined on all nodes. (WSAPI 1.2 and later)
INV_OPERATION_VV_ONLINE_COPY_IN_PROGRESS	87	409 Conflict	Invalid operation. Online copy is in progress. (WSAPI 1.2 and later)
INV_OPERATION_VV_VOLUME_CONV_IN_PROGRESS	88	409 Conflict	Invalid Operation. Volume conversion is in progress. (WSAPI 1.2 and later)
INV_OPERATION_VV_SNAPSPACE_NOT_MOVED_TO_CPG	89	409 Conflict	Invalid operation. Snapshot space must be moved first. (WSAPI 1.2 and later)
INV_OPERATION_VV_VOLUME_ACCOUNTING_IN_PROGRESS	90	409 Conflict	Invalid operation. Volume accounting is in progress. (WSAPI 1.2 and later)
INV_OPERATION_VV_ZERO_DETECT_TPVV	91	403 Forbidden	Invalid operation. Zero detect policy on TPVV. (WSAPI 1.2 and later)
INV_OPERATION_CPG_RAID0_DISABLED	92	403 Forbidden	Invalid operation. RAID-0 must be enabled. (WSAPI 1.2 and later)
INV_OPERATION_CPG_RAID5_NL_DISABLED	93	403 Forbidden	Invalid operation. RAID-5 on NL drives must be enabled. (WSAPI 1.2 and later)
INV_OPERATION_GROW_SIZE_TOO_SMALL	94	400 Bad Request	CPG grow size is too small. (WSAPI 1.2 and later)
INV_OPERATION_VV_CPG_ON_SNAPSHOT	96	409 Conflict	CPG cannot be assigned to a snapshot.
INV_OPERATION_VLUN_PCOPY_TARGET_VV	97	409 Conflict	Volume is a target of physical copy.
INV_INPUT_DUP_PATH	98	400 Bad Request	Duplicate path specified.
LUN_HOSTPERSONA_CONFLICT	99	409 Conflict	LUN number and persona capability conflict.
NON_EXISTENT_QOS_RULE	100	404 Not Found	QoS rule does not exist. (WSAPI 1.3 and later)

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
EXISTENT_SET	101	409 Conflict	The set already exists. (WSAPI 1.3 and later)
NON_EXISTENT_SET	102	404 Not Found	The set does not exist. (WSAPI 1.3 and later)
VVSET_QOS_TARGET	103	409 Conflict	The VV set is a target of a QoS rule. (WSAPI 1.3 and later)
MEMBER_IN_SET	104	409 Conflict	The object is already part of the set. (WSAPI 1.3 and later)
MEMBER_IN_DOMAINSET	105	409 Conflict	The host is in a domain set. (WSAPI 1.3 and later)
MEMBER_NOT_IN_SET	106	404 Not Found	The object is not part of the set. (WSAPI 1.3 and later)
MEMBER_NOT_IN_SAME_DOMAIN	107	409 Conflict	Objects must be in the same domain to perform the operation. (WSAPI 1.3 and later)
VV_IN_INCONSISTENT_STATE	108	403 Forbidden	The volume has an internal inconsistency error. (WSAPI 1.3 and later)
VV_IS_BEING_REMOVED	109	403 Forbidden	The volume is being removed. (WSAPI 1.3 and later)
LUN_ID_CONFLICT	110	409 Conflict	LUN ID conflict. (WSAPI 1.3 and later)
INVALID_CURSOR_ID	111	400 Bad Request	Invalid cursor ID for chunking. (WSAPI 1.3 and later)
INV_INPUT_IO_MIN_GOAL_GRT_MAX_LIMIT	112	400 Bad Request	The I/O maximum limit should be greater than the minimum goal. (WSAPI 1.3 and later)
INV_INPUT_BW_MIN_GOAL_GRT_MAX_LIMIT	113	400 Bad Request	The bandwidth maximum limit should be greater than the minimum goal. (WSAPI 1.3 and later)
EXISTENT_QOS_RULE	114	400 Bad Request	The QoS rule already exists.

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
			(WSAPI 1.3 and later)
INV_INPUT_BELOW_RANGE	115	400 Bad Request	The number is below the expected range. (WSAPI 1.3 and later)
INV_INPUT_QOS_PATTERN	116	400 Bad Request	Invalid QoS rule pattern. (WSAPI 1.3 and later)
INV_INPUT_QOS_TARGET_OBJECT	117	400 Bad Request	Invalid QoS target object. (WSAPI 1.3 and later)
VV_NOT_IN_SAME_DOMAIN	118	403 Forbidden	The volume is not in the current domain. (WSAPI 1.3 and later)
INV_OPERATION_VV_NON_BASE_VOLUME	119	403 Forbidden	The volume is not a base volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_IN_REMOTE_COPY	120	403 Forbidden	The volume is involved in remote copy. (WSAPI 1.3 and later)
INV_OPERATION_VV_EXPORTED	121	403 Forbidden	The volume is exported. (WSAPI 1.3 and later)
INV_OPERATION_VV_COPY_TO_SELF	122	403 Forbidden	The destination volume is the same as the parent volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_COPY_TO_BASE	123	403 Forbidden	The destination volume is the base of the parent volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_READONLY_SNAPSHOT	124	403 Forbidden	The destination volume is a read-only snapshot. (WSAPI 1.3 and later)
INV_OPERATION_VV_NO_SNAPSHOT_ALLOWED	125	403 Forbidden	The parent volume must allow snapshots. (WSAPI 1.3 and later)
INV_OPERATION_VV_COPY_PARENT_TOO_BIG	126	409 Conflict	The parent volume is larger in size than the destination volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_CLEANUP_IN_PROGRESS	127	403 Forbidden	Internal volume cleanup is in progress. (WSAPI 1.3 and later)

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
INV_OPERATION_VV_CIRCULAR_COPY	128	403 Forbidden	The parent volume is a copy of the destination copy. (WSAPI 1.3 and later)
INV_OPERATION_VV_NOT_IN_NORMAL_STATE	129	403 Forbidden	The volume state is not normal. (WSAPI 1.3 and later)
INV_OPERATION_VV_PCOPY_IN_PROGRESS	130	409 Conflict	The volume has a copy in progress. (WSAPI 1.3 and later)
INV_OPERATION_VV_FAILED_ONLINE_COPY	131	409 Conflict	The volume has a failed online copy. (WSAPI 1.3 and later)
INV_OPERATION_VV_NO_PARENT	132	403 Forbidden	The volume has no physical parent. (WSAPI 1.3 and later)
NON_EXISTENT_VVCOPY	133	404 Not Found	Physical copy not found. (WSAPI 1.3 and later)
VV_LIMIT_REACHED	134	503 Service Unavailable	Maximum number of volumes has been reached. (WSAPI 1.3 and later)
SNAPSHOT_LIMIT_REACHED	135	503 Service Unavailable	Maximum number of snapshots has been reached. (WSAPI 1.3 and later)
VV_ID_LIMIT_REACHED	136	503 Service Unavailable	Maximum number of volume IDs has been reached. (WSAPI 1.3 and later)
INVALID_INPUT_VV_PATTERN	137	400 Bad Request	Invalid volume pattern specified. (WSAPI 1.3 and later)
EMPTY_SET	138	404 Not Found	The set is empty. (WSAPI 1.3 and later)
INV_OPERATION_VV_READONLY_TO_READONLY_SNAP	139	403 Forbidden	Creating a read-only copy from a read-only volume is not permitted. (WSAPI 1.3 and later)
INV_OPERATION_VV_SNAP_PARENT_SAME_BASE	140	403 Forbiddenn	Two parent snaps share same base volume. (WSAPI 1.3 and later)

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
VV_IN_STALE_STATE	141	403 Forbidden	The volume is stale. (WSAPI 1.3 and later)
VV_NOT_STARTED	142	403 Forbidden	The volume is not started. (WSAPI 1.3 and later)
VV_UNAVAILABLE	143	403 Forbidden	The volume is not accessible. (WSAPI 1.3 and later)
CPG_ALLOCATION_WARNING_REACHED	144	503 Service Unavailable	The CPG has reached the allocation warning. (WSAPI 1.3 and later)
NON_EXISTENT_TASK	145	404 Not Found	Task not found. (WSAPI 1.3 and later)
INV_INPUT_EMPTY_VVSET	146	400 Bad Request	The VV set is empty. (WSAPI 1.3 and later)
INV_INPUT_MATCHED_HOSTSET	147	400 Bad Request	Cannot export host sets with port (matched set). (WSAPI 1.3 and later)
INV_QUERY_STRING	148	400 Bad Request	Invalid query string. (WSAPI 1.3 and later)
SET_SIZE_NOT_SAME	149	409 Conflict	The set sizes are different. (WSAPI 1.3 and later)
INV_OPERATION_UNSUPPORTED_VV_TYPE	150	403 Forbidden	Invalid operation: Cannot grow this type of volume.(WSAPI 1.3 and later)
INV_OPERATION_VV_TUNE_IN_PROGRESS	151	409 Conflict	Invalid operation: Volume tuning is in progress. (WSAPI 1.3 and later)
INV_INPUT_VV_GROW_SIZE	152	400 Bad Request	Invalid grow size.(WSAPI 1.3 and later)
VV_NEW_SIZE_EXCEED_CPG_LIMIT	153	403 Forbidden	New volume size exceeds CPG limit.(WSAPI 1.3 and later)
VV_NEW_SIZE_IS_SMALLER	154	403 Forbidden	New volume size is smaller than current size. (WSAPI 1.3 and later)

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
VV_NEW_SIZE_EXCEED_LIMIT	155	403 Forbidden	New volume size exceeds the limit. (WSAPI 1.3 and later)
INV_OPERATION_VV_SA_SD_SPACE_REMOVED	156	403 Forbidden	Invalid operation. Volume SA or SD space is being removed.(WSAPI 1.3 and later)
INV_OPERATION_VV_PROMOTE_IN_PROGRESS	157	409 Conflict	Invalid operation: Volume promotion is in progress. (WSAPI 1.3 and later)
INV_OPERATION_VV_PARENT_OF_PCOPY	158	409 Conflict	Invalid operation: Volume is the parent of a physical copy. (WSAPI 1.3 and later)
INV_OPERATION_VV_IS_BUSY	159	409 Conflict	Invalid operation: Volume is currently busy. (WSAPI 1.3 and later)
INV_INPUT_VV_TARGET_OF_QOS_RULE	160	409 Conflict	The volume is the target of a QoS rule. (WSAPI 1.3 and later)
INV_OPERATION_CPG_NOT_IN_AO_CONFIG	161	409 Conflict	Invalid operation: CPG is not in an 3PAR AO configuration. (WSAPI 1.3 and later)
INV_OPERATION_AO_CONFIG_CONFLICT	162	409 Conflict	Invalid operation: AO configuration conflict between CPGs. (WSAPI 1.3 and later)
INV_OPERATION_VV_MODIFY_SNP_CPG_TPVV	163	409 Conflict	Invalid operation: Cannot change snap CPG of a TPVV. (WSAPI 1.3 and later)
INV_OPERATION_VV_MODIFY_USR_CPG_CPVV	164	409 Conflict	Invalid operation: Cannot change USR CPG of an FPVV. (WSAPI 1.3 and later)
INV_OPERATION_VV_IS_PCOPY	165	409 Conflict	Invalid operation: The volume is a physical copy.
INV_OPERATION_CANNOT_STOP_ONLINE_PROMOTE	166	403 Forbidden	Invalid operation: The online promote cannot be stopped. Instead, use canceltask.

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
			<i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INV_OPERATION_PARENT_PCOPY_IN_PROGRESS	167	403 Forbidden	Invalid operation: The parent is involved in a physical copy. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INV_OPERATION_VV_BASE_VOLUME	168	409 Conflict	Invalid operation: The volume is a base volume. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INV_OPERATION_PROMOTE_TARGET_NOT_BASE_VV	169	403 Forbidden	Invalid operation: The promote target is not a base volume. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INV_OPERATION_PARENT_SIZE_HAS_INCREASED	170	409 Conflict	Invalid operation: The parent volume size has increased. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INV_OPERATION_PARENT_VV_EXPORTED	171	403 Forbidden	Invalid operation: The parent volume is exported. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INV_OPERATION_CANNOT_CANCEL_TASK	172	409 Conflict	Invalid operation: The task cannot be canceled. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INV_OPERATION_RC_TASK	173	409 Conflict	Invalid operation: Remote copy synchronizations can be canceled only by using a <code>stoprcopygroup</code> operation. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
	174		(Not used by the 3PAR OS.)

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
NON_ACTIVE_TASK	175	400 Bad Request	The task is not active at this time. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INVALID_TASK_ID	176	400 Bad Request	Invalid task ID specified. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INV_OPERATION_VV_TASK_CANCEL_IN_PROGRESS	177	409 Conflict	Invalid operation: A task involving the volume is being canceled. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
VV_NEEDS_TO_BE_CHECKED	178	403 Forbidden	The volume needs to be checked. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
NODE_DOWN	179	403 Forbidden	The node is down. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
—	180		(Not used by the 3PAR OS.)
—	181		(Not used by the 3PAR OS.)
INV_INPUT_VV_IS_TPVV	183	403 Forbidden	Volume is already thinly provisioned. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INV_INPUT_VV_IS_FPVV	184	403 Forbidden	Volume is already fully provisioned. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INV_OPERATION_VV_PROMOTE_IS_NOT_IN_PROGRESS	185	409 Conflict	Invalid operation: Volume promotion is not in progress. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
NON_EXISTENT_RCOPY_GROUP	187	404 Not Found	The remote-copy group does not exist. <i>(WSAPI 1.4 and later)</i>

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
NON_EXISTENT_SNAPSHOT	188	404 Not Found	The specified snapshot does not exist. The remote-copy group target is not unique.
RCOPY_GROUP_SNAPSHOT_IS_RW	189	403 Forbidden	The specified snapshot can only be read-only. (WSAPI 1.4 and later)
RCOPY_GROUP_VOL_IS_RO	190	403 Forbidden	The volume to be admitted to the remote-copy group cannot be read-only. (WSAPI 1.4 and later)
RCOPY_GROUP_HAS_NO_CPG	191	403 Forbidden	The volume on the target cannot be created automatically because no CPG has been defined in the remote-copy group. (WSAPI 1.4 and later)
RCOPY_GROUP_EXISTENT_VOL	192	409 Conflict	The specified volume is already in the remote-copy group. (WSAPI 1.4 and later)
RCOPY_GROUP_EXISTENT_VOL_ON_TARGET	193	409 Conflict	The specified secondary volume to be automatically created already exists on the target. (WSAPI 1.4 and later)
RCOPY_GROUP_INV_TARGET	194	403 Forbidden	The specified target is not a target of the remote-copy group. (WSAPI 1.4 and later)
RCOPY_GROUP_VOL_SIZE_NOT_MATCH	195	403 Forbidden	The size of the volume added to the remote-copy group does not match the size of the volume on the target. (WSAPI 1.4 and later)
RCOPY_GROUP_NON_EXISTENT_VOL_ON_TARGET	196	404 Not Found	The specified secondary volume does not exist on the target. (WSAPI 1.4 and later)
RCOPY_GROUP_VOL_NO_SNAPSHOT_SPACE	197	403 Forbidden	The volume to be admitted into the remote-copy group requires that snapshot space be allocated. (WSAPI 1.4 and later)

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
RCOPY_GROUP_TARGET_VOL_NO_SNAPSHOT_SPACE	198	403 Forbidden	The specified secondary volumes on the target require snapshot space. (WSAPI 1.4 and later)
RCOPY_GROUP_VOL_IS_PHYSICAL_COPY	199	403 Forbidden	A physical copy cannot be added to a remote-copy group. (WSAPI 1.4 and later)
RCOPY_GROUP_MAX_VOL_REACHED_PERIODIC	200	403 Forbidden	The number of periodic-mode volumes on the system has reached the limit. (WSAPI 1.4 and later)
RCOPY_GROUP_MAX_VOL_REACHED_SYNC	201	403 Forbidden	The number of synchronous-mode volumes on the system has reached the limit. (WSAPI 1.4 and later)
RCOPY_GROUP_MAX_VOL_REACHED_ASYNC	202	403 Forbidden	(Not used by the 3PAR OS.) The number of asynchronous-mode volumes on the system has reached the limit. (WSAPI 1.5)
RCOPY_GROUP_MAX_VOL_REACHED	203	403 Forbidden	The number of mixed-mode volumes on the system has reached the limit. (WSAPI 1.4 and later)
RCOPY_IS_NOT_READY	204	403 Forbidden	The remote-copy configuration is not ready for commands. (WSAPI 1.4 and later)
RCOPY_GROUP_VOL_INTERNAL_CONSISTENCY_ERR	205	403 Forbidden	The volume to be admitted into the remote-copy group has an internal consistency error. (WSAPI 1.4 and later)
RCOPY_GROUP_IS_BEING_REMOVED	206	403 Forbidden	The volume to be admitted into the remote-copy group is being removed. (WSAPI 1.4 and later)
RCOPY_GROUP_TARGET_VOL_EXPORTED	207	403 Forbidden	Secondary volumes cannot be admitted when they are exported.

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
			<i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_VOL_IS_PEER_PROVISIONED	208	403 Forbidden	A peer-provisioned volume cannot be admitted into a remote-copy group. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_VOL_ONLINE_CONVERSION	209	403 Forbidden	Online volume conversions do not support remote copy. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_VOL_ONLINE_PROMOTE	210	403 Forbidden	Online promote operations do not support remote copy. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_VOL_ONLINE_COPY	211	403 Forbidden	Online volume copy operations do not support remote copy. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_VOL_CLEAN_UP	212	403 Forbidden	Cleanup of internal volume is in progress. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_VOL_IS_INTERNAL	213	403 Forbidden	Internal volumes cannot be admitted into a remote-copy group. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_VOL_NOT_IN_SAME_DOMAIN	214	403 Forbidden	The remote-copy group has a different domain than the volume. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_STARTED	215	403 Forbidden	The remote-copy group has already been started. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_IS_BUSY	216	403 Forbidden	The remote-copy group is currently busy. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_VOL_IN_OTHER_GROUP	217	403 Forbidden	The volume is already in another remote-copy group. A volume cannot be in more than one remote-copy group. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_INV_TARGET_NUMBER	218	403 Forbidden	The wrong number of targets is specified for the remote-copy group.

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
			<i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_NOT_SUPPORT_VOL_ID	219	403 Forbidden	The target for the remote-copy group does not support volume IDs. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_IS_SELF_MIRRORED	220	403 Forbidden	The target is self-mirrored. Volumes cannot be mirrored to themselves <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_OPERATION_ONLY_ON_PRIMARY_SIDE	221	403 Forbidden	The operation should be performed only on the primary side. <i>(WSAPI 1.4 and later)</i>
RCOPY_TARGET_IS_NOT_READY	222	403 Forbidden	The remote-copy group target is not ready. <i>(WSAPI 1.4 and later)</i>
RCOPY_UNSUPPORTED_TARGET_VERSION	223	501 NOT IMPLEMENTED	The target 3PAR OS version is not supported. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_MULTIPLE_VOL_IN_SAME_FAMILY	224	403 Forbidden	A remote-copy group cannot contain multiple volumes in the same family tree. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_MULTIPLE_RW_SNAPSHOT_IN_SAME_FAMILY	225	403 Forbidden	Only one read/write snapshot in the same family can be added to a remote-copy group. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_SYNC_SNAPSHOT_IN_MULTIPLE_TARGET	226	403 Forbidden	A synchronization snapshot cannot be set with multiple targets. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_ADD_VOL_FAILED	227	403 Forbidden	Failed to add volume to the remote-copy group. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_ADD_VOL_FAILED_PARTIAL	228	403 Forbidden	Adding volume to remote-copy group succeeded on some targets. An attempt is being made to clean up. <i>(WSAPI 1.4 and later)</i>

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
RCOPY_GROUP_EMPTY	229	403 Forbidden	The remote-copy group does not contain any volumes. (WSAPI 1.4 and later)
RCOPY_TARGET_NOT_SPECIFIED	230	403 Forbidden	A target must be specified to complete this operation. (WSAPI 1.4 and later)
RCOPY_GROUP_NOT_ALL_VOLUMES_SPECIFIED	231	403 Forbidden	All the volumes in the remote-copy group must be specified to complete this operation. (WSAPI 1.4 and later)
RCOPY_GROUP_VOL_NOT_IN_GROUP	232	404 Not Found	The volume is not in a remote-copy group. (WSAPI 1.4 and later)
RCOPY_GROUP_RENAME_RESYNC_SNAPSHOT_FAILED	233	403 Forbidden	Renaming of the remote-copy group resynchronization snapshot failed. (WSAPI 1.4 and later)
RCOPY_REMOVE_REMOTE_VOLUME_FAILED	234	400 Bad Request	Removal of the volume from the remote-copy group failed. (WSAPI 1.4 and later)
RCOPY_GROUP_CREATED_MIRROR_CONFIG_OFF	235	400 Bad Request	The remote-copy group was created when the configuration mirroring policy was turned off on the target. However, this policy is now turned on. In order to dismiss a volume from the remote-copy group, the configuration mirroring policy must be turned off. Retry after turning the policy off. The remote-copy group must be started before the policy can be turned on again. (WSAPI 1.4 and later)
RCOPY_GROUP_MIXED_MODES_ON_ONE_TARGET	236	400 Bad Request	Remote-copy groups with different modes on a single target are not supported. (WSAPI 1.4 and later)

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
EXISTENT_RCOPY_GROUP	237	404 Not Found	The remote-copy group already exists. (WSAPI 1.4 and later)
RCOPY_GROUP_TOO_MANY_TARGETS	238	400 Bad Request	Too many remote copy group targets have been specified. (WSAPI 1.4 and later)
RCOPY_GROUP_TARGET_NOT_UNIQUE	239	400 Bad Request	The remote-copy group target is not unique. (WSAPI 1.4 and later)
RCOPY_GROUP_MODE_NOT_SUPPORTED	240	403 Forbidden	The remote-copy group mode is not supported. (WSAPI 1.4 and later)
RCOPY_GROUP_NOT_STARTED	241	403 Forbidden	The remote-copy group is not started. (WSAPI 1.4 and later)
RCOPY_GROUP_MAX_GROUP_REACHED_PERIODIC	242	503 Service Unavailable	The maximum number of remote-copy groups in periodic mode has been reached. (WSAPI 1.4 and later)
RCOPY_GROUP_MAX_GROUP_REACHED_SYNC	243	503 Service Unavailable	The maximum number of remote-copy groups in synchronous mode has been reached. (WSAPI 1.4 and later)
RCOPY_GROUP_MAX_GROUP_REACHED_ASYNC	244	503 Service Unavailable	(Not used by the 3PAR OS.) The maximum number of remote-copy groups in asynchronous mode has been reached. (WSAPI 1.5)
RCOPY_GROUP_SECONDARY_GROUP_MORE_THAN_ONE_BACKUP_TARGET	245	403 Forbidden	Secondary groups should have only one target that is not a backup. (WSAPI 1.4 and later)
RCOPY_GROUP_MORE_THAN_ONE_SYNC_TARGET	246	503 Service Unavailable	Remote-copy groups can have no more than one mode in synchronous mode. (WSAPI 1.4 and later)
RCOPY_GROUP_MORE_THAN_ONE_PERIODIC_TARGET	247	503 Service Unavailable	Remote-copy groups can have no more than one mode in periodic mode.

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
			<i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_ONE_TO_ONE_CONFIG_FOR_MIXED_MODE	248	403 Forbidden	Mixed mode is supported for only in a 1-to-1 remote-copy configuration. <i>(WSAPI 1.4 and later)</i>
RCOPY_TARGET_MODE_NOT_SUPPORTED	249	501 NOT IMPLEMENTED	The remote-copy target mode is not supported. <i>(WSAPI 1.4 and later)</i>
RCOPY_TARGET_IN_PEER_PERSISTENCE_SYNC_GROUP_ONLY	250	501 NOT IMPLEMENTED	The remote-copy target is configured with peer persistence; only synchronous groups can be added. <i>(WSAPI 1.4 and later)</i>
RCOPY_TARGET_MULTI_TARGET_NOT_SUPPORTED	251	501 NOT IMPLEMENTED	The remote-copy target was created in an earlier version of the 3PAR OS that does not support multiple targets. <i>(WSAPI 1.4 and later)</i>
RCOPY_TARGET_VOL_AUTO_CREATION_NOT_SUPPORTED	252	501 NOT IMPLEMENTED	The remote-copy target is in an older version of the 3PAR OS that does not support autocreation of volumes. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_TARGET_VOL_IS_RO	253	403 Forbidden	The remote-copy target volume cannot be read-only. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_SNAPSHOT_PARENT_MISMATCH	254	403 Forbidden	The names of the snapshot and its parent do not match. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_IN_FAILOVER_STATE	255	403 Forbidden	The remote-copy group is in failover state; both the source system and the target system are in the primary state. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_SECONDARY_DOES_NOT_MATCH_PRIMARY	256	403 Forbidden	The remote-copy group is in the failover state. Both systems are in the primary state. <i>(WSAPI 1.4 and later)</i>
RCOPY_GROUP_TARGET_VOLUME_MISMATCH	257	404 Not Found	Secondary group on target system has a

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
			mismatched volume configuration. (WSAPI 1.4 and later)
RCOPY_GROUP_EXISTENT_VOL_WWN_ON_TARGET	258	404 Not Found	Secondary volume WWN already exists on the target. (WSAPI 1.4 and later)
RCOPY_GROUP_VOLUME_ALREADY_SYNCED	259	404 Not Found	Volume is already synchronized. (WSAPI 1.4 and later)
RCOPY_GROUP_INCORRECT_SNAPSHOT_OR_VOLUME_SPECIFIED	260	400 Bad Request	An incorrect starting snapshot or volume was specified, or the snapshot or volume does not exist. (WSAPI 1.4 and later)
RCOPY_MAX_SYNC_TARGET_REACHED	261	503 Service Unavailable	The maximum number of remote-copy synchronous targets has been reached. (WSAPI 1.4 and later)
RCOPY_MAX_PERIODIC_TARGET_REACHED	262	503 Service Unavailable	The maximum number of remote-copy periodic targets has been reached. (WSAPI 1.4 and later)
RCOPY_MAX_ASYNC_TARGET_REACHED	263	503 Service Unavailable	(Not used by the 3PAR OS.) The maximum number of remote-copy asynchronous targets has been reached. (WSAPI 1.5 and later)
INV_OPERATION_SET_AUTO_CREATED	264	403 Forbidden	The set was created automatically. Members cannot be added or removed. (WSAPI 1.4 and later)
INV_OPERATION_SNAPSHOT_NOT_SAME_TYPE	265	403 Forbidden	Snapshot CPG should be tuned. Some snapshots in the volume set are read-only, some are read-write. (WSAPI 1.4 and later)
INV_OPERATION_SNAPSHOT_CPG_TUNE_NEEDED	266	403 Forbidden	Snapshot CPG should be tuned. (WSAPI 1.4 and later)

Table 7 Operation-specific API code Member Status and error codes (continued)

API Error	API Error Code	HTTP Code	Description
NON_EXISTENT_ROLE	267	404 Not Found	The role does not exist. (WSAPI 1.4 and later)
NON_LOCAL_USER	268	404 Not Found	User not a local user. (WSAPI 1.4 and later)
NON_EXISTENT_USER	269	400 Bad Request	User not found. (WSAPI 1.4 and later)
DEDUP_OPERATION_NOT_SUPPORTED	272	403 Forbidden	The system does not support deduplication operations. (WSAPI 1.4.1 and later)
INV_INPUT_VV_IS_TDVV	273	403 Forbidden	The volume is already deduplicated. (WSAPI 1.4.1 and later)
INV_OPERATION_VV_MODIFY_USR_CPG_TDVV	274	403 Forbidden	Cannot change USR CPG of a TDVV to a different CPG. (WSAPI 1.4.1 and later)
TDVV_COUNT_EXCEED_CPG_LIMIT	275	403 Forbidden	The TDVV count has exceeded the limit per CPG. (WSAPI 1.4.1 and later)
RCOPY_GROUP_NOT_STARTED	276	403 Forbidden	Remote-copy group not started. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
RCOPY_GROUP_INVOLVED_IN_SYNCHRONIZATION	277	403 Forbidden	Remote-copy group is already involved in Synchronization (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
RCOPY_GROUP_INV_POLICY_FOR_SYNC_GROUP	278	403 Forbidden	Invalid policy for a synchronous target. The over_per_alert and no_over_per_alert policies are valid only for asynchronous periodic groups. The target is not in asynchronous periodic mode. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
RCOPY_GROUP_INV_POLICY_FOR_PERIODIC_GROUP	279	403 Forbidden	Invalid policy for a periodic group. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
RCOPY_GROUP_IS_NOT_PERIODIC	280	403 Forbidden	Target in group is not periodic. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
RCOPY_GROUP_INV_OPERATION_ON_MULTIPLE_TARGETS	281	403 Forbidden	The operation is not supported on multiple targets. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
INV_OPERATION_RCOPY_GROUP_ROLE_CONFLICT	282	403 Forbidden	The remote-copy group is not in the correct role for this operation. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
RCOPY_GROUP_OPERATION_ONLY_ON_SECONDARY_SIDE	283	403 Forbidden	The operation should be issues only on the secondary side. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
RCOPY_GROUP_NOT_STOPPED	284	403 Forbidden	The remote-copy group is not stopped. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
NON_EXISTENT_FLASH_CACHE	285	404 Not Found	The flash cache does not exist. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
EXISTENT_FLASH_CACHE	286	409 Conflict	The flash cache already exists. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
FLASH_CACHE_NOT_SUPPORTED	287	403 Forbidden	Flash cache is not supported. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
FLASH_CACHE_IS_BEING_REMOVED	288	403 Forbidden	The flash cache is being removed. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
INV_FLASH_CACHE_SIZE	289	400 Bad Request	Invalid flash cache size. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
NO_DISK_PRESENT	290	400 Bad Request	The specified disks are not present in the system.
NON_EXISTENT_TEMPLATE	291	404 Not Found	The specified template does not exist.

Table 7 Operation-specific API code Member Status and error codes *(continued)*

API Error	API Error Code	HTTP Code	Description
			(WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
INV_OPERATION_RCOPY_GROUP_MODE_CONFLICT	292	403 Forbidden	The group mode is not supported for this operation. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
NON_EXISTENT_AO	293	404 Not Found	Specified AO config does not exist
RCOPY_GROUP_VOLUME_NOT_SYNCED	294	403 Forbidden	Volume not synced. Target does not exist in the remote copy group.
RCOPY_GROUP_TARGET_NOT_IN_GROUP	295	404 Not Found	Invalid system reporter parameter name or value
INV_REPORT_PARAM	296	400 Bad Request	Invalid system reporter parameter name or its value
SYSTEM_REPORTER_DATA_NOT_AVAILABLE	297	404 Not Found	System reporter data not available.
NON_EXISTENT_PERSONA	298	404 Not Found	Host persona does not exist. Attributes partially set successfully, but there might be some errors.
PARTIAL_EXECUTION_SUCCESS	299	400 Bad Request	Partially successful setting attributes. Errors possible.
ALL_EXECUTION_FAILED	300	400 Bad Request	All attribute setting failed.
RCOPY_TARGET_NOT_ASYNC	301	403 Forbidden	The target in the remote copy group is not asynchronous.
RCOPY_GROUP_INV_POLICY_FOR_GROUP_TARGET	302	403 Forbidden	The policy is not valid for remote copy group's target.
PARAMETER_ALREADY_SPECIFIED	303	400 Bad Request	Parameter already specified.

The desc Member

The `desc` member provides supplementary information that helps explain the reason for the error code. Hewlett Packard Enterprise recommends avoiding parsing the `desc` member and using it only for display purposes. For example, the `desc` member for an error may change from `No snap CPG specified in one storage system version` to `Error: The volume must have a snap CPG in another version`. The associated WSAPI error code does not change.

❗ **IMPORTANT:** The text in the `desc` member is subject to change between releases.

Examples of `desc` include:

```
{"code":28,"desc":"client request contains values that are too large"}
{"code":24,"desc":"insufficient space for requested operation"}
```

The ref Member

If an error occurs, the ref member can specify the reason for the error. For example, if the client sends an incorrect value for a JSON member, the system can use the ref member information to identify the member with the incorrect value. It is not always necessary or useful to include a ref member, so it does not appear for all errors.

Sample Request

```
POST /api/v1/hosts
HTTP/1.1
Content-Type: application/json
Host: storsys1:8080
Accept: application/json
{"name":abc}
```

Sample Response

```
HTTP/1.1 400 Bad Request
Date: Tue, Wed, 21 May 2013 22:15:52 GMT
Server: hp3par-wsapi
Content-Type: application/json
Connection: close
{"code":60,"desc":"JSON syntax error","ref":"name"}
```

HTTP error codes

In addition to the API-specific error information, the response to a client request that has failed will include an HTTP error code. Each API error code is associated with an HTTP status code as shown in [“Generic WSAPI code Member Status and error codes” \(page 29\)](#).

The following is an example of a failed client request, followed by the server response showing API error code 5 in association with HTTP status code 403 Forbidden:

Request

```
POST /api/v1/credentials HTTP/1.1
Content-Type: application/json
Host: storsys1:8080
Content-Length: 44
Expect: 100-continue
Accept: application/json
{"password":"not bob's password","user":"bob"}
```

Response

```
HTTP/1.1 403 Forbidden
Date: Tue, Wed, 31 Oct 2012 22:15:52 GMT
Server: hp3par-wsapi
Content-Type: application/json
Connection: close
{"code":5,"desc":"invalid user or password"}
```

System Access

This section discusses the use of session keys with the WSAPI. Session keys enable access to the HTTP methods for a single session.

Creating Credentials

In order to use the Web Services, you must create a session key by providing a username and password. The username and password are the same that you would use to access the 3PAR storage server through the 3PAR CLI or the 3PAR MC. The authorization carries the same user permissions for the WSAPI as for the CLI or MC, in that you have permission to perform the same operations through the API (where available) as you would with the CLI or MC.

1. Create a session key using the HTTP POST method with a URI of the following format:
`https://<storage_system>:8080/api/v1/credentials`
2. The message body of the request is a JSON object, with members as shown in [Table 8 \(page 56\)](#).

Table 8 Session Key Message body Member JSON objects

Member	JSON type	Value	Description
user	string	Username	User's name.
password	string	User's password	User's password.

For error output for this and other conditions, see [“HTTP Status and error codes” \(page 28\)](#).

Creating a Session Key

Except when querying the API version and when creating and deleting a session key, the session key is required for all operations and is passed in an HTTP header with the name `X-HP3PAR-WSAPI-SessionKey`.

Each session key is associated with the IP address of the client that originally requested it, and subsequent use is restricted to requests from that same IP address. An example of creating a session key using cURL (a command-line utility available for most Linux distributions) is as follows:

1. Enter the following (in a single command line):

```
curl -k -H "Accept:application/json" -H  
"Content-Type:application/json" --data-binary  
'{"user":"example","password":"example"}'  
https://<storage_system>:8080/api/v1/credentials
```
2. The system returns the HTTP code 201 `Created`, the URI of the newly created session key in the `Location` portion of the HTTP header, and a message body with the JSON object; see [Table 9 \(page 57\)](#).

Example

```
HTTP/1.1 201 Created  
Date: Thu, 28 Jul 2011 00:00:38 GMT  
Server: hp3par-wsapi  
Cache-Control: no-cache  
Pragma: no-cache  
Content-Type: application/json  
Location: /api/v1/credentials/48A70B8A8301C458037E0821  
Connection: close  
{ "key": "48A70B8A8301C458037E0821" }
```


Table 9 Message body JSON objects for Session Key creation

Member	JSON type	Description
key	string	The session key.

Using a Session Key

Except for creating and deleting a session key, the session key is required for all operations. The key is passed in an HTTP header with the following name:

X-HP3PAR-WSAPI-SessionKey

Example using the cURL command line utility

```
curl -s -H "X-HP3PAR-WSAPI-SessionKey: 48A70B8A8301C458037E0821" \
http://InServ1:8080/api/v1/volumes
```

The resulting HTTP request appears as follows:

```
GET /api/v1/volumes HTTP/1.1
User-Agent: curl/7.21.3 (i686-pc-linux-gnu) libcurl/7.21.3
OpenSSL/0.9.8ozlib/1.2.3.4 libidn/1.18
Host: InServ1:8080
Accept: */*
X-HP3PAR-WSAPI-SessionKey: 48A70B8A8301C458037E0821
```

Supported JSON sub-objects for the Accept: */* header are shown in [Table 3 \(page 23\)](#).

Session Key Security

Because session keys allow access to the storage server, client applications should not display session keys or otherwise make them visible to end users. Revealing a session key is similar to revealing a password in that an unauthorized person who obtains a session key can use it to access the storage server until the key is deleted.

Beginning with WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2, protocol connections accept only TLS v1 or higher. SSL v3 is no longer supported.

Multiple Session Keys

A multi-threaded client application can use one session key in multiple threads concurrently. However, the requested operations will be serialized by the server. When true concurrency is needed, a client can create a session key for each concurrent thread.

Maximum Number of WSAPI Sessions

Starting with 3PAR OS 3.1.3, the WSAPI server uses a processing scheme that is distributed across nodes and can handle a higher number of concurrent sessions.

The maximum number of WSAPI sessions that can be accommodated concurrently depends on the number of nodes in the storage system, system memory, the location of the master and network nodes, and other factors. For a two-node storage system over FC, for instance, the maximum number of WSAPI sessions is 24; on an eight-node cluster, the maximum is 672. See [Table 10 \(page 58\)](#).

Table 10 Maximum WSAPI Sessions per Node

Storage Model	Number of Nodes in Cluster	Maximum Number of Sessions per Node	Total WSAPI Sessions
HPE 3PAR T-Class	2	24	24
HPE 3PAR StoreServ 7200 Storage	2	36	36
HPE 3PAR StoreServ 7400 Storage ¹	2	36	36
HPE 3PAR StoreServ 7450 Storage ¹	2	36	36
HPE 3PAR F-Class	4	24	48 to 72
HPE 3PAR StoreServ 7400 Storage	4	36	72 to 108
HPE 3PAR StoreServ 7450 Storage ¹	4	36	72 to 108
HPE 3PAR StoreServ 10400 Storage systems (before December 2013)	4	48	96 to 144
HPE 3PAR StoreServ 10400 Storage systems (December 2013 and later)	8	96	192 to 288
HPE 3PAR StoreServ 10800 Storage	8	96	576 to 672

¹ The HPE 3PAR StoreServ 7400 Storage and HPE 3PAR StoreServ 7450 Storage systems can be configured with two or four nodes. The two-node system can be upgraded to four nodes.

The maximum number of WSAPI sessions on a cluster depends on the following factors:

- The number of nodes in the cluster
- The maximum number of sessions per node
 - Two-node clusters:
Two nodes are considered a single unit, so the number of nodes included in the total calculation of sessions is 1, and the total number of WSAPI sessions will be:
 $(1) * (\text{maximum number of sessions per node})$
 - Four-node or eight-node clusters:
If n is the number of nodes on these systems, then:
 - If the master and network nodes are on the same machine, then the number of nodes processing the request will be $n - 1$, and the total number of WSAPI sessions will be:
 $(n - 1) * (\text{maximum number of sessions per node})$
 - If the master and network nodes are on separate machines, then the number of nodes processing the request will be $n - 2$, and the total number of WSAPI sessions will be:
 $(n - 2) * (\text{maximum number of sessions per node})$

On the 3PAR StoreServ 10400 Storage (after December 2013) and the 3PAR StoreServ 10800 Storage, the WSAPI server excludes the network and master nodes from processing HTTP requests. (The sole exception is that the network node will process an HTTP GET request for WSAPI configuration information.) Consequently, these nodes do not enter the maximum-session calculation.

The maximum number of sessions that the WSAPI server can handle at any given time can be queried by using an HTTP GET operation. For more information, see [“Getting WSAPI configuration information” \(page 202\)](#).

Deleting a Session Key

When a client is finished making requests to the server it should delete the session keys it created. This frees up server resources and allows for better server performance.

-
- ❗ **IMPORTANT:** Unused session keys expire automatically after the configured session times out.
-

To delete a session key, send a request with the HTTP DELETE method and the URI:

`https://<storage_system>:8080/api/v1/credentials/<session key>`

The `<session key>` parameter contains the session key you created. For more information, see [“Creating Credentials” \(page 56\)](#).

Session key deletion success

A successful session key deletion returns the HTTP status code 200 OK without a message body.

Session key deletion errors

An error condition returns an error object as a message body.

Example

To delete credentials using cURL, enter the following command (as a single line):

```
curl -X DELETE -H "Accept: application/json"
https://<storage_system>:8080/api/v1/credentials/1-c86aedb2e7e98b41-b06d2d50
```

Session timeout

By default, the idle timeout for a session is 15 minutes. To change this value, use the `setwsapi -timeout` CLI command. The range is 3 to 1440 minutes. A user can view this value with the CLI command `showwsapi -d`.

4 Working with Common Provisioning Groups (CPGs)

You can use a CPG to create a virtual pool of logical disks that allows virtual volumes to share the resources of the CPG and allocates space on demand. You can create FPVVs and TPVVs that draw space from the logical disk pool.

You can use this chapter to:

- Create a CPG
- Modify a CPG
- Remove a CPG
- Query a CPG

CPG enumeration and configuration objects

Many of the CPG operation objects have enumerations or contain sub-objects, as described in the following sections.

CPG LDDLayout JSON objects

LDDLayout is a sub-object of the CPG object for creation and modification. The CPG objects SAGrowth and SDGrowth also return LDDLayout upon query of CPGs. See [Table 11 \(page 60\)](#).

Table 11 JSON objects for CPG LDDLayout

Member	JSON type	API type	Ignored Values	Description
RAIDType	number	RAIDType Enum	Negative values	Specifies the RAID type for the logical disk.
setSize	number	igint32	Negative values	Specifies the set size in the number of chunklets.
HA	number	HA Enum	Negative values	Specifies that the layout must support the failure of one port pair, one cage, or one magazine.
chunkletPosPref	number	chunkletPosPref Enum	Negative values	Specifies the chunklet location preference characteristics.
diskPatterns	array of objects	array of diskPatterns objects	None	Specifies patterns for candidate disks.

CPG RAIDType enumeration

[Table 12 \(page 60\)](#) lists the RAID type enumeration values specified upon creation, modification, and query.

Table 12 CPG RAIDType enumeration values for RAID type

Symbol	Value	Description
R0	1	RAID level 0
R1	2	RAID level 1
R5	3	RAID level 5
R6	4	RAID level 6

CPG HA enumeration

Upon creation, modification, or query, specify the HA setting as a JSON object HA with an enumeration based on [Table 13 \(page 61\)](#).

Table 13 CPG HA enumeration values

Symbol	Value	Description
PORT	1	Support failure of a port.
CAGE	2	Support failure of a drive cage.
MAG	3	Support failure of a drive magazine.

CPG chunkletPosPref enumeration

Upon creation, modification, or query, specify the chunklet location preference characteristics as a JSON object, with enumeration as shown in [Table 14 \(page 61\)](#).

Table 14 CPG chunkletPosPref enumeration values

Symbol	Value	Description
FIRST	1	Lowest numbered available chunklets, where transfer rate is the fastest.
LAST	2	Highest numbered available chunklets, where transfer rate is the slowest.

CPG diskPatterns JSON object

The JSON object `diskPatterns` is a sub-object of the `LDLayout` object for creation and modification of CPG objects. The `diskPatterns` object, which is also returned within the `LDLayout` object upon CPG query, specifies a pattern for candidate disks, as shown in [Table 15 \(page 61\)](#).

Table 15 CPG diskPatterns JSON object values

Member	JSON type	Ignored values	Description
<code>nodeList</code>	string	Null	Specifies one or more nodes. Nodes are identified by one or more integers. Multiple nodes are separated with a single comma (1,2,3). A range of nodes is separated with a hyphen (0–7). The primary path of the disks must be on the specified node number.
<code>slotList</code>	string	Null	Specifies one or more PCI slots. Slots are identified by one or more integers. Multiple slots are separated with a single comma (1,2,3). A range of slots is separated with a hyphen (0–7). The primary path of the disks must be on the specified PCI slot number(s).
<code>portList</code>	string	Null	Specifies one or more ports. Ports are identified by one or more integers. Multiple ports are separated with a single comma (1,2,3). A range of ports is separated with a hyphen (0–4). The primary path of the disks must be on the specified port number(s).
<code>cageList</code>	string	Null	Specifies one or more drive cages. Drive cages are identified by one or more integers. Multiple drive cages are separated with a single comma (1,2,3). A range of drive cages is separated with

Table 15 CPG diskPatterns JSON object values (continued)

Member	JSON type	Ignored values	Description
			a hyphen (0–3). The specified drive cage(s) must contain disks.
magList	string	Null	Specifies one or more drive magazines. Drive magazines are identified by one or more integers. Multiple drive magazines are separated with a single comma (1,2,3). A range of drive magazines is separated with a hyphen (0–7). The specified magazine(s) must contain disks.
diskPosList	string	Null	Specifies one or more disk positions within a drive magazine. Disk positions are identified by one or more integers. Multiple disk positions are separated with a single comma (1,2,3). A range of disk positions is separated with a hyphen (0–3). The specified portion(s) must contain disks.
diskList	string	Null	Specifies one or more physical disks. Disks are identified by one or more integers. Multiple disks are separated with a single comma (1,2,3). A range of disks is separated with a hyphen (0–3). Disks must match the specified ID(s).
totalChunkletsGreaterThanOrEqualTo	number	Negative values	Specifies that physical disks with total chunklets greater than the number specified be selected.
totalChunkletsLessThan	number	Negative values	Specifies that physical disks with total chunklets less than the number specified be selected.
freeChunkletsGreaterThanOrEqualTo	number	Negative values	Specifies that physical disks with free chunklets less than the number specified be selected.
freeChunkletsLessThan	number	Negative values	Specifies that physical disks with free chunklets greater than the number specified be selected.
diskModels	array of string	Null array elements	Specifies that PDs identified by their models are selected.
diskType	number	Negative values	Specifies that physical disks must have the specified device type. See CPG diskType enumeration (page 62)
RPM	number	Negative values	Disks must be of the specified speed.

CPG diskType enumeration

Upon creation, modification, or query, specify the `diskType` JSON member as an enumeration, as shown in [Table 16 \(page 62\)](#).

Table 16 CPG diskType enumeration values

Symbol	Value	Description
FC	1	Fibre Channel
NL	2	Near Line
SSD	3	SSD

CPG space usage objects

The `SDUsage`, `SAUsage` and `UsrUsage` objects, all of which use the same members, are sub-objects of the `cpg` object returned by queries. Those members are listed in [Table 17 \(page 63\)](#).

Table 17 CPG `SDUsage`, `SAUsage`, and `UsrUsage` JSON objects

Member	JSON type	API type	Description
<code>totalMiB</code>	number	uint64	Total logical disk space in MiB.
<code>rawTotalMiB</code>	number	uint64	Total physical (raw) logical disk space in MiB.
<code>usedMiB</code>	number	uint64	Amount of logical disk used, in MiB.
<code>rawUsedMiB</code>	number	uint64	Amount of physical (raw) logical disk used, in MiB.

Growth objects

The `SAGrowth` and `SDGrowth` objects both use the same members, as shown in [Table 18 \(page 63\)](#). Growth objects are sub-objects of the CPG object returned by queries.

Table 18 CPG `SAGrowth` and `SDGrowth` JSON objects

Member	JSON type	API type	Description
<code>warningMiB</code>	number	uint32	Threshold of used logical disk space, when exceeded, results in a warning alert.
<code>limitMiB</code>	number	uint32	The auto-grow operation is limited to the specified storage amount that sets the growth limit.
<code>incrementMiB</code>	number	uint32	The growth increment, the amount of logical disk storage created on each auto-grow operation.
<code>LDLayout</code>	object	LDLayout object	Logical disk types to be used for this CPG. For member details, see “CPG <code>LDLayout</code> JSON objects” (page 60) .

CPG state enumeration

The JSON object `state` enumeration is shown in [Table 19 \(page 63\)](#).

Table 19 CPG `state` enumeration values

Symbol	Value	Description
<code>NORMAL</code>	1	The CPG is operating normally.
<code>DEGRADED</code>	2	The CPG is in a degraded state.
<code>FAILED</code>	3	The CPG is operating abnormally.

CPG `DetailedState` enumeration

`DetailedState` enumeration values are used in multiple arrays including `failedStates`, `degradedStates`, and `additionalStates`. Details of the CPG state are enumerated in [Table 20 \(page 64\)](#).

Table 20 CPG DetailedState enumeration

Symbol	Value	Description
SA_LIMIT_REACHED	1	Administrative space is at limit.
SD_LIMIT_REACHED	2	Copy space is at limit.
SA_GROW_FAILED	3	Administrative space grow failed.
SD_GROW_FAILED	4	Copy space grow failed.
SA_WARN_REACHED	5	Administrative space is at warning level.
SD_WARN_REACHED	6	Copy space at warning level.
INVALID	7	Invalid

Creating a CPG

To create a CPG, use the HTTP POST method with the following URI:

https://<storage_system>:8080/api/v1/cpgs

[Table 21 \(page 64\)](#) shows the message body members.

- ❗ **IMPORTANT:** This operation requires access to all domains, as well as Super or Edit roles, or any role granted `cpg_create` permissions.

Table 21 Message body JSON objects for CPG creation and modification

Member	JSON type	API type	Ignored Values	Description
name	string	name31	Required field.	Specifies the name of the CPG. For CPG creation only.
newName	string	name31	None	Specifies the new name of the CPG. For CPG modification only.
growthIncrementMiB	number	igint32	Zero and negative values In WSAPI 1.2 and later, zero and negative values are ignored.	Specifies the growth increment, in MiB, the amount of logical disk storage created on each auto-grow operation.
growthLimitMiB	number	igint32	Negative values In WSAPI 1.2 and later, zero and negative values are ignored.	Specifies that the auto-grow operation is limited to the specified storage amount, in MiB, that sets the growth limit.
usedLDWarningAlertMiB	number	igint32	Negative values In WSAPI 1.2 and later, zero and negative values are ignored.	Specifies that the threshold of used logical disk space, in MiB, when exceeded results in a warning alert.

Table 21 Message body JSON objects for CPG creation and modification (*continued*)

Member	JSON type	API type	Ignored Values	Description
domain	string	name31	Null	Specifies the name of the domain in which the object will reside. For CPG creation only.
LDLayout	object	LDLayout object	Null	Specifies logical disk types to be used for this CPG.
template	string	name31	Null	Specifies the name of the template from which the CPG is created. For CPG creation only. (WSAPI 2.4.2 with 3PAR OS 3.2.1 MU2)
disableAutoGrow	boolean	boolean		If <code>true</code> , CPG auto grow is disabled. The default setting is <code>false</code> . For CPG modification only.
rmGrowthLimit	boolean	boolean		If <code>true</code> , no auto grow limit is enforced. The default setting is <code>false</code> . For CPG modification only.
rmWarningAlert	boolean	boolean		If <code>true</code> , no warning limit is enforced. The default setting is <code>false</code> . For CPG modification only.

CPG creation success

A successful operation returns the HTTP status code 201 `Created` without a message body.

Upon successful creation of the CPG, the `Location` portion of the response header contains the URI for the newly created CPG in the following format:

```
/api/v1/cpgs/<cpg name>
```

CPG creation errors

If an error occurs, the system returns one of the error codes shown in [Table 22 \(page 65\)](#), or a generic error code listed in “[Generic WSAPI code Member Status and error codes](#)” (page 29):

Table 22 CPG creation and modification error codes

API Error	HTTP Code	Description
BAD_CPG_PATTERN	400 Bad Request	A pattern in a CPG LDLayout specifies illegal values.
CPG_NOT_IN_SAME_DOMAIN	403 Forbidden	The snap CPG is not in the same domain as the user CPG. (WSAPI 1.2 and later)
EXISTENT_CPG	409 Conflict	CPG already exists.
IN_USE	409 Conflict	The CPG cannot be removed because it is in use by a volume.

Table 22 CPG creation and modification error codes *(continued)*

API Error	HTTP Code	Description
INV_INPUT	400 Bad Request	Missing CPG name.
INV_INPUT_EXCEEDS_LENGTH	400 Bad Request	Invalid input: string length exceeds limit.
INV_INPUT_EXCEEDS_RANGE	400 Bad Request	Invalid input: number exceeds expected range.
INV_OPERATION_GROW_SIZE_TOO_SMALL	400 Bad Request	CPG grow size is too small (WSAPI 1.2 and later)
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	Input contains one or more illegal characters.
INV_INPUT_MISSING_REQUIRED	400 Bad Request	Invalid input: Some or all required parameters are missing.
INV_INPUT_WARN_GT_LIMIT	400 Bad Request	The allocation warning level is higher than the allocation limit.
INV_OPERATION_CPG_RAID0_DISABLED	403 Forbidden	Invalid operation. RAID-0 must be enabled. (WSAPI 1.2 and later)
INV_OPERATION_CPG_RAID5_NL_DISABLED	403 Forbidden	Invalid operation. RAID-5 on NL drives must be enabled. (WSAPI 1.2 and later)
INV_SET_SIZE	400 Bad Request	The set size is invalid for the selected RAID type.
NO_SPACE	400 Bad Request	Insufficient space for requested operation. (WSAPI 1.3 and later)
NON_EXISTENT_CPG	404 Not Found	The CPG does not exist. This error applies only to CPG modification, not creation.
NON_EXISTENT_DOMAIN	404 Not Found	The domain does not exist.
NO_DISK_PRESENT	400 Bad Request	The specified disks are not present in the system. (WSAPI 1.4.2 with HPE 3PAR OS 3.2.1 MU2)
NON_EXISTENT_TEMPLATE	404 Not Found	The specified template does not exist. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)

Modifying a CPG

To modify a CPG, use the HTTP PUT method with the following URI:

`https://<storage_system>:8080/api/v1/cpgs/<cpg_name>`

[Table 21 \(page 64\)](#) and [Table 23 \(page 67\)](#) list the message body members.



IMPORTANT: This operation requires access to all domains, as well as Super, Service, or Edit roles, or any role granted `cpg_set` permission.

Table 23 CPG modification JSON objects

Member	JSON type	API type	Ignored Values	Description
disableAutoGrow	boolean	boolean	None	If <code>True</code> , disable CPG auto grow. The default setting is <code>false</code> .
rmGrowthLimit	boolean	boolean	None	If <code>True</code> , no auto grow limit is enforced. The default setting is <code>False</code> .
rmWarningAlert	boolean	boolean	None	If <code>True</code> , no warning limit is enforced. The default setting is <code>False</code> .
newName	string	name31	Null	Specifies the name of the CPG to be updated.

CPG modification success

A successful modification returns the HTTP code `200 OK` without a message body. The `Location` portion of the JSON response header indicates the URI of the updated CPG.

Upon successful modification of the CPG, the `Location` portion of the response header contains the URI for the newly modified CPG in the following format:

```
/api/v1/cpgs/<new name>
```

The new CPG name appears if the CPG name is successfully updated. If it is not updated, then `<new name>` is `<cpg name>`.

CPG modification errors

If an error occurs, the system returns one of the error codes shown in [Table 22 \(page 65\)](#), or a generic error code listed in [“Generic WSAPI code Member Status and error codes” \(page 29\)](#).

Removing a CPG

- ❗ **IMPORTANT:** This operation requires access to all domains, as well as Super, or Edit roles, or any role granted `cpg_remove` permission.

To remove a CPG, use the HTTP DELETE method with the following URI:

```
https://<storage_system>:8080/api/v1/cpgs/<cpg name>
```

CPG removal success

A successful removal returns the HTTP code `200 OK` with no message body.

CPG removal errors

[Table 24 \(page 67\)](#) lists the possible errors following an attempt to remove a CPG. For generic API error codes, see [Table 6 \(page 29\)](#).

Table 24 CPG removal error codes

API Error	HTTP Code	Description
NON_EXISTENT_CPG	404 Not Found	CPG not found.
IN_USE	409 Conflict	The CPG cannot be removed because it is in use by a volume.

Querying CPG information

You can query for information about all the CPGs on the storage system or for information about a single CPG.

Querying all CPGs

To query for CPG information, use the HTTP GET method with the following URI and no message body:

https://<storage_system>:8080/api/v1/cpgs

The body of the response is an object with `total` and `members` as described in [Table 25 \(page 68\)](#).

Table 25 Message body JSON objects for CPG query

Member	JSON type	API type	Description
<code>total</code>	number	int32	Number of CPG objects returned.
<code>members</code>	array of objects	array of CPG Property objects	CPG properties.

As is the case with all collection queries, the `total` object returns the number of objects in the collection. The `members` object is a JSON array of zero or more JSON objects as shown in [Table 26 \(page 68\)](#).

Table 26 CPG query `members` JSON objects

Member	JSON type	API type	Description
<code>domain</code>	string	name31	Domain to which the CPG belongs.
<code>id</code>	number	uint32	CPG ID
<code>name</code>	string	name31	CPG name.
<code>numFPVVs</code>	number	uint32	Number of FPVVs allocated in the CPG.
<code>numTDVVs</code>	number	uint32	Number of TDVVs created in the CPG. (WSAPI 1.4.1 and later)
<code>numTPVVs</code>	number	uint32	Number of TPVVs allocated in the CPG.
<code>SAUsage</code>	object	SAUsage object	Snapshot administration usage.
<code>SDUsage</code>	object	SDUsage object	Snapshot data space usage.
<code>UsrUsage</code>	object	UsrUsage object	User data space usage.
<code>uuid</code>	string	uuid string	The UUID that was automatically assigned to the CPG at creation.
<code>warningPct</code>	number	uint32	Percentage usage at which to issue an alert.
<code>SAGrowth</code>	object	SAGrowth object	Snapshot administration space auto-growth parameters.
<code>SDGrowth</code>	object	SDGrowth object	Snapshot data space auto-growth parameters.
<code>state</code>	number	state Enum	Overall state of the CPG
<code>failedStates</code>	array of numbers	array of CPG DetailedState Enum	Detailed state of the CPG.

Table 26 CPG query members JSON objects (continued)

Member	JSON type	API type	Description
degradedStates	array of numbers	array of CPG DetailedState Enum	Detailed state of the CPG.
additionalStates	array of numbers	array of CPG DetailedState Enum	Detailed state of the CPG.
dedupCapable	boolean	boolean	True: CPG is dedup-capable False: CPG is not dedup-capable.

CPG query success

Upon success, the HTTP status code 200: OK.

CPG query errors

[Table 27 \(page 69\)](#) lists the possible error codes. For generic API error codes, see [Table 6 \(page 29\)](#).

Table 27 CPG query error codes

API Error	HTTP Code	Description
INT_SERV_ERR	500 Internal Server Error	Internal server error.

Querying a single CPG

This section defines API operations to query a single CPG on the storage system.

To query a single CPG, use the HTTP GET method with the following URI and no message body:

https://<storage_system>:8080/api/vi/cpgs/<cpg name>

The <cpg name> parameters name of the CPG to query.

Single-CPG query success

A successful single-CPG query returns the HTTP code 200 OK.

Unless an error occurs, the response includes JSON objects as specified in [Table 26 \(page 68\)](#).

Single-CPG query errors

Possible error codes for a single-CPG query are shown in [Table 28 \(page 69\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 28 Single-CPG query error codes

API Error	HTTP Code	Description
NON_EXISTENT_CPG	404 Not Found	CPG does not exist. (WSAPI 1.2 and later)
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	CPG name contains invalid character. (WSAPI 1.2 and later)

5 Working with storage volumes

This chapter describes how to manage storage volumes. The sections apply to creation, modification, and query operations on storage volumes, including the following:

- Create a storage volume
- Modify a storage volume (WSAPI 1.2 and later)
- Remove a storage volume (WSAPI 1.2 and later)
- Query a storage volume (WSAPI 1.3 and later)

Licensing information

Thinly provisioned virtual volumes

With an HPE 3PAR Thin Provisioning Software license, you can create Thinly Provisioned Virtual Volumes (TPVV) and Thinly Deduplicated Virtual Volumes (TDVV).

Fully provisioned virtual volumes

A fully provisioned virtual volume is provisioned storage space from LDs that belong to a CPG. Fully provisioned virtual volumes are the default system volume and do not require any additional licenses.

Reducing volume size using HPE 3PAR Thin Persistence Software

Maintaining TPVV and read/write snapshot size with the Thin Persistence feature requires HPE 3PAR StoreServ 10000 or HPE 3PAR StoreServ 7000 Storage System, HPE 3PAR Thin Provisioning Software license, HPE 3PAR Thin Conversion Software license, and HPE 3PAR Thin Persistence Software license.

Setting retention times for virtual volumes

HPE 3PAR Virtual Lock Software is an optional feature that enforces the retention period of any volume or copy of a volume. You must purchase the Virtual Lock license to use the `retentionHours` field. For more information, see the [HPE 3PAR Virtual Lock Software website](#).

Volume enumeration and configuration objects

WSAPI uses several enumerations and configuration objects for the various volume API operations.

Volume provisioningType enumeration types

[Table 29 \(page 70\)](#) lists enumeration for the `provisioningType` JSON object.

Table 29 Volume provisioningType enumeration

Symbol	Value	Description
FULL	1	FPVV, either with no snapshot space or with statically allocated snapshot space. Also, a commonly-provisioned VV where the user space is fully provisioned and the snapshot space is associated with the <code>snapCPG</code> property.
TPVV	2	TPVV, with space for the base volume allocated from the user space that is associated with the <code>userCPG</code> property. Also includes old-style thinly provisioned VV (created on a 2.2.4 release or earlier) where both the base VV and snapshot

Table 29 Volume provisioningType enumeration (continued)

Symbol	Value	Description
		data are allocated from the snapshot space associated with userCPG.
SNP	3	The VV is a snapshot (Type vcopy) and its space is provisioned from the base volume's snapshot space.
PEER	4	Remote volume admitted into the local storage system.
UNKNOWN	5	Unknown.
TDVV	6	The volume is a deduplicated volume.

Volume CopyType enumeration types

Table 30 (page 71) lists enumeration for the CopyType JSON object.

Table 30 Volume CopyType enumeration

Symbol	Value	Description
BASE	1	Base volume (not a copy).
PHYSICAL_COPY	2	Physical copy (full copy).
VIRTUAL_COPY	3	Snapshot copy (virtual copy).

Volume state enumeration types

Table 31 (page 71) lists enumeration for the state JSON object.

Table 31 Volume state enumeration

Symbol	Value	Description
NORMAL	1	The VV is operating normally.
DEGRADED	2	The VV is in degraded state.
FAILED	3	The VV is operating abnormally.

Volume DetailedState enumeration types

Table 32 (page 71) lists the enumerated volume state. DetailedState is not a JSON object itself, but is an enumeration that applies to multiple JSON objects, including failedStates, degradedStates, and additionalStates.

Table 32 Volume DetailedState enumeration

Symbol	Value	Description
LDS_NOT_STARTED	1	LDs not started.
NOT_STARTED	2	VV not started.
NEEDS_CHECK	3	Needs to be checked for consistency.
NEEDS_MAINT_CHECK	4	Maintenance check required.
INTERNAL_CONSISTENCY_ERROR	5	Internal consistency error.
SNAPDATA_INVALID	6	Snapshot data invalid.
PRESERVED	7	One or more sets of an LD is unavailable due to missing chunklets, and the remaining VV data is preserved.

Table 32 Volume DetailedState enumeration (continued)

Symbol	Value	Description
STALE	8	Parts of the VV contain old data because of a copy-on-write operation.
COPY_FAILED	9	A promote or copy operation to this volume failed.
DEGRADED_AVAIL	10	Degraded due to availability.
DEGRADED_PERF	11	Degraded due to performance.
PROMOTING	12	The volume is currently the target of a promote operation.
COPY_TARGET	13	The volume is currently the target of a physical copy operation.
RESYNC_TARGET	14	The volume is currently the target of a resynchronized-copy operation.
TUNING	15	The volume is being tuned.
CLOSING	16	The volume is closing.
REMOVING	17	The volume is being removed.
REMOVING_RETRY	18	The volume is retrying a removal operation.
CREATING	19	The volume is being created.
COPY_SOURCE	20	Copy source.
IMPORTING	21	The volume is being imported.
CONVERTING	22	The volume is being converted.
INVALID	23	Invalid.

Volume policies configuration object

The `policies` JSON object specify the policies of a volume, as detailed in [Table 33 \(page 72\)](#).

Table 33 Volume policies JSON objects

Member	Value	Description
<code>staleSS</code>	Boolean	<p>TRUE: Stale snapshots. If there is no space for a copy-on-write operation, the snapshot is allowed to go stale but the host write can proceed without an error.</p> <p>FALSE: No stale snapshots. If there is no space for a copy-on-write operation, the host write will fail.</p>
<code>oneHost</code>	Boolean	<p>TRUE: This indicates a volume is constrained to export to one host or one host cluster.</p> <p>FALSE: This indicates a volume exported to multiple hosts for use by a cluster-aware application, or when "port presents" VLUNs are used</p>
<code>zeroDetect</code>	Boolean	<p>TRUE: This indicates that the storage system will scan for zeros in the incoming write data.</p> <p>FALSE: This indicates that the storage system will not scan for zeros in the incoming write data.</p>
<code>system</code>	Boolean	TRUE: Special volume used by the system.

Table 33 Volume policies JSON objects (continued)

Member	Value	Description
		FALSE: Normal user volume.
caching	Boolean	This is a read-only policy and cannot be set. TRUE: This indicates that the storage system is enabled for write caching, read caching, and read ahead for the volume. FALSE: This indicates that the storage system is disabled for write caching, read caching, and read ahead for the volume.

Volume space objects

The volume space is specified by the following three sub-objects, each of which uses the same members:

- adminSpace
- snapshotSpace
- userSpace

The members are listed in [Table 34 \(page 73\)](#).

Table 34 Volume space JSON objects

Member	JSON type	API type	Description
reservedMiB	number	uint32	Reserved space in MiB.
rawReservedMiB	number	uint32	Raw reserved space in MiB.
usedMiB	number	uint32	Used space in MiB.
freeMiB	number	uint32	Free space in MiB.

Creating a storage volume

This section contains information about creating storage volumes.

- ❗ **IMPORTANT:** Any user with Super or Edit role, or any role granted `vv_create` permission (for base volumes), `vvcopy_create` permission (for physical copies of volumes), or `sv_create` permission (for snapshots), can create a volume.

For more information about creating snapshots, see [“Creating a volume snapshot” \(page 137\)](#).

For more information about creating physical copies of volumes, see [“Creating a physical copy of a volume” \(page 139\)](#).

- ❗ **Licensing information:**

For licensing information, see [Licensing information \(page 70\)](#)

Creating base volumes

To create a storage volume, use the HTTP POST method with the following URI:

`https://<storage_system>:8080/api/v1/volumes`

The `<storage_system>` parameter contains the storage system host name or IP address.

The message body is a JSON object with the members shown in [Table 35 \(page 74\)](#).

Most of the message-body JSON object members are optional. The definition of members can be found in the 3PAR Command Line Interface Reference or in the column help for the CLI command `createvv`.

Table 35 Message body JSON objects for base-volume creation

Member	JSON type	API type	Ignored Values	Description
name	string	name31	None (Required)	Specifies a volume name up to 31 characters in length.
cpg	string	name31	None (Required)	Specifies the name of the CPG from which the volume user space will be allocated.
sizeMiB	number	uint32	None (Required)	Specifies the size for the volume in MiB. The volume size is rounded up to the next multiple of 256 MiB.
id	number	igint32	Negative values	Specifies the ID of the volume. If not specified, the next available ID is chosen.
comment	string	print511	None	Specifies any additional information up to 511 characters for the volume.
policies	object	policies object	None, except caching and system, which are ignored if false.	Specifies volume policies. ¹
snapCPG	string	name31	None	Specifies the name of the CPG from which the snapshot space will be allocated.
ssSpcAllocWarningPct	number	igint32	Negative values	Enables a snapshot space allocation warning. A warning alert is generated when the reserved snapshot space of the volume exceeds the indicated percentage of the volume size.
ssSpcAllocLimitPct	number	igint32	Negative values	Sets a snapshot space allocation limit. The snapshot space of the volume is prevented from growing beyond the indicated percentage of the volume size.
tpvv	boolean	boolean	None	TRUE: Create TPVV. FALSE: (default) Do not create TPVV. With both <code>tpvv</code> and <code>tdvv</code> set to FALSE or unspecified, defaults to <code>FPVV</code> .
tdvv	boolean	boolean	None	TRUE: Create TDVV. FALSE: (default) Do not create TDVV. With both <code>tpvv</code> and <code>tdvv</code> set to FALSE or unspecified, defaults to <code>FPVV</code> .
usrSpcAllocWarningPct	number	igint32	Negative values	This field enables user space allocation warning. It specifies that a warning alert is generated when the reserved user space of the TPVV

Table 35 Message body JSON objects for base-volume creation (continued)

Member	JSON type	API type	Ignored Values	Description
				exceeds the specified percentage of the VV size.
usrSpcAllocLimitPct	number	igint32	Negative values	This field sets the user space allocation limit. The user space of the TPVV is prevented from growing beyond the indicated percentage of the VV size. After this size is reached, any new writes to the VV will fail.
expirationHours	number	igint32	Negative values	Specifies the relative time (from the current time) that the volume expires. Value is a positive integer with a range of 1–43,800 hours (1825 days).
retentionHours	number	igint32	Negative values	Specifies the amount of time relative to the current time that the volume is retained. Value is a positive integer with a range of 1–43,800 hours (1825 days).

¹ The policies object may set policies for staleSS, oneHost, tpZeroFill, or zeroDetect. Setting the system or cache policy boolean values to true will result in an error.

Volume creation success

A successful operation returns the HTTP status code 201 Created with no message body.

Upon successful creation of the volume, the Location portion of the response header contains the URI for the newly created volume in the following format:

```
/api/v1/volumes/<volume name>
```

Volume creation errors

An error condition returns one of the errors in [Table 36 \(page 75\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 36 Base-volume and snapshot creation error codes

API Error	HTTP Code	Description
DEDUP_OPERATION_NOT_SUPPORTED	403 Forbidden	The system does not support deduplication operations. (WSAPI 1.4.1 and later)
EXISTENT_ID	409 Conflict	ID exists.
EXISTENT_VOL	409 Conflict	The volume already exists.
INV_INPUT	400 Bad Request	Invalid parameter or JSON object.
INV_INPUT_EXCEEDS_LENGTH	400 Bad Request	Invalid input: string length exceeds limit.
INV_INPUT_RETAIN_GT_EXPIRE	400 Bad Request	Retention time is greater than expiration time.
INV_INPUT_TIME	400 Bad Request	Invalid time specified.
INV_INPUT_USR_ALRT_NON_TPVV	400 Bad Request	User space allocation alerts are valid only with TPVVs.

Table 36 Base-volume and snapshot creation error codes *(continued)*

API Error	HTTP Code	Description
INV_INPUT_VV_POLICY	400 Bad Request	Invalid policy specification (for example, caching or system set to true).
INV_INPUT_WARN_GT_LIMIT	400 Bad Request	Allocation warning level is higher than the limit.
NO_SNAP_CPG	409 Conflict	No snapshot space is available.
NO_SPACE	400 Bad Request	Not enough space is currently available. (WSAPI 1.3 and later)
TDVV_COUNT_EXCEED_CPG_LIMIT	403 Forbidden	The TDVV count has exceeded the limit per CPG. (WSAPI 1.4.1 and later)
TOO_LARGE	400 Bad Request	Volume size is above the architectural limit.

Modifying a virtual volume

To modify or update a volume, use the HTTP PUT method with the following URI:

https://<storage_system>:8080/api/v1/volumes/<volume_name>

The <volume_name> variable is the name of the volume being modified. The message body is a JSON object with members.



Licensing information:

For licensing information, see [Licensing information \(page 70\)](#)

Table 37 Message body JSON objects for volume modification request

Member	JSON type	API type	Ignored Values	Description
newName	string	name31	None	New name of the volume. (WSAPI 1.2 and later)
comment	string	print511	None	Comment about the volume. (WSAPI 1.2 and later)
expirationHours	number	igint32	Zero and negative values	Time in hours that the volume would expire. (WSAPI 1.2 and later)
retentionHours	number	igint32	Zero and negative values	Time in hours that the volume would be retained. (WSAPI 1.2 and later)
policies	object	policies object	None except caching and system, which are ignored if false.	Specify virtual volume policies. (WSAPI 1.2 and later)
snapCPG	string	name31	None	The snap CPG name. (WSAPI 1.2 and later)
ssSpcAllocWarningPct	number	igint32	Zero and negative values	Snap space allocation warning percent. (WSAPI 1.2 and later)

Table 37 Message body JSON objects for volume modification request *(continued)*

Member	JSON type	API type	Ignored Values	Description
ssSpcAllocLimitPct	number	igint32	Zero and negative values	Snap space allocation limit percent. (WSAPI 1.2 and later)
userCPG	string	name31	None	User CPG name. (WSAPI 1.2 and later)
usrSpcAllocWarningPct	number	igint32	Zero and negative values	User space allocation warning percent. (WSAPI 1.2 and later)
usrSpcAllocLimitPct	number	igint32	Zero and negative values	User space allocation limit percent. (WSAPI 1.2 and later)
rmSsSpcAllocWarning	boolean	boolean	None	If True , remove snapshot space allocation warning. If False , and warning value is 0, then ignore. If False , and warning value is positive, then set. (WSAPI 1.2 and later)
rmUsrSpcAllocWarning	boolean	boolean	None	If True , remove user space allocation warning. If False , and warning value is 0, then ignore. If False , and warning value is positive, then set. (WSAPI 1.2 and later)
rmExpTime	boolean	boolean	None	If True , reset the expiration time to 0. If False , and expiration time value is 0, then ignore. If False , and expiration time value is positive, then set. (WSAPI 1.2 and later)
rmSsSpcAllocLimit	boolean	boolean	None	If True , remove snapshot space allocation limit. If False , and limit value is 0, then ignore. If False , and limit value is positive, then set. (WSAPI 1.2 and later)
rmUsrSpcAllocLimit	boolean	boolean	None	If True , remove user space allocation limit.

Table 37 Message body JSON objects for volume modification request *(continued)*

Member	JSON type	API type	Ignored Values	Description
				<p>If <code>False</code>, and limit value is 0, then ignore.</p> <p>If <code>False</code>, and limit value is positive, then set.</p> <p>(WSAPI 1.2 and later)</p>

The volume `policies` object is described in [Table 33 \(page 72\)](#). The `policies` object may be set to the `staleSS`, `oneHost`, or `zeroDetect` policies.

Volume modification success

A successful request to modify a volume returns the HTTP code 200 OK. The `Location` portion of the response header contains the new URI for the updated volume:

```
/api/v1/volumes/<volume_name>
```

Virtual-volume modification errors

Possible error codes following a volume modification request are shown in [Table 38 \(page 78\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 38 Volume modification request error codes

API Error	HTTP Code	Description
INV_INPUT_WARN_GT_LIMIT	400 Bad Request	Allocation warning level is higher than the limit. (WSAPI 1.2 and later)
INV_INPUT_USR_ALRT_NON_TPVV	400 Bad Request	User space allocation alerts are valid only with a TPVV.
INV_INPUT_RETAIN_GT_EXPIRE	400 Bad Request	Retention time is greater than expiration time.
INV_INPUT_VV_POLICY	400 Bad Request	Invalid policy specification (for example, caching or system is set to <code>true</code>). (WSAPI 1.2 and later)
INV_INPUT_EXCEEDS_LENGTH	400 Bad Request	Invalid input: string length exceeds limit. (WSAPI 1.2 and later)
INV_INPUT_TIME	400 Bad Request	Invalid time specified.
INV_OPERATION_VV_MODIFY_USR_CPG_TPVV	403 Forbidden	<code>usr_cpg</code> cannot be modified on a TPVV. (WSAPI 1.2 and later)
UNLICENSED_FEATURE	403 Forbidden	Retention time cannot be modified on a system without the Virtual Lock license.
CPG_NOT_IN_SAME_DOMAIN	403 Forbidden	Snap CPG is not in the same domain as the user CPG. (WSAPI 1.2 and later)
INV_OPERATION_VV_PEER_VOLUME	403 Forbidden	Cannot modify a peer volume.

Table 38 Volume modification request error codes (continued)

API Error	HTTP Code	Description
		(WSAPI 1.2 and later)
INT_SERV_ERR	500 Internal Server Error	Metadata of the VV is corrupted.
INV_OPERATION_VV_SYS_VOLUME	403 Forbidden	Cannot modify retention time on a system volume. (WSAPI 1.2 and later)
INV_OPERATION_VV_INTERNAL_VOLUME	403 Forbidden	Cannot modify an internal volume (WSAPI 1.2 and later)
INV_OPERATION_VV_VOLUME_NOT_DEFINED_ALL_NODES	409 Conflict	Cannot modify a volume until the volume is defined on all volumes. (WSAPI 1.2 and later)
INVALID_OPERATION_VV_ONLINE_COPY_IN_PROGRESS	409 Conflict	Cannot modify a volume when an online copy for that volume is in progress. (WSAPI 1.2 and later)
INVALID_OPERATION_VV_VOLUME_CONV_IN_PROGRESS	409 Conflict	Cannot modify a volume in the middle of a conversion operation. (WSAPI 1.2 and later)
INVALID_OPERATION_VV_SNAPSPACE_NOT_MOVED_TO_CPG	409 Conflict	Snapshot space of a volume needs to be moved to a CPG before the user space. (WSAPI 1.2 and later)
INV_OPERATION_VV_VOLUME_ACCOUNTING_IN_PROGRESS	409 Conflict	The volume cannot be renamed until snapshot accounting has finished. (WSAPI 1.2 and later)
INV_OPERATION_VV_ZERO_DETECT_TPVV	403 Forbidden	The zero_detect policy can be used only on TPVVs. (WSAPI 1.2 and later)
INV_OPERATION_VV_CPG_ON_SNAPSHOT	409 Conflict	CPG cannot be assigned to a snapshot.
INV_INPUT_VV_IS_TPVV	403 Forbidden	Volume is already thinly provisioned. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_SNAPSHOT_NOT_SAME_TYPE	403 Forbidden	Snapshot CPG should be tuned. (WSAPI 1.4 and later)

Growing volumes

To grow a volume, use the HTTP PUT method with the following URI:

`https://<storage_system>:8080/api/v1/volumes/<volume_name>`

The **<volume_name>** variable is the name of the volume to be grown.

The message body is a JSON object with two members, as shown in [Table 39 \(page 80\)](#).

Table 39 Message body JSON object members for growing volumes

Member	JSON type	API type	Ignored Values	Description
action	number	Enum	Required field	Specifies the action to be taken for the specified volume.
sizeMiB	number	uint32	Required field	Specifies the size in MiB to be added to the volume user space. The size is rounded up to the next multiple of chunklet size, 256 MiB or 1000 MiB.

Enumeration for the `action` JSON object is shown in [Table 40 \(page 80\)](#).

Table 40 Enumeration for the `action` JSON object

Symbol	Value	Description
STOP_PHYSICAL_COPY	1	Stop the physical copy operation. (WSAPI 1.3 and later)
RESYNC_PHYSICAL_COPY	2	Resynchronize the physical copy. (WSAPI 1.3 and later)
GROW_VOLUME	3	Increase the size of a virtual volume. (WSAPI 1.3 and later)
PROMOTE_VIRTUAL_COPY	4	Promote a virtual copy. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
STOP_PROMOTE_VIRTUAL_COPY	5	Stop the promote virtual copy task. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
TUNE_VOLUME	6	Tune a volume. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
UPDATE_VIRTUAL_COPY	7	Update a virtual copy or vvset. (WSAPI 1.5 and later)
SNAPSHOT_ENUM_ACTION	8	Create a snapshot for a group of volumes. (WSAPI 1.5 and later)

Volume growth success

A successful request to grow a volume returns the HTTP status code 200 OK. The `Location` portion of the response header contains the following URI:

```
/api/v1/volumes/<volume_name>
```

Volume growth error codes

For possible errors following a request to grow a volume, see [Table 41 \(page 80\)](#).

Table 41 Volume growth error codes

API Error	HTTP Code	Description
VV_NOT_IN_SAME_DOMAIN	403 Forbidden	The volume is not in the same domain. (WSAPI 1.3 and later)
NON_EXISTENT_VOL	404 Not Found	The volume does not exist.

Table 41 Volume growth error codes *(continued)*

API Error	HTTP Code	Description
		<i>(WSAPI 1.3 and later)</i>
INV_OPERATION_UNSUPPORTED_VV_TYPE	403 Forbidden	Invalid operation: Cannot grow this type of volume. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_TUNE_IN_PROGRESS	409 Conflict	Invalid operation: Volume tuning is in progress. <i>(WSAPI 1.3 and later)</i>
INV_INPUT_EXCEEDS_LENGTH	400 Bad Request	Invalid input: String length exceeds limit. <i>(WSAPI 1.3 and later)</i>
INV_INPUT_VV_GROW_SIZE	400 Bad Request	Invalid grow size. <i>(WSAPI 1.3 and later)</i>
VV_NEW_SIZE_EXCEED_CPG_LIMIT	403 Forbidden	The new volume size exceeds the CPG limit. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_INTERNAL_VOLUME	403 Forbidden	This operation is not allowed on an internal volume. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_VOLUME_CONV_IN_PROGRESS	409 Conflict	Invalid operation: Volume conversion is in progress. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_ONLINE_COPY_IN_PROGRESS	409 Conflict	Invalid operation: online copy is in progress. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_CLEANUP_IN_PROGRESS	403 Forbidden	Internal volume cleanup is in progress. <i>(WSAPI 1.3 and later)</i>
VV_IS_BEING_REMOVED	403 Forbidden	The volume is being removed. <i>(WSAPI 1.3 and later)</i>
VV_IN_INCONSISTENT_STATE	403 Forbidden	The volume has an internal consistency error. <i>(WSAPI 1.3 and later)</i>
VV_SIZE_CANNOT_REDUCE	403 Forbidden	New volume size is smaller than the current size. <i>(WSAPI 1.3 and later)</i>
VV_NEW_SIZE_EXCEED_LIMIT	403 Forbidden	The new volume size exceeds the limit. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_SA_SD_SPACE_REMOVED	409 Conflict	Invalid operation: Volume SA/SD space is being removed. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_IS_BUSY	409 Conflict	Invalid operation: The volume is currently busy. <i>(WSAPI 1.3 and later)</i>
VV_NOT_STARTED	403 Forbidden	The volume is not started. <i>(WSAPI 1.3 and later)</i>

Table 41 Volume growth error codes (continued)

API Error	HTTP Code	Description
INV_OPERATION_VV_IS_PCOPY	409 Conflict	Invalid operation: The volume is a physical copy. (WSAPI 1.3 and later)
INV_OPERATION_VV_NOT_IN_NORMAL_STATE	403 Forbidden	The volume state is not normal. (WSAPI 1.3 and later)
INV_OPERATION_VV_PROMOTE_IN_PROGRESS	409 Conflict	Invalid operation: Volume promotion is in progress. (WSAPI 1.3 and later)
INV_OPERATION_VV_PCOPY_IN_PROGRESS	409 Conflict	The volume has a copy in progress. (WSAPI 1.3 and later)
INV_OPERATION_VV_PARENT_OF_PCOPY	409 Conflict	Invalid operation: The volume is the parent of a physical copy. (WSAPI 1.3 and later)
NO_SPACE	400 Bad Request	Insufficient space for requested operation. (WSAPI 1.3 and later)

Tuning a virtual volume

❗ Licensing information:

Software licensing requirements

- To convert volumes from TPVV or TDVV to full, you need the 3PAR Dynamic Optimization Software license.
- To convert volumes from full to TPVV or TDVV, you need both the 3PAR Dynamic Optimization Software license and the 3PAR Thin Provisioning Software license.

To tune a volume, use the HTTP PUT method with the following URI:

https://<storage_system>:8080/api/v1/volumes/<volume_name>

The <volume_name> parameter contains the name of the volume to be tuned.

The message body is a JSON object with members as shown in [Table 42 \(page 82\)](#).

Table 42 JSON object members for a volume tune operation

Member	JSON type	API type	Ignored Values	Description
action	number	Action Enum	Required field.	Specifies the action to be performed on the volume. (WSAPI 1.3 and later)
tuneOperation	number	tuneOperationEnum	Required.	Tune operation. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
userCPG	string	name31	Required if the tuneOperation value is 1.	Specifies the new user CPG that the volume will be tuned to. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)

Table 42 JSON object members for a volume tune operation *(continued)*

Member	JSON type	API type	Ignored Values	Description
snapCPG	string	name31	Required if the tuneOperation value is 2.	Specifies the snap CPG that the volume will be tuned to. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
conversionOperation	number	conversionOperationEnum	Ignored if 0 or null. If the value is 1, 2, or 3, usrCPG must be specified.	See Table 43 (page 83) . (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1) (WSAPI 1.4 and later)
keepVV	string	name31	This requires conversionOperation to be 1, 2, or 3.	The name of the new volume where the original logical disks will be saved. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)

Enumeration for the tuneOperationEnum JSON object is shown in [Table 43 \(page 83\)](#).

Table 43 tuneOperationEnum enumeration for tuning a volume

Symbol	Value	Description
USR_CPG	1	Change the user CPG of the volume. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
SNP_CPG	2	Change the snap CPG of the volume. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)

Enumeration for the conversionOperationEnum JSON object is shown in [Table 44 \(page 83\)](#).

Table 44 conversionOperationEnum enumeration for tuning a volume

Symbol	Value	Description
TPVV	1	Convert the volume to a TPVV. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
FPVV	2	Convert the volume to an FPVV. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
TDVV	3	Convert the volume to a TDVV. (WSAPI 1.4.1 and later)

Virtual volume tuning success

A successful request to tune a volume returns the HTTP status code 200 OK. The message body shows the task ID of the tunevv task. For example:

```
{
  taskid: 1234
  links: [ 1 ]
    - 0: {
      href: "https://<server_name>:8080/api/v1/volumes/<vvcopy_name>"
      rel: "self",
```

```
}
}
```

If you specified `keepVV`, a successful request returns the HTTP status code `200 OK`. The message body shows the task ID of the `tunevv` task and the URI of the newly created volume. For example:

```
{
  taskid: 1234
  links: [ 2 ]
    - 0: {
      href: "https://<server_name>:8080/api/v1/volumes/<vv_tuned>"
      rel: "self"
    }
    - 1: {
      href: "https://<server_name>:8080/api/v1/volumes/keepvv"
      rel: "OriginalLDsVV"
    }
}
```

Virtual volume tuning errors

An error condition returns an error code as shown in [Table 45 \(page 84\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 45 Error codes for volume tuning

API Error	HTTP Code	Description
CPG_NOT_IN_SAME_DOMAIN	403 Forbidden	The CPG is not in the current domain. (WSAPI 1.3 and later)
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	Invalid volume name or CPG name. (WSAPI 1.3 and later)
INV_INPUT_VV_IS_FPVV	403 Forbidden	The volume is already fully provisioned. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_INPUT_VV_IS_TDVV	403 Forbidden	The volume is already deduplicated. (WSAPI 1.4.1 and later)
INV_INPUT_VV_IS_TPVV	403 Forbidden	The volume is already thinly provisioned. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_UNSUPPORTED_VV_TYPE	403 Forbidden	Invalid operation: Cannot grow this type of volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_MODIFY_USR_CPG_TDVV	403 Forbidden	Cannot change USR CPG of a TDVV to a different CPG. (WSAPI 1.4.1 and later)
INV_OPERATION_VV_NON_BASE_VOLUME	403 Forbidden	The destination volume is not a base volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_SYS_VOLUME	403 Forbidden	The volume is a system volume. This operation is not allowed on a system volume.

Table 45 Error codes for volume tuning *(continued)*

API Error	HTTP Code	Description
		<i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_CLEANUP_IN_PROGRESS	403 Forbidden	Cleanup of internal volume for the volume is in progress. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_INTERNAL_VOLUME	403 Forbidden	The operation is not allowed on an internal volume. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_VOLUME_CONV_IN_PROGRESS	409 Conflict	The volume is in a conversion operation. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_NOT_IN_NORMAL_STATE	403 Forbidden	The volume is not in the normal state. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_PEER_VOLUME	403 Forbidden	The operation is not allowed on a peer volume. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_TASK_CANCEL_IN_PROGRESS	409 Conflict	Invalid operation: A task involving the volume is being canceled. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
INV_OPERATION_VV_PROMOTE_IN_PROGRESS	409 Conflict	Invalid operation: Volume promotion is in progress. <i>(WSAPI 1.3 and later)</i>
INV_OPERATION_VV_TUNE_IN_PROGRESS	409 Conflict	Invalid operation: Volume tuning is in progress.
NO_SPACE	400 Bad Request	Insufficient space for requested operation.
NODE_DOWN	403 Forbidden	The node is down. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
NON_EXISTENT_CPG	404 Not Found	The CPG does not exist. <i>(WSAPI 1.3 and later)</i>
NON_EXISTENT_VOL	404 Not Found	The volume does not exist. <i>(WSAPI 1.3 and later)</i>
VV_IN_INCONSISTENT_STATE	403 Forbidden	The volume has an internal consistency error. <i>(WSAPI 1.3 and later)</i>
VV_IS_BEING_REMOVED	403 Forbidden	The volume is being removed. <i>(WSAPI 1.3 and later)</i>
VV_NEEDS_TO_BE_CHECKED	403 Forbidden	The volume needs to be checked. <i>(WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)</i>
VV_NOT_STARTED	403 Forbidden	Volume is not started. <i>(WSAPI 1.3 and later)</i>

Displaying virtual volume space distribution

You can display volume space distribution for all virtual volumes among CPGs, or display space distribution for a specific volume or volume set.

To display space distribution for all virtual volumes among CPGs, use the following HTTP GET request:

```
https://<storage_system>:8080/api/v1/volumespacedistribution
```

To display space distribution for a specific virtual volume or a volume set among CPGs, use the following HTTP GET request:

```
https://<storage_system>:8080/api/v1/volumespacedistribution/<name>
```

The `<name>` variable is either a single virtual volume name or a volume set name (start with **set:** to use a volume set name). If you use a volume set name, the system displays the space distribution for all volumes in that volume set.

Volume space distribution success

A successful query returns the HTTP code 200 OK.

Volume space distribution response

A successful query response includes a message body that contains a JSON array of zero or more JSON objects. [Table 46](#) lists the JSON object members for an all-virtual-volumes request. [Table 47](#) defines the volume space distribution data.

Table 46 JSON object members for a query of all virtual volumes

Member	JSON type	API type	Description
total	number	Int32	Number of data (WSAPI 1.5 and later)
members	Array of objects	Array of volume space distribution data	Virtual volume space distribution among CPGs (WSAPI 1.5 and later)
links	Array of URL links	Array of URL links	Links include the self URL (WSAPI 1.5 and later)

Table 47 JSON object members for a query of volume space distribution data

Member	JSON type	API type	Description
volumeName	string	name31	Name of the virtual volume. (WSAPI 1.5 and later)
CPGs	object	Array of spaceDistribution objects	Array of CPGs to which the virtual volume space is allocated. (WSAPI 1.5 and later)
links	URL links	URL links	Link to the single instance of virtual volume, volumeName. (WSAPI 1.5 and later)

[Table 48](#) defines the `spaceDistribution` object members.

Table 48 spaceDistribution objects

Member	JSON type	API type	description
cpgName	string	name31	CPG name (WSAPI 1.5 and later)
current	object	CPGSpace object	Current space distribution for a CPG (WSAPI 1.5 and later)
new	object	CPGSpace object	New space distribution for a CPG during the regional move. Object numbers display as 0 unless you are moving some regions from one CPG to another. During the move, the space being moved appears under both the current space object for the old CPG and under the new space object for the new CPG. After completing the move, the system removes the space from the old CPG and the volumes appear under the current space object for the new CPG only. (WSAPI 1.5 and later)
links	URL links	URL links	Link to the single instance of CPG, name. (WSAPI 1.5 and later)

Table 49 defines the CPGSpace object members.

Table 49 CPGSpace objects

Member	JSON type	API type	description
adminSpaceMiB	number	uint64	Admin space in MiB (WSAPI 1.5 and later)
snapshotSpaceMiB	number	uint64	Snapshot space in MiB (WSAPI 1.5 and later)
userSpaceMiB	number	uint64	User space in MiB (WSAPI 1.5 and later)

Error Mapping for volume space distribution queries

Table 50 list the possible errors when querying volume space distribution:

Table 50 Error codes for distributing volumes

API error	HTTP code	Description
INT_SERV_ERR	500 Internal Server Error	Internal Server Error (WSAPI 1.5 and later)

Removing a storage volume

To remove a volume, use the HTTP DELETE method with the following URI and no message body:

`https://<storage_system>:8080/api/v1/volumes/<volume_name>`

Storage volume removal success

A successful storage-volume removal returns the HTTP status code 200 OK.

Storage volume removal errors

An error condition returns an error code as shown in [Table 51 \(page 88\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 51 Storage volume removal error codes

API Error	HTTP Code	Description
NON_EXISTENT_VOL	404 Not Found	The volume does not exist.
RETAINED	409 Conflict	The volume retention time has not expired.
HAS_RO_CHILD	409 Conflict	The volume has read-only child.
HAS_CHILD	409 Conflict	The volume has a child volume. (WSAPI 1.2 and later)
IN_USE	409 Conflict	The volume is in use by VV set, VLUN, etc. (WSAPI 1.2 and later)

Querying volume information

Querying all volumes

To query for storage volume information, use the HTTP GET method with the following URI and no message body:

https://<storage_system>:8080/api/v1/volumes

All-volumes query success

As of WSAPI 1.3, in order to support a large number of volumes and VLUNs in the 3PAR OS, HTTP chunked transfer encoding is used to send a response in chunked format. The HTTP response header is similar to the following example:

```
HTTP/1.1 200 OK
Date: Fri, 22 May 2013 18:05:43 GMT
Server: hp3par-wsapi
Cache-Control: no-cache
Pragma: no-cache
Content-Type: application/json
Connection: close
Transfer-Encoding: chunked
```

Each chunk starts with the `chunk-size` field, which is a string of hexadecimal digits and a terminating CRLF sequence followed by the chunk data. The chunk is terminated by CRLF. The last chunk is a regular chunk, except that its length is zero.

Unless an error occurs, the response includes a message body with the JSON objects shown in [Table 52](#).

Table 52 JSON object members in message body

Member	JSON type	API type	Description
total	number	int32	Number of volume objects returned
members	array of objects	array of Volume Property objects	Storage volume properties
links	Array of URL links	Array of URL links	Links include the URL for self and space distribution for all volumes

JSON object members are shown in [Table 53 \(page 89\)](#)

Table 53 Message body JSON objects for volume query

Member	JSON type	API type	Description
additionalStates	array of numbers	array of volume DetailedState Enum	Detailed state of the VV.
adminSpace	Object	Space	Administrative space in MiB.
baseId	number	uint32	The ID of the volume that is the base volume (at the root of the snapshot tree) for the volume.
comment	string	print511	Comment associated with the volume.
capacityEfficiency	Object	capacityEfficiency object	Capacity efficiency attributes (see Table 234). (WSAPI 1.4.1 with 3PAR OS 3.2.1 MU1)
copyOf	string	name31	If the volume is a physical copy or virtual copy of another volume, this field indicates the volume that this volume is a copy of.
copyType	number	copyType Enum	Indicates the copy type of the volume.
creationTime8601	string	8601	Time of volume creation.
creationTimeSec	number	epoch	Time of volume creation, measured in seconds since 12 AM on 01/01/1970.
degradedStates	array of numbers	array of volume DetailedState Enum	Detailed state of the volume.
domain	string	name31	Volume domain.
expirationTime8601	string	8601	Time of volume expiration.
expirationTimeSec	number	epoch	Time of volume expiration.
failedStates	array of numbers	array of volume DetailedState Enum	Detailed state of the volume.
id	number	int32	Volume identifier.
links	Array of URL links	Array of URL links	Links include the URL for space distribution for a particular volume, and the self URL when querying for the single instance.
name	string	name31	Volume name.
parentId	number	int32	ID of the parent in the snapshot tree (not necessarily the same as the CopyOf VV).
physParentId	number	int32	ID of the physical parent. Valid only for a physical copy.
policies	object	policies object	Policies used for the volume.
provisioningType	number	provisioningType Enum	Volume provisioning. See Table 29 (page 70) .
readOnly	boolean	boolean	true: Read only. false: Read and write allowed.
retentionTime8601	string	8601	Time of volume retention time expiration.

Table 53 Message body JSON objects for volume query (continued)

Member	JSON type	API type	Description
retentionTimeSec	number	epoch	Time of volume retention expiration.
roChildId	number	int32	ID of the read-only child volume in the snapshot tree.
rwChildId	number	int32	ID of the read/write child volume in the snapshot tree.
sizeMiB	number	uint32	Virtual size of volume in MiB (1024 ² bytes).
snapCPG	string	name31	CPG name from which the snapshot (snap and admin) space is allocated.
snapshotSpace	Object	Space	Snapshot space in MiB.
ssSpcAllocLimitPct	number	igint32	Sets a snapshot space allocation limit. Prevents the snapshot space of the volume from growing beyond the indicated percentage of the volume size.
ssSpcAllocWarningPct	number	igint32	Enables a snapshot space allocation warning. Generates a warning alert when the reserved snapshot space of the virtual volume exceeds the indicated percentage of the virtual volume size.
state	number	state Enum	State of the volume.
userCPG	string	name31	CPG name from which the user space is allocated.
userSpace	Object	Space	User space in MiB.
usrSpcAllocLimitPct	number	igint32	This field sets the user space allocation limit. The user space of the TPVV is prevented from growing beyond the specified percentage of the volume size. After the size is reached, any new writes to the volume will fail.
usrSpcAllocWarningPct	number	igint32	This field enables a user space allocation warning. It specifies that a warning alert is generated when the reserved user space of the TPVV exceeds the specified percentage of the volume size.
uuid	string	uuid string	The UUID that was automatically assigned to the volume at creation.
wwn	string	WWN	Volume WWN.

All-volumes query errors

An unsuccessful query of all volumes might return the `INT_SERV_ERR`. For details about this error code, see [Table 6 \(page 29\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Chunking errors

During a query for all volumes or all VLUNs, the WSAPI server might encounter either of the following errors related to chunked encoding:

- An error might occur when the WSAPI server tries to get the first chunk of data. In this case, the WSAPI sends the HTTP error to the client, and stops sending the subsequent chunks of data. For example:

```
HTTP/1.1 <http error code> <http error msg>
Date: Fri, 22 May 2013 18:05:43 GMT
Server: hp3par-wsapi
Cache-Control: no-cache
Pragma: no-cache
Content-Type: application/json
Connection: close
{
  : <API error code code>
  desc:
}
```

- An error may occur while the WSAPI tries to get the second or any subsequent chunk of data.

Once HTTP headers are sent to the client (a header is always sent with the first successful chunk of data), the intended response must finish being sent. If an error occurs midway through the process, there is no way to report the error to the client. The only solution is to close the connection. The client will not receive the terminating zero-length CRLF chunk at the end of response. To help the client debug and resolve the issue, the WSAPI will send the API error code and its description as part of the JSON payload when the error occurs. For example:

```
"success":false,"message":{"code":101,"desc":"Invalid cursor id for chunking"}
```

Since there is no zero-length CRLF chunk at the end of response, the client has the option of handling the error either by catching the exception or by ignoring the error.

Querying a single volume

To query a single volume, use the HTTP GET method with the following URI:

https://<storage_system>:8080/api/v1/volumes/<volume_name>

Single-volume query success

The WSAPI server does not use chunked transfer encoding on requests for a single volume or VLUN.

Unless an error occurs, the response includes a message body as specified in [Table 53 \(page 89\)](#).

Single-volume query errors

Possible errors following a single-volume query are shown in [Table 54 \(page 91\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 54 Single-volume query error codes

API Error	HTTP Code	Description
INV_INPUT_ILLEGAL_CHAR	400 Bad request	Invalid character for volume name.

Table 54 Single-volume query error codes *(continued)*

API Error	HTTP Code	Description
		<i>(WSAPI 1.2 and later)</i>
NON_EXISTENT_VOL	404 Not Found	The volume does not exist. <i>(WSAPI 1.2 and later)</i>

Querying volume information with multiple WWNs

You can filter multiple WWNs in a query for a storage volume by using the HTTP GET method. Use the following URI with no message body:

```
https://<storage_system>:8080/api/v1/volumes?query="wwn EQ value1 OR
wwn EQ value2 ... OR wwn EQ valueN"
```

The filtering request supports the OR operator only, and is limited to approximately 150 WWNs, depending on how many spaces between blocks occur in the query. You can use == in place of EQ in the message body.

Volume query with WWN filtering success

A successful query returns a message body containing JSON object members as shown in [Table 55 \(page 92\)](#).

Table 55 Message body JSON objects for volume query with WWN filtering

Member	JSON type	API type	Description
members	array of objects	Array of volume objects	An array of volume objects matching the WWNs. With no matching volume found, returns an empty array. <i>(WSAPI 1.3 and later)</i>
total	number	int32	Number of volume objects returned, or zero if no WWNs matched volume records. <i>(WSAPI 1.3 and later)</i>

Errors for volume query with WWN filtering

Possible errors following a query for volume information with WWN filtering are shown in [Table 56 \(page 92\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 56 Volume query with WWN filtering error codes

API Error	HTTP Code	Description
INV_QUERY_STRING	400 Bad Request	Invalid query string. <i>(WSAPI 1.3 and later)</i>

Querying volume information with multiple volume filters

With WSAPI 1.3.1 and later, you can use the volume filter to query by UUIDs, userCPGs, and snapCPGs. You can filter multiple volumes in a query for a storage volume by using the HTTP GET method. Use the following URI with no message body:

```
https://<storage_system>:8080/api/v1/volumes?query="wwn EQ value1 OR
wwn EQ value2 OR userCPG EQ value3 OR snapCPG EQ value4... OR wwn EQ
valueN"
```

A filtering request supports the OR operator only with a limit of approximately 150 WWNs, depending on how many spaces between blocks occur in the query.

In place of “EQ” in the message body, “==” is acceptable.

To query for volumes that do not have a `userCPG` assigned, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/volumes?query="userCPG EQ null"
```

To query for volumes that do not have a `snapCPG` assigned, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/volumes?query="snapCPG EQ null"
```

Duplicate volume entries are not listed in a filtered query for volume information.

Volume query with multiple-volumes filters success

A successful query returns a message body containing JSON object members as shown in [Table 57 \(page 93\)](#).

Table 57 Message body JSON objects for volume query with multiple volume filters

Member	JSON type	API type	Description
members	array of objects	Array of volume objects	An array of volume objects matching any of the query conditions. With no matching volume found, returns an empty array. (WSAPI 1.3.1 and later MU1)
total	number	int32	Number of volume objects returned or zero if there are no matching volume records. (WSAPI 1.3.1 and later MU1)

Errors for volume query with multiple-volumes filters

Possible errors following a query for volume information with multiple-volumes filters are shown in [Table 58 \(page 93\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 58 Volume query with multiple-volumes filters error codes

API Error	HTTP Code	Description
INPUT_TOO_LONG	400 Bad Request	The client request is too long. (WSAPI 1.3.1 and later MU1)
INV_QUERY_STRING	400 Bad Request	Invalid query string. (WSAPI 1.3 and later)

6 Working with hosts

This chapter describes how to manage hosts. The sections apply to creation, modification, removal, and query operations on hosts.

Creating a host

- ❗ **IMPORTANT:** Any user with Super or Edit role, or any role granted `host_create` permission, can perform this operation. Requires access to all domains.

Create a host using the HTTP POST method. Use the following URI:

`https://<storage_system>:8080/api/v1/hosts`

Table 59 (page 94) shows the members that the message body can include.

Table 59 Message body JSON objects for host creation

Member	JSON type	Value Range	Mandatory	Ignored Values	Description
descriptors	HostDescriptors	descriptors object	No	Null	See HostDescriptors. (WSAPI 1.2 and later)
domain	string	name31	No	Null	Create the host in the specified domain, or default domain if unspecified. (WSAPI 1.2 and later)
FCWWNs	array of string	WWN	No	Null	One or more WWN to set for the host. (WSAPI 1.2 and later)
forceTearDown	boolean		No	None	If True, force to tear down low-priority VLUN exports. (WSAPI 1.2 and later)
iSCSINames	array of string	Name223	No	Null	One or more iSCSI names to set for the host. (WSAPI 1.2 and later)
name	string	name31	Yes	Null (Required)	Specifies the name of the host. (WSAPI 1.2 and later)
persona	number	HostPersona Enum	No	Zero and negative values	ID of the persona to assign to the host. If you do not specify the host persona, the default persona is used For 3PAR OS 3.1.3 and later, the default persona is Generic-ALUA. For OS 3.1.2 and earlier, the default persona is General. (WSAPI 1.2 and later)

When creating a host, the name is required. Other members are optional.

Host creation success

A successful host creation returns the `Location` portion of the response header, which contains the URI for the newly created host in the following format:

`/api/v1/hosts/<host_name>`

For example:

URI: `https://<Storage Server>:8080/api/v1/hosts`

Post: `{"name":"apitesthost","persona":5}`

Response: `HTTP/1.1 201 Created`

with the `Location` header:

`/api/v1/hosts/apitesthost`

Host creation errors

[Table 60 \(page 95\)](#) shows possible host creation errors. For generic API error codes, see [Table 6 \(page 29\)](#).

Table 60 Host creation error codes

API Error	HTTP Code	Description
EXISTENT_HOST	409 Conflict	Host name is already used. (WSAPI 1.2 and later)
EXISTENT_PATH	409 Conflict	iSCSI name or WWN is already claimed by other host. (WSAPI 1.2 and later)
INV_INPUT_EMPTY_STR	400 Bad Request	Input string (for domain name, iSCSI name, etc.) is empty. (WSAPI 1.2 and later)
INV_INPUT_EXCEEDS_LENGTH	400 Bad Request	Host name, domain name, or iSCSI name is too long. (WSAPI 1.2 and later)
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	Any error from host-name or domain-name parsing. (WSAPI 1.2 and later)
INV_INPUT_MISSING_REQUIRED	400 Bad Request	Name not specified. (WSAPI 1.2 and later)
INV_INPUT_PARAM_CONFLICT	400 Bad Request	Both <code>iSCSINames</code> and <code>FCWWNs</code> are specified. (WSAPI 1.2 and later)
INV_INPUT_TOO_MANY_WWN_OR_ISCSI	400 Bad Request	More than 1024 WWNs or iSCSI names are specified. (WSAPI 1.2 and later)
INV_INPUT_WRONG_TYPE	400 Bad Request	The length of WWN is not 16. WWN specification contains non-hexadecimal digit. (WSAPI 1.2 and later)
NO_SPACE	400 Bad Request	No space to create host.

Modifying a host

- ❗ **IMPORTANT:** Any user with Super or Edit role, or any role granted `host_set` permission, can perform this operation. Requires access to all domains.

Modify a host using the HTTP PUT method. Use the following URI:

`https://<storage_system>:8080/api/v1/hosts/<host_name>`

Table 61 (page 96) shows the members that the message body can include to make a host-modification request.

Table 61 Message body JSON objects for host modification request

Member	JSON type	API type	Ignored Values	Description
chapName	string	Name223	Null	The chap name. (WSAPI 1.2 and later)
chapOperationMode	number	hostChapOperationMode Enum	Zero and negative values	Initiator or target. (WSAPI 1.2 and later)
chapRemoveTargetOnly	boolean	boolean	None	if True, then remove target chap only. (WSAPI 1.2 and later)
chapSecret	string	string	Null	The chap secret for the host or the target (WSAPI 1.2 and later)
chapSecretHex	boolean	boolean	None	If True, then chapSecret is treated as Hex. (WSAPI 1.2 and later)
chapOperation	number	hostEditOperation Enum	Zero and negative values	Add or remove. (WSAPI 1.2 and later)
descriptors	HostDescriptors	descriptors object	Null	The description of the host. (WSAPI 1.2 and later)
FCWWNs	array of string	WWN	Null	One or more WWN to set for the host. (WSAPI 1.2 and later)
forcePathRemoval	boolean	boolean	None	If True, remove WWN(s) or iSCSI(s) even if there are VLUNs that are exported to the host. (WSAPI 1.2 and later)
iSCSINames	array of string	Name223	Null	One or more iSCSI names to set for the host. (WSAPI 1.2 and later)
newName	string	name31	Null	New name of the host (WSAPI 1.2 and later)
pathOperation	number	hostEditOperationEnum	Zero and negative values	If adding, adds the WWN or iSCSI name to the existing host.

Table 61 Message body JSON objects for host modification request (continued)

Member	JSON type	API type	Ignored Values	Description
				If removing, removes the WWN or iSCSI names from the existing host. (WSAPI 1.2 and later)
persona	number	hostPersona Enum	Zero and negative values	The ID of the persona to modify the host's persona to. (WSAPI 1.2 and later)

Table 62 (page 97) shows the `hostEditOperation` enumeration for the `chapOperation` and `pathOperation` JSON objects.

Table 62 Host `hostEditOperation` enumeration

Symbol	Value	Description
ADD	1	Add host chap or path. (WSAPI 1.2 and later)
REMOVE	2	Remove host chap or path. (WSAPI 1.2 and later)

Table 63 (page 97) shows the enumeration for the `chapOperationMode` JSON object.

Table 63 Host `chapOperationMode` enumeration

Symbol	Value	Description
INITIATOR	1	Set the initiator CHAP authentication information on the host. (WSAPI 1.2 and later)
TARGET	2	Set the target CHAP authentication information on the host. (WSAPI 1.2 and later)

Table 64 (page 97) shows the enumeration for the `hostPersona` JSON object.

Table 64 Host `hostPersona` enumeration

Symbol	Value
GENERIC	1
GENERIC_ALUA	2
GENERIC_LEGACY	3
HPUX_LEGACY	4
AIX_LEGACY	5
EGENERA	6
ONTAP_LEGACY	7
VMWARE	8
OPENVMS	9

Table 64 Host `hostPersona` enumeration (continued)

Symbol	Value
HPUX	10
WindowsServer	11

For details about persona capabilities, see the 3PAR command line interface administrator's guide

To obtain these documents, go to the following website:

[HPE Storage Information Library](http://www.hpe.com/info/storage/docs) (<http://www.hpe.com/info/storage/docs>)

Host modification success

A successful modification of a host returns the HTTP code 200 OK with no message body. The `Location` portion of the response header contains the URI of the updated host, as follows:

```
/api/v1/hosts/<host_name>
```

Host modification errors

Possible error codes following a host modification request are shown in [Table 65 \(page 98\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 65 Host modification error codes

API Error	HTTP Code	Description
INV_INPUT	400 Bad Request	Missing host name.
INV_INPUT_PARAM_CONFLICT	400 Bad Request	<p>If <code>pathOperation</code> is specified, then the following descriptors cannot be specified:</p> <pre>newName persona chapOperation</pre> <p>If <code>chapOperation</code> is specified, then the following descriptors cannot be specified:</p> <pre>newName persona pathOperation</pre> <p><code>forcePathRemoval</code> is specified and <code>pathOperation</code> is Add.</p> <p>The <code>forcePathRemoval</code> operation can be used only with path removal.</p> <p>Both <code>iSCSINames</code> and <code>FCWWNs</code> are specified.</p> <p>The system can handle either FC WWN or iSCSI names in one operation, but not both. (Multiple FC WWN or iSCSI names can be specified.)</p> <p><code>chapOperation</code> is Add, and <code>chapRemoveTargetOnly</code> is specified.</p> <p><code>chapRemoveTargetOnly</code> is for chap removal only.</p> <p><code>chapOperation</code> is remove, and <code>chapSecret</code>, <code>chapOperationMode</code>,</p>

Table 65 Host modification error codes *(continued)*

API Error	HTTP Code	Description
		chapName, or chapSecretHex is specified. chapSecret, chapOperationMode, chapName, or chapSecretHex are for chap addition (not removal).
INV_INPUT_ONE_REQUIRED	400 Bad Request	pathOperation is specified and no FCWWNs or iSCSINames is specified. At least one WWN or iSCSI name should be specified. Either FCWWNs or iSCSINames is specified and no pathOperation is specified. If pathOperation is not specified, then the system does not know whether to add or remove the specified path. forcePathRemoval is specified and pathOperation is not specified or null. forcePathRemoval can be used only with path removal. None of the following is specified: pathOperation newName descriptor chapOperation At least one operation for the host update should be specified.
INV_INPUT_BAD_ENUM_VALUE	400 Bad Request	Invalid enum value. The persona is not specified by a valid persona number.
INV_INPUT_MISSING_REQUIRED	400 Bad Request	Required fields are missing.
INV_INPUT_EXCEEDS_LENGTH	400 Bad Request	Host descriptor argument length, new host name, or iSCSI name is too long.
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	Any error from host or iSCSI name parsing.
EXISTENT_HOST	409 Conflict	New host name is already used.
NON_EXISTENT_HOST	404 Not Found	Host to be modified does not exist.
INV_INPUT_TOO_MANY_WWN_OR_ISCSI	400 Bad Request	More than 1024 WWNs or iSCSI names are specified.
INV_INPUT_WRONG_TYPE	400 Bad Request	Input value is of the wrong type.
EXISTENT_PATH	409 Conflict	WWN name or iSCSI name is already claimed by other host.
INV_INPUT_BAD_LENGTH	400 Bad Request	CHAP hex secret length is not 16 bytes, or chap ASCII secret length is not 12–16 characters.
NO_INITIATOR_CHAP	404 Not Found	Setting target CHAP without initiator CHAP.

Table 65 Host modification error codes *(continued)*

API Error	HTTP Code	Description
NON_EXISTENT_CHAP	404 Not Found	Remove non-existing CHAP.
NON_UNIQUE_CHAP_SECRET	409 Conflict	CHAP secret is not unique.
EXPORTED_VLUN	409 Conflict	Setting persona with active export. Remove a host path on an active export.
NON_EXISTENT_PATH	400 Bad Request	Removing a non-existent path.
LUN_HOSTPERSONA_CONFLICT	409 Conflict	LUN number and persona capability conflict:
INV_INPUT_DUP_PATH	404 Bad Request	Duplicate path specified.

Removing a host

- ❗ **IMPORTANT:** Any user with Super or Edit role, or any role granted `host_remove` permission, can perform this operation. Requires access to all domains.

To remove a host, use the HTTP DELETE method. Use the following URI:

`https://<storage_system>:8080/api/v1/hosts/<host_name>`

Host removal success

A successful host removal returns the HTTP code 200 OK with no message body.

Host removal errors

[Table 66 \(page 100\)](#) shows the errors that can occur following a request for host removal. For generic API error codes, see [Table 6 \(page 29\)](#).

Table 66 Host removal error codes

API Error	HTTP Code	Description
NON_EXISTENT_HOST	404 Not Found	Host not found.
HOST_IN_SET	409 Conflict	Host is a member of a set. (WSAPI 1.2 and later)

Querying host information

Querying all hosts

Query hosts using the HTTP GET method. Use the following URI with no message body:

`https://<storage_system>:8080/api/v1/hosts`

Querying a single host

To query a single host, use the following URI with no message body:

`https://<storage_system>:8080/api/v1/hosts/<host_name>`

Host query success

Unless an error occurs, the response includes a message body containing a JSON array of zero or more JSON objects, as shown in [Table 67 \(page 101\)](#).

Table 67 Host query JSON objects

Member	JSON type	API type	Description
name	string	name31	Specifies the name of the host. (WSAPI 1.2 and later)
persona	number	HostPersona Enum	ID of the persona to assigned to the host. (WSAPI 1.2 and later)
links	link	Array of links	Link to detailed persona info
FCPaths	Array of objects	Array of FCPaths objects	See Table 69 (page 102) . (WSAPI 1.2 and later)
iSCSIPaths	Array of objects	Array of iSCSIPaths objects	See Table 70 (page 102) . (WSAPI 1.2 and later)
domain	string	name31	The domain or associated with this host. (WSAPI 1.2 and later)
descriptors	Descriptors	—	See Table 68 (page 101) . (WSAPI 1.2 and later)
agent	Agent	—	See Table 72 (page 103) . (WSAPI 1.2 and later)
initiatorChapName	string	Name223	Initiator Chap Name (WSAPI 1.2 and later)
initiatorChapEnabled	boolean	boolean	Flag to determine whether or not the chap initiator is enabled. (WSAPI 1.2 and later)
targetChapName	string	Name223	Target chap name. (WSAPI 1.2 and later)
targetChapEnabled	boolean	boolean	Flag to determine whether or not the chap target is enabled. (WSAPI 1.2 and later)
initiatorEncryptedChapSecret	string	Name16	Encrypted CHAP secret of initiator. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
targetEncryptedChapSecret	string	Name16	Encrypted CHAP secret of target. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)

The `descriptors` member is an optional sub-object of the host object for creation and modification. The host object returns the `descriptors` sub-object following a query. See [Table 68 \(page 101\)](#).

Table 68 Host descriptors JSON objects

Member	JSON type	Description
location	string	The host's location.

Table 68 Host descriptors JSON objects *(continued)*

Member	JSON type	Description
		<i>(WSAPI 1.2 and later)</i>
IPAddr	string	The host's IP address. <i>(WSAPI 1.2 and later)</i>
os	string	The operating system running on the host. <i>(WSAPI 1.2 and later)</i>
model	string	The host's model. <i>(WSAPI 1.2 and later)</i>
contact	string	The host's owner and contact. <i>(WSAPI 1.2 and later)</i>
comment	string	Any additional information for the host. <i>(WSAPI 1.2 and later)</i>

When a host object is queried, it may include an array of one or more `FCPaths` objects. See [Table 69 \(page 102\)](#).

Table 69 Host FCPaths JSON objects

Member	JSON type	Description
WWN	string	A WWN assigned to the host. <i>(WSAPI 1.2 and later)</i>
portPos	portPos	See Table 71 (page 103) .
firmwareVersion	string	HBA firmware version. <i>(WSAPI 1.2 and later)</i>
vendor	string	HBA vendor. <i>(WSAPI 1.2 and later)</i>
model	string	HBA model. <i>(WSAPI 1.2 and later)</i>
driverVersion	string	HBA driver version <i>(WSAPI 1.2 and later)</i>
hostSpeed	string	HBA host speed <i>(WSAPI 1.2 and later)</i>

When a host object is queried, it may include an array of one or more `iSCSIPaths` objects. See [Table 70 \(page 102\)](#).

Table 70 Host iSCSIPaths JSON objects

Member	JSON type	Description
name	string	An iSCSI name to be assigned to the host. <i>(WSAPI 1.2 and later)</i>
portPos	portPos	See Table 71 (page 103) . <i>(WSAPI 1.2 and later)</i>

Table 70 Host iSCSIPaths JSON objects (continued)

Member	JSON type	Description
IPAddr	string	IP address for Remote Copy. (WSAPI 1.2 and later)
firmwareVersion	string	HBA firmware version. (WSAPI 1.2 and later)
vendor	string	HBA vendor. (WSAPI 1.2 and later)
model	string	HBA model. (WSAPI 1.2 and later)
driverVersion	string	HBA driver version (WSAPI 1.2 and later)
hostSpeed	string	HBA host speed. (WSAPI 1.2 and later)

The FCPaths and iSCSIPaths sub-object of the host object may in turn contain a portPos sub-object. See [Table 71 \(page 103\)](#).

Table 71 Host portPos configuration JSON objects

Member	JSON type	API type	Description
node	number	igint32 (0 – 7)	System node.
slot	number	igint32 (0–5)	PCI bus slot in the node.
cardPort	number	igint32 (0–4)	Port number on the FC card.

agent is an optional sub-object of the host object. See [Table 72 \(page 103\)](#).

Table 72 Host agent JSON objects

Member	JSON type	API type	Description
reportedName	string	Name255	The host name reported by the agent. (WSAPI 1.2 and later)
IPAddr	string	Name255	The host agent IP address. (WSAPI 1.2 and later)
architecture		Name255	The architecture description of the host agent. (WSAPI 1.2 and later)
os	string	Name255	Operating system of the host agent. (WSAPI 1.2 and later)
osVersion	string	Name255	The operating system version of the host agent. (WSAPI 1.2 and later)
osPatch	string	Name255	The operating system patch level of host agent. (WSAPI 1.2 and later)

Table 72 Host agent JSON objects (continued)

Member	JSON type	API type	Description
multiPathSoftware	string	Name255	The multipathing software in use by the host agent. (WSAPI 1.2 and later)
multiPathSoftwareVersion	string	Name255	The multipathing software version. (WSAPI 1.2 and later)
clusterName	string	Name255	Name of the host cluster of which the host is a member. (WSAPI 1.2 and later)
clusterSoftware	string	Name255	Host clustering software in use on host. (WSAPI 1.2 and later)
clusterVersion	string	Name255	Version of the host clustering software in use. (WSAPI 1.2 and later)
clusterId	string	Name255	Identifier for the cluster. (WSAPI 1.2 and later)
hosted	string	Name255	Identifier for the host agent (WSAPI 1.2 and later)

Host query errors

Table 73 (page 104) shows the errors that can occur following a host query. For generic API error codes, see Table 6 (page 29).

Table 73 Host query errors

API Error	HTTP Code	Description
INV_INPUT	400 Bad Request	Invalid URI syntax. (WSAPI 1.2 and later)
NON_EXISTENT_HOST	404 Not Found	Host not found.
INT_SERV_ERR	500 Internal Server Error	Internal server error.
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	Host name contains invalid character.

Querying host information with WWN filtering

To query a host with a given WWN or iSCSI name, use the HTTP GET method. You must specify the `FCPaths` WWN or the `iSCSIPaths` name in the URI, as shown in the following example:

```
https://<storage_system>:8080/api/v1/hosts?query=" FCPaths[wwn EQ 5001438024226EAE OR wwn EQ 20010002AC000999 OR wwn EQ 10000000C98C4D95] OR iSCSIPaths[name EQ ign.1991-05.com.microsoft:fakeISCSIHost1 OR name EQ ign.1991-05.com.microsoft:fakeISCSIHost2 OR name EQ ign.1991-05.com.microsoft:fakeISCSIHost3 OR name EQ ign.1991-05.com.microsoft:fakeISCSIHost4 OR name EQ ign.1991-05.com.microsoft:fakeISCSIHost5] "
```


Host query with WWN filtering success

A successful query filtering operation returns a message body with JSON object members as shown in [Table 74 \(page 105\)](#).

Table 74 Message body JSON objects for host query with a WWN filtering

Member	JSON type	API type	Description
total	number	int32	Number of host objects returned. If the host record matching the WWN is found, the number of hosts will be 1; otherwise, it will be 0. (WSAPI 1.3 and later)
members	array of objects	array of Host Property objects. (An array of size 1 will be returned if a host is found matching the WWN; otherwise, an empty array will be returned.)	Storage host properties. (WSAPI 1.3 and later)

Host query with WWN filtering errors

Possible errors following a query for host information with WWN filtering are shown in [Table 73 \(page 104\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Querying host personas

You can query multiple host personas or query a specific host persona.

Querying multiple host personas

To query for multiple host persona information, use the HTTP GET method with the following URI and no message body:

`https://<storage_system>:8080/api/v1/hostpersonas`

The body of the response includes an object as described in [Table 75](#).

Table 75 Message body objects for host persona query

Member	JSON type	API type	Description
total	number	Int32	Total number of host personas
members	Array of objects	Array of host persona data	Host persona objects
links	Array of URL links	Array of URL links	Links include the self URL

As is the case with all collection queries, the total object is the number of objects in the collection. The members object is a JSON array of zero or more JSON objects as listed in [Table 76](#):

Table 76 JSON objects for host persona queries

Member	JSON type	API type	Description
id	number	UInt32	Persona Id.
name	string	string	Persona name.
wsapiAssignedId	string	Array of String	Persona ID assigned by WSAPI.
OS	string	Array of String	List of supported operating systems.

Table 76 JSON objects for host persona queries *(continued)*

Member	JSON type	API type	Description
capabilities	string	Array of String	List of capabilities.
links	Array of URL links	Array of URL links	Link to the persona single instance URI.

Multiple host persona query success

A successful query returns the HTTP status code 200 OK.

Multiple host persona query errors

Host persona errors include the error shown in [Table 77](#).

Table 77 Host persona query errors

API Error	HTTP Code	Description
INT_SERV_ERR	500	Internal Server Error

Querying persona information with wsapiAssignedId filtering

You can filter by wsapiAssignedId using the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/hostpersonas?query="wsapiAssignedId EQ <wsapiAssignedId>"
```

Use the OR operator to filter requests for multiple wsapiAssignedId:

```
https://<storage_system>:8080/api/v1/hostpersonas?query="wsapiAssignedId EQ <wsapiAssignedId1> OR wsapiAssignedId EQ <wsapiAssignedId2>"
```

For example, to query the host personas with wsapiAssignedId 1 or 2, use HTTP GET with the following URI:

```
https://<storage_system>:8080/api/v1/hostpersonasnl?query="wsapiAssignedId EQ 1 OR wsapiAssignedId EQ 2"
```

Host persona query with wsapiAssignedId filtering success

A successful query returns the HTTP status code 200 OK, and a message body containing JSON object members as defined in [Table 76](#).

If the filtering does not match any host persona, the system returns zero for the total and an empty array for members.

Host persona query with wsapiAssignedId filtering errors.

[Table 78](#) lists possible errors for host persona query with wsapiAssignedId filtering.

Table 78 wsapiAssignedID filtering errors

API error	HTTP code	Description
INT_QUERY_STRING	400	Invalid query string

Querying a single host persona

To query a single host persona, use the HTTP GET method on the following URI and no message body:

```
https://<storage_system>:8080/api/v1/hostpersonas/<id>
```

The <id> parameter is the host persona id you want to query. The body of the response includes an object as described in [Table 76 \(page 105\)](#).

Single host persona query success

A successful query returns the HTTP status code 200: OK.

Single host persona query errors

Table 79 shows the possible host persona errors when querying a single host persona.

Table 79 Single host persona query errors

API Error	HTTP Code	Description
NON_EXISTENT_PERSONA	404 Not found	Persona does not exist

7 Working with host sets and VV sets

This chapter describes how to manage sets for volumes and hosts. The sections describe how to create, modify, remove, and perform query operations on sets.

You can use information in this chapter to:

- Create a host set or VV set
- Modify a host set or VV set
- Remove a host set or VV set
- Query all host sets or VV sets
- Query single host sets or single VV sets
- Export a VLUN from a VV set
- Set and query flash-cache policy for a VV set.

For information about exporting a VLUN to a host set, see [“Creating a VLUN” \(page 125\)](#).

For information about creating, querying, and removing flash cache, see [“Working with Flash cache” \(page 193\)](#). For information about setting and querying flash-cache policy for the entire system, see [“Setting and querying system flash-cache policy” \(page 207\)](#).

Creating a host set or VV set

To create a host set, use the HTTP POST in the following URI, with a message body as shown in [Table 80 \(page 108\)](#):

`https://<storage_system>:8080/api/v1/hostsets/<host_set_name>`

To create a VV set, use the HTTP POST method in the following URI, with message body parameters as shown in [Table 80 \(page 108\)](#):

`https://<storage_system>:8080/api/v1/volumesets/`

Table 80 Message body JSON objects for host-set and VV-set creation

Member	JSON type	API type	Mandatory	Ignored Values	Description
name	string	Name27	Yes	None. Required field.	Name of the VV set or host set to be created.
comment	string	Print255	No	Null, empty string	Comment for the VV set or host set.
domain	string	name31	No	Null, empty string	The domain in which the VV set or host set will be created.
setmembers	array of string		No	Null	The virtual volume or host to be added to the set. The existence of the volume or will not be checked.

IMPORTANT: Any user with the Super or Edit role can create a host set or VV set. Any role granted `hostset_set` permission can add hosts to a host set. Any role granted `vvset_set` permission can add volumes to a VV set.

Hosts can be added to a host set, or volumes to a VV set, by using a glob-style pattern. A glob-style pattern is not supported when removing hosts or volumes from sets.

For additional information about glob-style patterns, see “Glob-Style Patterns” in the 3PAR Command Line Interface Reference, which is available at the following website:

[HPE Storage Information Library](http://www.hpe.com/info/storage/docs) (<http://www.hpe.com/info/storage/docs>)

For information about creating a snapshot of a VV set, see “Creating a VV-set snapshot” (page 146),

Host-set or VV-set creation success

A successful creation of the host set returns the `Location` portion of the response header containing the URI for the newly created host in the following format:

```
api/v1/hostsets/<host_set_name>
```

A successful creation of the VV set returns the `Location` portion of the response header containing the URI for the newly created VV set in the following format:

```
api/v1/volumesets/<volume_set_name>
```

The system returns the following HTTP status code:

HTTP_CREATED

Host-set or VV-set creation errors

If an error occurs, the system returns one of the error codes shown in [Table 81 \(page 109\)](#), or a generic error code as shown in [Table 6 \(page 29\)](#).

Table 81 Host-set or VV-set creation error codes

API Error	HTTP Code	Description
EXISTENT_SET	400 Bad Request	The set already exists. (WSAPI 1.3 and later)
NON_EXISTENT_DOMAIN	404 Not Found	The domain does not exist. (WSAPI 1.3 and later)
MEMBER_IN_DOMAINSET	409 Conflict	The host is in a domain set. (WSAPI 1.3 and later)
MEMBER_IN_SET	409 Conflict	The object is already part of the set. (WSAPI 1.3 and later)
MEMBER_NOT_IN_SAME_DOMAIN	409 Conflict	Objects must be in the same domain to perform the operation. (WSAPI 1.3 and later)
INV_INPUT_DUP_NAME	400 Bad Request	Invalid input (duplicate name).
VV_IN_INCONSISTENT_STATE	403 Forbidden	The volume has an internal inconsistency error. (WSAPI 1.3 and later)
VV_IS_BEING_REMOVED	403 Forbidden	The volume is being removed. (WSAPI 1.3 and later)
NON_EXISTENT_VOL	404 Not Found	The volume does not exist.
NON_EXISTENT_HOST	404 Not Found	The host does not exist.

Table 81 Host-set or VV-set creation error codes (continued)

API Error	HTTP Code	Description
INV_OPERATION_VV_SYS_VOLUME	403 Forbidden	The operation is not allowed on a system volume.
INV_OPERATION_VV_INTERNAL_VOLUME	403 Forbidden	The operation is not allowed on an internal volume.

Modifying a host set or VV set

To modify a host set, use the HTTP PUT method in the following URI, with a message body as shown in [Table 82 \(page 110\)](#):

`https://<storage_system>:8080/api/v1/hostsets/<host_set_name>`

To modify a VV set, use the HTTP PUT method in the following URI, with message body parameters as shown in [Table 82 \(page 110\)](#):

`https://<storage_system>:8080/api/v1/volumesets/<volume_set_name>`

Table 82 Message body JSON objects modifying a host set or VV set

Member	JSON type	API type	Ignored Values	Description
action	number	memEditOperation	Zero and negative values.	Add or remove. For enumeration of the action JSON object, see Table 139 (page 150) .
newName	string	Name27	Null	New name of the set.
comment	string	Name255	Null	New comment for the VV set or host set. To remove the comment, use "".
setmembers	array of string		Null	The volume or host to be added to or removed from the set.
priority	number	TaskPriorityEnum	Zero and negative values. The default is 2, medium. This applies only if the action is 3 (resynchronize the physical copy).	1: high 2: medium 3: low

❗ **IMPORTANT:** Any user with the Super or Edit role can modify a host set or VV set. Any role granted `hostset_set` permission can add a host to the host set or remove a host from the host set. Any role granted `vvset_set` permission can add volumes to the VV set or remove volumes from the VV set.

Hosts can be added to a host set, or volumes to a VV set, by using a glob-style pattern. A glob-style pattern is not supported when removing hosts or volumes from sets.

For additional information about glob-style patterns, see “Glob-Style Patterns” in the 3PAR Command Line Interface Reference, which is available at the following website:

[HPE Storage Information Library](http://www.hpe.com/info/storage/docs) (<http://www.hpe.com/info/storage/docs>)

Host-set or VV-set modification success

A successful modification of a host set or VV set returns the HTTP code 200 OK with no message body. The response header contains the URI of the updated host as follows:

```
/api/v1/hostsets/<host_set_name>
```

```
/api/v1/volumesets/<volume_set_name>
```

Host-set or VV-set modification errors

If an error occurs, the system returns one of the error codes shown in [Table 83 \(page 111\)](#) or [Table 137 \(page 149\)](#), or a generic error code as shown in [Table 6 \(page 29\)](#).

Table 83 Host-set or VV-set modification error codes

API Error	HTTP Code	Description
EXISTENT_SET	400 Bad Request	The set already exists. (WSAPI 1.3 and later)
NON_EXISTENT_SET	404 Not Found	The set does not exist. (WSAPI 1.3 and later)
MEMBER_IN_DOMAINSET	409 Conflict	The host is in a domain set. (WSAPI 1.3 and later)
MEMBER_IN_SET	409 Conflict	The object is already part of the set. (WSAPI 1.3 and later)
MEMBER_NOT_IN_SET	404 Not Found	The object is not part of the set. (WSAPI 1.3 and later)
MEMBER_NOT_IN_SAME_DOMAIN	409 Conflict	Objects must be in the same domain to perform the operation. (WSAPI 1.3 and later)
VV_IN_INCONSISTENT_STATE	403 Forbidden	The volume has an internal inconsistency error. (WSAPI 1.3 and later)
VV_IS_BEING_REMOVED	403 Forbidden	The volume is being removed. (WSAPI 1.3 and later)
NON_EXISTENT_VOL	404 Not Found	The volume does not exist.
INV_OPERATION_VV_SYS_VOLUME	403 Forbidden	The operation is not allowed on a system volume.
INV_OPERATION_VV_INTERNAL_VOLUME	403 Forbidden	The operation is not allowed on an internal volume.
INV_INPUT_DUP_NAME	400 Bad Request	Invalid input (duplicate name).
INV_INPUT_PARAM_CONFLICT	400 Bad Request	Invalid input (parameters cannot be present at the same time).
LUN_ID_CONFLICT	400 Bad Request	LUN ID conflict.

Removing a host set or VV set

Any user with Super or Edit role can perform this operation.

To remove a host set , use the HTTP DELETE method. Use the following URI, without a message body:

`https://<storage_system>:8080/api/v1/hostsets/<host_set_name>`

To remove a VV set , use the HTTP DELETE method. Use the following URI, without a message body:

`https://<storage_system>:8080/api/v1/volumesets/<volume_set_name>`

Host-set or VV-set removal success

A successful removal returns the HTTP code 200 OK with no message body.

Host-set or VV-set removal errors

If an error occurs, the system returns one of the error codes shown in [Table 84 \(page 112\)](#), or a generic error code as shown in [Table 6 \(page 29\)](#).

A glob-style pattern is not supported when removing hosts or volumes from sets. If you attempt to remove hosts or volumes from sets by using a glob-style pattern, the INV_INPUT_ILLEGAL_CHAR error code (400 Bad Request) will be returned.

For additional information about glob-style patterns, see “Glob-Style Patterns” in the 3PAR Command Line Interface Reference, which is available at the following website:

[HPE Storage Information Library](http://www.hpe.com/info/storage/docs) (<http://www.hpe.com/info/storage/docs>)

Table 84 Host-set or VV-set removal error codes

API Error	HTTP Code	Description
NON_EXISTENT_SET	404 Not Found	The set does not exist. (WSAPI 1.3 and later)
EXPORTED_VLUN	409 Conflict	The host set has exported VLUNs. The VV set was exported. (WSAPI 1.3 and later)
VVSET_QOS_TARGET	409 Conflict	The VV set is the target of a QoS rule. (WSAPI 1.3 and later)

Setting and querying a VV-set flash-cache policy

To set the flash-cache policy for a VV set, use the HTTP PUT method with the following URI, and a message body as shown in [Table 85 \(page 112\)](#):

`https://<storage_system>:8080/api/v1/volumesets/<volumesetname>`

Table 85 VV-set flash-cache policy setting JSON objects

Member	JSON type	API type	Description
flashCachePolicy	number	flashCachePolicyEnum	(WSAPI 1.4.2 and later with 3PAR OS 3.2.1 MU2)

[Table 86](#) lists the enumerations for flashCachePolicyEnum.

Table 86 VV-set flash-cache policy enumerations

Symbol	Value	Description
Enable	1	(WSAPI 1.4.2 and later with 3PAR OS 3.2.1 MU2)
Disable	2	(WSAPI 1.4.2 and later with 3PAR OS 3.2.1 MU2)

You can get VV-set flash-cache policy information by querying a VV-set. See [“Querying all host sets or all VV sets” \(page 113\)](#).

VV-set flash-cache policy setting success

A successful policy setting returns the HTTP code 200 OK with no message body.

Unless an error occurs, the response contains a message body with members as shown in [Table 202 \(page 194\)](#):

VV-set flash-cache policy setting errors

If an error occurs, the system returns one of the error codes shown in [Table 87 \(page 113\)](#). For generic error codes, see [Table 6 \(page 29\)](#).

Table 87 Flash-cache policy setting error codes

API Error	HTTP Status Code	Description
NON_EXISTENT_SET	404 Not Found	The VV set does not exist.
INV_INPUT_EXCEEDS_LENGTH	413 Request Entity Too Large	Invalid input: string length exceeds limit.
NON_EXISTENT_FLASH_CACHE	404 Not Found	The flash cache does not exist. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)

Querying all host sets or all VV sets

To query information about all host sets, use the HTTP GET method with the following URI, without a message body:

`https://<storage_system>:8080/api/v1/hostsets`

To query information about all VV sets, use the HTTP GET method with the following URI, without a message body:

`https://<storage_system>:8080/api/v1/volumesets`

All-host-sets or all-VV-sets query success

Unless an error occurs, the response is a message body with members as shown in [Table 88 \(page 113\)](#).

Table 88 Message body for all-host-set or all-VV-set query response

Member	JSON type	API type	Description
total	number	int32	Number of set objects returned.
members	array of objects	array of SetObjectProperty objects	Set properties.

The `members` object is a JSON array of zero or more JSON objects, one array for each set on the system. See [Table 89 \(page 113\)](#).

Table 89 The `members` object of the SetObjectProperty JSON array for host-set or VV-set query response

Member	JSON type	API type	Description
name	string	Name27	Name of the set.
id	number	int32	Set identifier.

Table 89 The `members` object of the `SetObjectProperty` JSON array for host-set or VV-set query response (continued)

Member	JSON type	API type	Description
<code>domain</code>	string	name31	Set domain.
<code>comment</code>	string	Print255	Comment for the set.
<code>setmembers</code>	array of string	array of name31	The members of the set.
<code>flashCachePolicy</code>	number	<code>flashCachePolicyEnum</code>	1: Enabled 2: Disabled (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2) The <code>flashCachePolicy</code> member is valid only for volumes sets.
<code>qosEnabled</code>	boolean	boolean	True: Enabled vvset QoS rule. False: Disabled vvset QoS rules.

All-host-sets or all-VV-sets query errors

For generic API error codes, see [Table 6 \(page 29\)](#).

Querying a single host set or a single VV set

To query information about a single host set, use the HTTP GET method with the following URI, without a message body:

`https://<storage_system>:8080/api/v1/hostsets/<host_set_name>`

To query information about a single VV set, use the HTTP GET method with the following URI, without a message body:

`https://<storage_system>:8080/api/v1/volumesets/<volume_set_name>`

Single-host-set or single-VV-set query success

Unless an internal server error occurs, a single-instance query returns a `SetObject`, with members as shown in [Table 89 \(page 113\)](#).

Single-host set or single-VV set query errors

If an error occurs, the system returns one of the error codes shown in [Table 90 \(page 114\)](#), or a generic error code as shown in [Table 6 \(page 29\)](#).

Table 90 Host-set or VV set removal error codes

API Error	HTTP Code	Description
<code>NON_EXISTENT_SET</code>	404 Not Found	The set does not exists. (WSAPI 1.3 and later)

8 Working with ports and switches

This section defines API operations on ports.

Port configuration and enumeration objects

Port operations use the enumeration and configuration objects listed in the following tables.

[Table 71 \(page 103\)](#) lists the Inform API server configuration object `portPos` definitions.

The 3PAR OS API server returns the port mode enumeration, as shown in [Table 91 \(page 115\)](#).

Table 91 Port `portMode` enumeration

Symbol	Value	Description
SUSPENDED	1	Target port that has yet to be initialized by the system. (WSAPI 1.2 and later)
TARGET	2	Target port connects to hosts or fabric. (WSAPI 1.2 and later)
INITIATOR	3	Initiator port connects to disks. (WSAPI 1.2 and later)
PEER	4	Peer port is an Ethernet port used for remote copy. (WSAPI 1.2 and later)

The 3PAR OS API server returns the port link state enumeration, as shown in [Table 92 \(page 115\)](#).

Table 92 Port `portLinkState` enumeration

Symbol	Value	Description
CONFIG_WAIT	1	Configuration wait. (WSAPI 1.2 and later)
ALPA_WAIT	2	ALPA wait. (WSAPI 1.2 and later)
LOGIN_WAIT	3	Login wait. (WSAPI 1.2 and later)
READY	4	Link is ready. (WSAPI 1.2 and later)
LOSS_SYNC	5	Link is loss sync. (WSAPI 1.2 and later)
ERROR_STATE	6	In error state. (WSAPI 1.2 and later)
XXX	7	xxx (WSAPI 1.2 and later)
NONPARTICIPATE	8	Link did not participate. (WSAPI 1.2 and later)
COREDUMP	9	Taking coredump.

Table 92 Port portLinkState enumeration (continued)

Symbol	Value	Description
		(WSAPI 1.2 and later)
OFFLINE	10	Link is offline. (WSAPI 1.2 and later)
FWDEAD	11	Firmware is dead. (WSAPI 1.2 and later)
IDLE_FOR_RESET	12	Link is idle for reset. (WSAPI 1.2 and later)
DHCP_IN_PROGRESS	13	DHCP is in progress. (WSAPI 1.2 and later)
PENDING_RESET	14	Link reset is pending. (WSAPI 1.2 and later)

The HPE 3PAR OS API server returns port connection type enumeration, as shown in [Table 93 \(page 116\)](#).

Table 93 Port portConnType enumeration

Symbol	Value	Description
HOST	1	FC port connected to hosts or fabric. (WSAPI 1.2 and later)
DISK	2	FC port connected to disks. (WSAPI 1.2 and later)
FREE	3	Port is not connected to hosts or disks. (WSAPI 1.2 and later)
IPORT	4	Port is in iport mode. (WSAPI 1.2 and later)
RCFC	5	FC port used for Remote Copy. (WSAPI 1.2 and later)
PEER	6	FC port used for data migration. (WSAPI 1.2 and later)
RCIP	7	IP (Ethernet) port used for remote copy. (WSAPI 1.2 and later)
ISCSI	8	iSCSI (Ethernet) port connected to hosts. (WSAPI 1.2 and later)
CNA	9	CNA port, which can be FCoE or iSCSI. (WSAPI 1.2 and later)
FS	10	Ethernet File Persona ports.

The 3PAR OS API server returns port protocol enumeration as shown in [Table 94 \(page 117\)](#).

Table 94 Port portProtocol enumeration

Symbol	Value	Description
FC	1	Fibre Channel. (WSAPI 1.2 and later)
iSCSI	2	iSCSI. (WSAPI 1.2 and later)
FCOE	3	Fibre Channel over Ethernet. (WSAPI 1.2 and later)
IP	4	Internet Protocol (remote copy) (WSAPI 1.2 and later)
SAS	5	Serial-attached SCSI. (WSAPI 1.2 and later)

The 3PAR OS API server returns port failover state enumeration as shown in [Table 95 \(page 117\)](#).

Table 95 Port portFailOverState enumeration

Symbol	Value	Description
NONE	1	No failover in operation. (WSAPI 1.2 and later)
FAILOVER_PENDING	2	In the process of failing over to partner. (WSAPI 1.2 and later)
FAILED_OVER	3	Failed over to partner. (WSAPI 1.2 and later)
ACTIVE	4	The partner port is failed over to this port. (WSAPI 1.2 and later)
ACTIVE_DOWN	5	(WSAPI 1.2 and later)
ACTIVE_FAILED	6	The partner port is failed over to this port, but this port is down. (WSAPI 1.2 and later)
FAILBACK_PENDING	7	In the process of failing back from partner. (WSAPI 1.2 and later)

Querying all ports

To query port information, use the HTTP GET method with the following URI and no message body:

https://<storage_system>:8080/api/v1/ports

All-ports query success

Unless an error occurs, the response includes a message body as specified in [Table 96 \(page 118\)](#).

Table 96 Message body JSON objects for port collection

Member	JSON type	API type	Description
total	number	int32	Number of port objects returned. (WSAPI 1.2 and later)
members	array of objects	array of Port Property objects	Storage port properties. (WSAPI 1.2 and later)

The total is the number of objects in the collection. The `members` object is a JSON array of zero or more JSON objects, one object for each port on the system. See [Table 97 \(page 118\)](#) for object descriptions

Table 97 Message body Port Property JSON objects for all-ports query

Member	JSON type	API type	Description
portPos	object	portPos object	Port n:s:p. (WSAPI 1.2 and later)
mode	number	portMode Enum	Port mode. (WSAPI 1.2 and later)
linkState	number	portLinkState Enum	Port link state. (WSAPI 1.2 and later)
nodeWWN	string	WWN	Node WWN that is unique across all ports. (WSAPI 1.2 and later)
portWWN	string	WWN	Port WWN for FCoE and FC ports. Not included in JSON for other ports. (WSAPI 1.2 and later)
type	number	portConnType Enum	Port connection type. (WSAPI 1.2 and later)
HWAddr	string	MAC	Hardware address for RCIP and iSCSI ports. Not included in JSON for other ports.
protocol	number	portProtocol Enum	Indicates the port protocol type: <ul style="list-style-type: none"> • FC • FCoE • IP(remote copy) • iSCSI • -: No mode selected (for CNA ports) (WSAPI 1.2 and later)
label	string	string	Configurable, human-readable label identifying the HBA port. Maximum length is 15 characters. (WSAPI 1.2 and later)
device	array of string	array of name31	Array of device name (cage0, host1, etc.) of the device connected to the port. (WSAPI 1.2 and later)
partnerPos	object	portPos object	Location of failover partner port in <Node>:<Slot>:<Port> format.

Table 97 Message body Port Property JSON objects for all-ports query (continued)

Member	JSON type	API type	Description
			(WSAPI 1.2 and later)
failoverState	number	portFailoverState Enum	<p>The state of the failover operation, shown for the two ports indicated in the <code>N:S:P</code> and <code>Partner</code> columns. The value can be one of the following:</p> <ul style="list-style-type: none"> <code>none</code>: No failover in operation. <code>failover_pending</code>: In the process of failing over to partner. <code>failed_over</code>: Failed over to partner. <code>active</code>: The partner port is failed over to this port. <code>active_down</code>: The partner port is failed over to this port, but this port is down. <code>failback_pending</code>: In the process of failing back from partner. <p>(WSAPI 1.2 and later)</p>
IPAddr	string	string	<p>For RCIP and iSCSI ports only; not included in the JSON object for other ports.</p> <p>(WSAPI 1.2 and later)</p>
iSCSIName	string	Name223	<p>For iSCSI port only; not included in the JSON object for other ports.</p> <p>(WSAPI 1.2 and later)</p>
enodeMACAddr	string	MAC	Ethernet node MAC address.
pfcMask	string	Hex	PFC mask.
iSCSIPortInfo	object	iSCSI-port property object	Contains information related to iSCSI port properties. (WSAPI 1.5 and later)

Table 98 lists the JSON object members of the iSCSI port property.

Table 98 iSCSI-port property JSON object members

Member	JSON type	API type	Description
ipAddr	string	string	iSCSI port only, not included in the JSON object for other ports
iSCSIName	string	name223	iSCSI port only, not included in the JSON object for other ports
netmask	string	string	Netmask for Ethernet port
gateway	string	string	IP address of the gateway
mtu	number	uint32	MTU size in bytes
stgt	boolean	boolean	Send Targets Group Tag of the iSCSI target (replaces DHCP in WSAPI 1.5 and later).
iSNSPort	number	uint32	TCP port number for the iSNS server).
iSNSAddr	string	string	iSNS server IP address
rate	string	string	Data transfer rate for the iSCSI port

Table 98 iSCSI-port property JSON object members *(continued)*

tpgt	number	unit32	Target portal group tag
vlangs	boolean	boolean	Indicates whether the port supports VLANs

All-ports query errors

The `INT_SERV_ERR` is sometimes returned when querying all volumes. For details about this error code, see [Table 6 \(page 29\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Querying a single port

To query port information for a single instance, use the HTTP GET method with the following URI and no message body, where `<n:s:p>` is the port `<node>:<slot>:<port>` value:

`https://<storage_system>:8080/api/v1/ports/<n:s:p>`

Single-port query success

A successful query returns the HTTP code `200 OK`.

Unless an internal server error occurs, the response includes a message body as specified in [Table 99 \(page 120\)](#).

Table 99 Port collection message body for a single-port query

JSON type	API type	Description
object	Port Property object	Storage port properties. (WSAPI 1.2 and later)

Single-port query errors

Possible errors for a single-port query response are shown in [Table 100 \(page 120\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 100 Single-port query error codes

API Code	HTTP Code	Description
INV_INPUT_PORT_SPECIFICATION	400 Bad Request	Incorrect port specification. (WSAPI 1.2 and later)
NON_EXISTENT_PORT	404 Not Found	Port does not exist. (WSAPI 1.2 and later)
INV_INPUT_ALL_WHITE_SPACES_STR		

Querying ports with type filtering

With WSAPI 1.5 and later, you can query for ports using the `type` filter. Use the HTTP GET method on the following URI with no message body:

`https://<storage_system>:8080/api/v1/ports?query="type EQ <value1> OR type EQ <value2> OR type EQ <valueN>"`

A type filtering request supports only the OR operator.

[Table 93 \(page 116\)](#) lists valid port types and associated enumerations.

Type filtering success

A successful query returns a message body with JSON object members as shown in [Table 101](#)

Table 101 Type filtering message body JSON object members

Member	JSON type	API type	Description
total	number	int32	Number of port objects returned, or zero if no types matched port records
member	array of objects	An array of port property objects	Storage port properties.

Errors for Port Query with Type Filtering

Possible errors following a query for port information with type filtering are shown in the following table:

Table 102 Error definitions for port query with type filtering

API code	HTTP code	Description
INV_QUERY_STRING	400 Bad Request	Invalid query string

Querying port devices

To query for port devices connected to a specified port, use the HTTP GET method with the following URI and no message body:

`https://<storage_system>:8080/api/v1/portdevices?query="portPos EQ <n:s:p>"`

`https://<storage_system>:8080/api/v1/portdevices?query="portPos EQ 1:2:3" OR portPos EQ 0:1:2"`

For information about using filtering to query port devices, see [“Filtering in Queries” \(page 27\)](#).

Port-device query success

A successful query returns a response that includes a message body as shown in [Table 103 \(page 121\)](#).

Table 103 Message body JSON objects for portDevices query

Member	JSON type	API type	Description
total	number	int32	Number of portDevices objects returned. (WSAPI 1.3 and later)
members	array of objects	array of portDevices property objects	Port device properties. (WSAPI 1.3 and later)

The `total` is the number of objects in the collection. `members` is an array of zero or more JSON objects, one for each device connected to the port, as described in [Table 104 \(page 121\)](#).

Table 104 Message body for portDevices JSON object

Member	JSON type	API type	Description
portId	string	Hex	Port ID of the device. (WSAPI 1.3 and later)
loopId	string	Hex	Arbitrated loop physical address of the device.

Table 104 Message body for portDevices JSON object (continued)

Member	JSON type	API type	Description
			(WSAPI 1.3 and later)
hardAddr	string	Hex	Hard address on the loop for the device. (WSAPI 1.3 and later)
nodeWWN	string	WWN	Node WWN of the device. (WSAPI 1.3 and later)
portWWN	string	WWN	Port WWN of the device. (WSAPI 1.3 and later)
commonFeatures	string	Hex	PLOGI ACC common features. (WSAPI 1.3 and later)
serviceParams	string	Hex	PRLI service parameters. (WSAPI 1.3 and later)
bufferToBufferCredit	string	Hex	PLOGI ACC buffer-to-buffer credit. (WSAPI 1.3 and later)
frameLength	string	Hex	PLOGI ACC frame length. (WSAPI 1.3 and later)
virtualportWWN	string	WWN	Virtual port WWN that is associated with the device. (WSAPI 1.3 and later)

Port-device query errors

An unsuccessful query of all port devices can return the `INT_SERV_ERR` (see [Table 6 \(page 29\)](#)). For generic API error codes, see [Table 6 \(page 29\)](#).

Querying FC switches

To query for a list of all FC switches connected to a specified port, use the HTTP GET method with the following URI and no message body:

```
https://<storage_system>:8080/api/v1/fcswitches?query="portPos EQ <n:s:p>"
```

For example:

```
https://<storage_system>:8080/api/v1/fcswitches?query="portPos EQ 0:1:1 OR portPos EQ 0:1:2"
```

For information about using filtering to query FC switches, see [“Filtering in Queries” \(page 27\)](#).

FC-switches query success

A successful query response includes a message body as shown in [Table 105 \(page 122\)](#).

Table 105 Message body JSON objects for FCswitches query

Member	JSON type	API type	Description
total	number	int32	Number of FCswitches objects returned.

Table 105 Message body JSON objects for FCswitches query (continued)

Member	JSON type	API type	Description
			(WSAPI 1.3 and later)
members	array of objects	array of FCswitches property objects	FC switch properties. (WSAPI 1.3 and later)

The `total` JSON object is the number of objects in the collection. The `members` JSON object is an array of zero or more JSON objects, one for each FC switch connected to the port, as described in [Table 106 \(page 123\)](#).

Table 106 Message body JSON object for FCswitches query

Member	JSON type	API type	Description
name	string	WWN	The name of the fabric switch or port. (WSAPI 1.3 and later)
logicalName	string	print256	The logical name of a fabric interconnect. (WSAPI 1.3 and later)
type	number	fabricType enum	The port type of a fabric port. (WSAPI 1.3 and later)
vendor	string	print64	The vendor name of the fabric interconnect. (WSAPI 1.3 and later)
ports	number	uint32	The number of ports on the fabric interconnect. (WSAPI 1.3 and later)

Enumeration for `fabricType` is shown in [Table 107 \(page 123\)](#).

Table 107 fabricType enumeration for FCswitches query

Symbol	Value	Description
UNKNOWN	1	Type is unknown. (WSAPI 1.3 and later)
SWITCH	2	Type is switch. (WSAPI 1.3 and later)
HUB	3	Type is hub. (WSAPI 1.3 and later)
BRIDGE	4	Type is bridge. (WSAPI 1.3 and later)

FC switches query errors

For generic API error codes, see [Table 6 \(page 29\)](#).

9 Working with virtual LUNs

This chapter describes the API operations you can perform on VLUNs. A VLUN is a pairing between a virtual volume (VV) and a LUN, expressed as either a VLUN template or an active VLUN.

A VLUN template sets up an association between a volume and one of the following combinations by establishing the export rule, the manner in which the volume is exported. If, when a VLUN template is created, the current system state meets the conditions established by the template, then active VLUNs—for example, exports that are seen as LUNs by the host—are the result. Depending on the conditions of the VLUN template, a single template can produce more than one active VLUN.

The sections that follow describe the APIs to perform VLUN operations.

VLUN configuration and enumeration objects

Several enumerations and configuration objects are used for managing VLUNs. These configuration objects are defined in this section.

VLUN `portPos` configuration object

The API server communicates port position as a `portPos` object, as defined in [Table 108 \(page 124\)](#).

Table 108 VLUN `portPos` JSON objects

Members	JSON type	API type	Description
<code>node</code>	number	igint32	System node (0–7).
<code>slot</code>	number	igint32	PCI bus slot in the node (0–5).
<code>cardPort</code>	number	igint32	Port number on the FC card (0–4).

VLUN `type` enumeration

This component enumerates the type of VLUNs (`VLUNType`) assigned in the system, as defined in [Table 109 \(page 124\)](#).

Table 109 VLUN `type` enumeration

Symbol	Value	Description
EMPTY	1	Empty.
PORT	2	Port.
HOST	3	Host.
MATCHED_SET	4	Matched set.
HOST_SET	5	Host set.

VLUN multipathing enumeration

The API server will communicate the multipathing configuration, enumerated as shown in [Table 110 \(page 125\)](#).

Table 110 VLUN multipathing configuration enumeration

Symbol	Value	Description
UNKNOWN	1	Unknown.
ROUND_ROBIN	2	Round Robin.
FAILOVER	3	Failover.

VLUN failedPathPol enumeration

The API server will communicate the failed path monitoring method (`failedPathPol`) enumerated as shown in [Table 111 \(page 125\)](#).

Table 111 VLUN failedPathPol configuration enumeration

Symbol	Value	Description
UNKNOWN	1	Unknown.
SCSI_TEST_UNIT_READY	2	SCSI test unit is ready.
INQUIRY	3	Inquiry.
READ_SECTOR0	4	Read Sector 0.

Creating a VLUN

This section describes the HTTP request and response JSON object members for creating a VLUN template.

- ❗ **IMPORTANT:** Any user with Super or Edit role, or any role granted `vlun_create` permission, can perform this operation.

Create a VLUN using the HTTP POST method. Use the following URI:

`https://<storage_system>:8080/api/v1/vluns`

[Table 112 \(page 125\)](#) shows the JSON members that are sent in the request body that specifies the parameters for creating a VLUN template.

To create a VLUN, the `VolumeName` and `lun` members are required. Either `hostname` or `portPos` (or both in the case of matched sets) is also required. The `noVcn` and `overrideLowerPriority` members are optional.

The LUN number can also be signed by the system within the specified LUN range. In that case, you must specify a range. A range can be `n+` (minimal `n`) or `m–n` (`m` to `n`). To support `auto lun`, the fields `autoLun` and `maxAutoLun` are now supported in the message body for VLUN creation.

Table 112 Message body JSON objects for VLUN template request

Member	JSON type	API type	Ignored Values	Description
<code>volumeName</code>	string	name31	None. Required field. ¹	Name of the volume or VV set to export. Use the following format for the VV set: <code>set:set:volumeName</code>
<code>lun</code>	number	igint32	None. ¹ Required field.	LUN ID.
<code>hostname</code>	string	name31	None. ¹ Required field.	Name of the host or host set to which the volume or VV set is to be exported.

Table 112 Message body JSON objects for VLUN template request *(continued)*

Member	JSON type	API type	Ignored Values	Description
				The host set should be in <code>set:hostset_name</code> format.
<code>portPos</code>	object	<code>portPos</code>	None. ^{1, 2}	System port of VLUN exported to. It includes node number, slot number, and card port number.
<code>noVcn</code>	boolean	boolean	None. ¹ Optional field.	Specifies that a VCN not be issued after export (<code>-novcn</code>). Default: False.
<code>overrideLowerPriority</code>	boolean	boolean	None. ¹ Optional field.	Existing lower priority VLUNs will be overridden (<code>-ovrd</code>). Use only if <code>hostname</code> member exists. Default: False.
<code>autoLun</code>	boolean	boolean		States whether the <code>lun</code> number should be autosigned. <i>(WSAPI 1.2 and later and later)</i>
<code>maxAutoLun</code>	number			If <code>autoLun</code> is true, the <code>lun</code> number should be in the range of <code>lun</code> and <code>maxAutoLun</code> . If <code>maxAutoLun</code> is 0, then no max. <i>(WSAPI 1.2 and later and later)</i>

¹ A VLUN requires the `volumeName` and `lun` members, as well as either `hostname` or `portPos` (or both in the case of matched sets). Optional members include `noVcn` and `overrideLowerPriority`.

² The `portPos` member is required if you are creating a matched-set or port-present VLUN. If absent, a host set or host-set VLUN is created.

VLUN creation success

A successful VLUN creation returns the HTTP status code 201 `Created`, without a message body.

A successful creation of the VLUN returns the `Location` response header with the URI for the newly created VLUN in the following format:

```
/api/v1/vluns/<volume name>,<lun>,<host_name>,[<port>]
```

- `<volume name>` is the volume that the newly created VLUN exports.
- The `<host_name>` or `[<port>]` information, or both (depending on the VLUN type), are the host name and port for the newly created VLUN. The `port` information will not be displayed for a `host`-type VLUN.
- If the `<host_name>` information was not provided, then the location will be:
`/api/v1/vluns/<volume_name>,<lun>,<port>`

VLUN creation errors

A failed creation returns the error code and API-specific error information as shown in [Table 113 \(page 127\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 113 VLUN creation error codes

API Error	HTTP Code	Description
INV_INPUT_MISSING_REQUIRED	400 Bad Request	Missing volumeName or incomplete port info, specifying override option without hostname. LUN number and the host persona capability conflict. <i>WSAPI 1.2 and later and later.</i>
INV_INPUT	400 Bad Request	Missing volumeName or LUN or both hostname and portPos members. Incomplete port info, specifying override option without hostname.
NON_EXISTENT_VOL	404 Not found	Specified volume does not exist.
NON_EXISTENT_HOST	404 Not found	Specified hostname not found.
NON_EXISTENT_PORT	404 Not found	Specified port does not exist. <i>(WSAPI 1.2 and later and later)</i>
MISSING_VLUN_EXPORT_INFO	400 Bad Request	Missing both hostname and portPos for VLUN creation.
BAD_PORT_TYPE	404 Not found	Specified port is of invalid port type.
EXISTENT_LUN	409 Conflict	LUN already exists.
INV_INPUT_PORT_SPECIFICATION	400 Bad Request	Incorrect portPos specification or the node or slot or cardPort in portPos object maybe out of range.
INV_INPUT_PARAM_CONFLICT	400 Bad Request	OverrideLowerPriority is being specified without hostname.
TOO_LARGE	400 Bad Request	LUN is greater than 16384.
AUTO_LUN_ID_UNAVAILABLE	409 Conflict	LUN ID cannot be assigned within the specified range. <i>(WSAPI 1.2 and later and later)</i>
INV_OPERATION_VLUN_PCOPY_TARGET_VV	409 Conflict	The volume is the target of physical copy.
INV_INPUT_EMPTY_VVSET	400 Bad Request	The VV set is empty. <i>WSAPI 1.3</i>
INV_INPUT_MATCHED_HOSTSET	400 Bad Request	Cannot export host sets with port (matched set). <i>(WSAPI 1.3 and later)</i>

VLUN creation example

The following example creates a matched VLUN type template for test_vv02 volume.

HTTP request

```
POST /api/v1/vluns HTTP/1.1
Host: storsys1.example.com:8080
Accept: application/json
Content-Type: application/json
X-HP3PAR-WSAPI-SessionKey: 2-33fe8891e288b34b3f914410e7cc7907-a93d1c50
{
```

```

"volumeName": "test_vv02",
"lun": 252,
"hostname": "mysystem",
"portPos": {
  "node": 2,
  "slot": 2,
  "cardPort": 4
},
"noVcn": false,
"overrideLowerPriority": false
}

```

HTTP response

```

HTTP/1.1 201 Created
Date: Mon, 16 Apr 2012 06:44:26 GMT
Server: hp3par-wsapi
Cache-Control: no-cache
Pragma: no-cache
Location: /api/v1/vluns/test_vv02,252,mysystem,2:2:4

```

Removing a VLUN

This section describes the HTTP request and response for removing a virtual volume's SCSI LUN export definition from the system. Any user with the Super or Edit role, or any role granted with the `vlun_remove` right, can perform this operation.

To remove the VLUN definition, use the HTTP DELETE method with the following URI:

```

https://<storage_system>:8080/api/v1/vluns/<volume_name>,<lun>,
<host_name>[,<port>] [?!<option>]

```

Table [Table 114 \(page 128\)](#) shows the URI parameters that are sent in the URI for VLUN removal.

Table 114 URI parameters for VLUN removal

URI Parameter ¹	Ignored Values	Description
<volume_name>	None (Required)	Name of the volume or VV set to be exported. The VV set should be in <code>set:<volumeset_name></code> format.
<lun>	None (Required)	LUN.
<host_name>	None (required if volume is exported to host or host set, or to both the host or host set and port)	Name of the host or host set to which the volume or VV set is to be exported. For VLUN of port type, the value is empty. The host set should be in <code>set:<hostset_name></code> format.
<port>	None (required if volume is exported to port, or to both host and port)	Specifies the system port of the VLUN export. It includes the system node number, PCI bus slot number, and card port number on the FC card in the format: <code><node>:<slot>:<port></code>
<option>	None	Can be replaced with a boolean value: <ul style="list-style-type: none"> noVcn=true noVcn=false

¹ Must be percent-encoded as described in RFC 3968 for reserved characters.

VLUN removal success

A successful removal returns the HTTP status code 200 OK and no message body:

VLUN removal errors

An error state returns one of the errors shown in [Table 115 \(page 129\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 115 VLUN removal error codes

API Error	HTTP Code	Description
INV_INPUT	400 Bad Request	Incomplete VLUN information. Invalid URL percent-encoding. (WSAPI 1.2 and later and later)
NON_EXISTENT_HOST	404 Not Found	Specified hostname not found.
NON_EXISTENT_VLUN	404 Not Found	Incorrect LUN or volumeName
INV_INPUT_PORT_SPECIFICATION	400 Bad Request	Specified port is invalid.
INV_INPUT_EXCEEDS_RANGE	400 Bad Request	The LUN specified exceeds expected range.
INV_INPUT_MISSING_REQUIRED	400 Bad Request	Incomplete VLUN info. Missing volumeName or lun, or both hostname and port.
NON_EXISTENT_VLUN	404 Not Found	Incorrect LUN or volumeName

VLUN removal example

In the following example, the VLUN for volume `test_vv02` with LUN 252, which is exported to `mysystem` through port `2:5:2`, is deleted. The optional port information is also sent because the VLUN is of matched type.

HTTP request

```
DELETE /api/v1/vluns/test_vv02,252,mysystem,2:2:4 HTTP/1.1
Host: storsys1.example.com:8080
Accept: application/json
Content-Type: application/json
X-HP3PAR-WSAPI-SessionKey: 2-33fe8891e288b34b3f914410e7cc7907-a93d1c50
```

HTTP response

```
HTTP/1.1 200 OK
Date: Mon, 16 Apr 2012 07:16:39 GMT
Server: hp3par-wsapi
Cache-Control: no-cache
Pragma: no-cache
Connection: close
```

Querying VLUNs

The VLUN query collects information about all the VLUN templates and active VLUNs on the system.

Querying all VLUNs

To query for VLUN information, use the HTTP GET method with the following URI. The syntax is as follows:

```
https://<storage_system>:8080/api/v1/vluns
```

All-VLUNs query success

A successful query returns the HTTP code 200 OK.

To support a large number of volumes and VLUNs in the 3PAR OS, WSAPI 1.3 and later uses HTTP chunked transfer encoding to send a response in chunked format, and includes an HTTP response header similar to the following:

```
HTTP/1.1 200 OK
Date: Fri, 22 May 2013 18:05:43 GMT
Server: hp3par-wsapi
Cache-Control: no-cache
Pragma: no-cache
Content-Type: application/json
Connection: close
Transfer-Encoding: chunked
```

Each chunk starts with the `chunk-size` field, which is a string of hexadecimal digits and a CRLF sequence followed by the chunk data. The chunk is terminated by CRLF. The last chunk is a regular chunk, except that its length is zero.

A successful query returns the HTTP status code 200 OK and a response body with members as shown in [Table 116 \(page 130\)](#).

Table 116 All-VLUNs query JSON objects

Member	JSON type	API type	Description
total	number	int32	Number of VLUN objects returned.
members	array of objects	array of VLUN Property objects	VLUN properties.

The `members` object is a JSON array of zero or more JSON objects – one for each VLUN on the system. These objects are described in [Table 117 \(page 130\)](#).

Table 117 JSON objects in `members` object for all-VLUNs query

Member	JSON type	API type	Description
lun	number	uint32	Exported LUN value.
volumeName	string	name31	Name of exported virtual volume name or VV-set name.
hostname	string	name31	Host name or host set name to which the VLUN is exported.
remoteName	string	name31	Host WWN, or iSCSI name, or SAS address; depends on port type.
portPos	object	portPos object For more information, see “VLUN	System port of VLUN exported to. It includes node number, slot number, and cardPort number.

Table 117 JSON objects in `members` object for all-VLUNs query (continued)

Member	JSON type	API type	Description
		portPos JSON objects (page 124).	
<code>type</code>	number	VLUNtype enum For more information, see “VLUNType enumeration” (page 124).	VLUN type.
<code>volumeWWN</code>	string	WWN	WWN of exported volume. If a VV set is exported, this value is null.
<code>multipathing</code>	number	multipathing Enum For more information see “VLUN multipathing configuration enumeration” (page 125).	Multipathing method in use.
<code>failedPathPol</code>	number	failedPathPol enum For more information, see “VLUN failedPathPol configuration enumeration” (page 125).	Failed path monitoring method.
<code>failedPathInterval</code>	number	uint32	Monitoring interval in seconds after which the host checks for failed paths.
<code>hostDeviceName</code>	string	name31	The device name for this VLUN on the host.
<code>active</code>	boolean	boolean	Specified if the VLUN is an active VLUN or a VLUN template. TRUE for active VLUN. FALSE for VLUN template.

All-VLUNs query example

The following query returns all VLUN templates or active VLUNs, including all active and template VLUNs on the storage system:

HTTP request

```
GET /api/v1/vluns HTTP/1.1
Host: storsys1.example.com:8080
Accept: application/json
Content-Type: application/json
X-HP3PAR-WSAPI-SessionKey: 2-33fe8891e288b34b3f914410e7cc7907-a93d1c50
```

HTTP response

```
{
  "total": 2,
  "members": [
    {
      "lun": 1,
      "volumeName": "vol1.0",
      "hostname": "host",
      "remoteName": "10000000C978500E",
      "portPos": {
        "node": 0,
        "slot": 4,
        "cardPort": 1
      },
      "type": 4,
      "volumeWWN": "60002AC000000000000000020D0000017D",
      "multipathing": 1,
      "failedPathPol": 1,
      "failedPathInterval": 0,
      "active": true
    },
    {
      "lun": 10,
      "volumeName": "vol1.0",
      "portPos": {
        "node": 0,
        "slot": 4,
        "cardPort": 1
      },
      "type": 4,
      "volumeWWN": "60002AC000000000000000020D0000017D",
      "multipathing": 1,
      "failedPathPol": 1,
      "failedPathInterval": 0,
      "active": false
    }
  ]
}
```

All-VLUNs query errors

An unsuccessful query of all VLUNs can return the `INT_SERV_ERR` (see [Table 6 \(page 29\)](#)). For generic API error codes, see [Table 6 \(page 29\)](#).

For information about chunking errors that might occur during an all-VLUNs query, see [“All-volumes query errors” \(page 90\)](#).

Querying a single VLUN

To query a single VLUN, use the HTTP GET method with the following URI:

`https://<storage_system>:8080/api/v1/vluns/<vlun_id>`

Available parameters include:

- `<vlun_id>` is the VLUN identifier returned in the `Location` header after the VLUN was created.
- `<vlun_id>` format can be one of the following:
 - `<vvname>,<lunID>,<hostname>,<portPos>`
 - `<vvname>,<lunID>,<hostname>`
 - `<vvname>,<lunID>,,<portPos>`

The `<vvname>` and `<lunID>` fields are mandatory. The `<hostname>` and `<portPos>` fields are optional, but one or both of them must be specified.

❗ **IMPORTANT:** WSAPI 1.2 does not support the use of patterns or sets when querying volumes and hosts. To query a single instance of a VLUN object, specify the volume name and host name.

Single-VLUN query success

In a single-VLUN query, there is no need for chunking, because the data sent back to the client is small and there is no issue with memory allocation. The WSAPI server does not use chunked transfer encoding when the request is for a single volume or VLUN.

A successful VLUN query returns the HTTP code 200 OK, with a response body including members as shown in [Table 118 \(page 133\)](#).

Table 118 Message body JSON objects for Single-VLUN query response

Member	JSON type	API type	Description
<code>total</code>	number	int32	Number of VLUN objects returned.
<code>members</code>	array of objects	array of VLUN Property objects	VLUN properties. (WSAPI 1.2 and later)

As with all collection queries, the `total` is the number objects in the collection.

Failure to specify a VLUN with the volume name, LUN, and host and/or port returns a `NON_EXISTENT_VLUN` error.

The `members` object is a JSON array of zero or more JSON objects as listed in [Table 119 \(page 133\)](#).

Table 119 JSON objects for `members` object in single-VLUN query response

Member	JSON type	API type	Description
<code>lun</code>	number	int32	LUN ID. (WSAPI 1.2 and later)
<code>volumeName</code>	string	name31	Volume name or VV-set name. (For volumes, WSAPI 1.2 and later and later; for VV sets, WSAPI 1.3 and later)
<code>hostname</code>	string	name31	Host name or host set name. (For hosts, WSAPI 1.2 and later; for host sets, WSAPI 1.3 and later)
<code>remoteName</code>	string	name31	Host WWN, or iSCSI name, or SAS address, depending on the port type. (WSAPI 1.2 and later)

Table 119 JSON objects for `members` object in single-VLUN query response (continued)

Member	JSON type	API type	Description
<code>portPos</code>	object	portPos object	System port of VLUN exported to. It includes node number, slot number, and cardPort number.
<code>type</code>	number	VLUNType enum	VLUN type. (WSAPI 1.2 and later)
<code>volumeWWN</code>	string	WWN	WWN of exported volume. (WSAPI 1.2 and later)
<code>multipathing</code>	number	Multipathing enum	Multipathing method in use. (WSAPI 1.2 and later)
<code>failedPathPol</code>	number	Failed-Path Monitoring-Method enum	Failed path monitoring method. (WSAPI 1.2 and later)
<code>failedPathInterval</code>	number	unit32	Monitoring interval in seconds after which the host checks for failed paths (WSAPI 1.2 and later)
<code>hostDeviceName</code>	string	name31	The device name of this VLUN on the host. (WSAPI 1.2 and later)
<code>active</code>	boolean	boolean	Specified if the VLUN is an active VLUN or a VLUN template. <code>TRUE</code> for active VLUN, <code>FALSE</code> for VLUN template. (WSAPI 1.2 and later)

Single-VLUN query errors

Possible error codes for the single VLUN query are shown in [Table 120 \(page 134\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 120 Single-VLUN query error codes

API Error	HTTP Code	Description
<code>INT_SERV_ERR</code>	500 Internal Server	Internal server error.
<code>INV_INPUT_MISSING_REQUIRED</code>	400 Bad Request	Some or all required parameters are missing (volume name and LUN ID are mandatory). Either one or both of host name and port need to be specified. (WSAPI 1.2 and later)
<code>INV_INPUT_WRONG_TYPE</code>	400 Bad Request	Invalid input: wrong type for value (LUN ID is invalid) (WSAPI 1.2 and later)
<code>NON_EXISTENT_VLUN</code>	404 Not found	Requested VLUN does not exist. (WSAPI 1.2 and later)
<code>NON_EXISTENT_VOL</code>	404 Not found	Requested volume does not exist. (WSAPI 1.2 and later)
<code>NON_EXISTENT_HOST</code>	404 Not found	Requested host does not exist.
<code>INV_INPUT_PORT_SPECIFICATION</code>	400 Bad Request	Incorrect port specification.

Table 120 Single-VLUN query error codes *(continued)*

API Error	HTTP Code	Description
		<i>(WSAPI 1.2 and later)</i>
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	Volume name or host name contains invalid character. <i>(WSAPI 1.2 and later)</i>
INV_INPUT_EXCEEDS_RANGE	400 Bad Request	LUN ID exceeds range. <i>(WSAPI 1.2 and later)</i>

Querying VLUNs using filters

You can query for VLUNs using the filters, such as:

- `volumeWWN` (WSAPI 1.4 and later)
- `remoteName` (WSAPI 1.4 and later)
- `volumeName` (WSAPI 1.4.2 and later)
- `hostname` (WSAPI 1.4.2 and later)

To query VLUNs using additional filters, use the HTTP GET method with the OR operator in the query string:

`volumeWWN EQ <volumeWWNvalue> OR remoteName EQ <remoteNamevalue>`

For example, to query VLUNs using filters, use the following URI and no message body:

`https://<storage_system>:8080/api/v1/vluns?query="volumeWWN EQ <value1>
OR remoteName EQ <value2> OR volumeWWN EQ <value3> ... OR remoteName EQ
<valueN>"`

where:

- The value of `volumeWWN` is the WWN of the exported volume.
- The `remoteName` value is the host WWN or an iSCSI path name.

To query for volumes without an FC path or iSCSI path, use `remoteName EQ null` in the URI:

`https://<storage_system>:8080/api/v1/vluns?query="remoteName EQ null"`

Duplicate VLUN entries are not listed in a filtered query for VLUN information.

Querying VLUNs using filters success

A successful VLUN query returns the HTTP code 200 OK, with a response body including members as shown in [Table 121 \(page 135\)](#).

Table 121 Message body JSON objects for VLUN query using filters response

Member	JSON type	API type	Description
<code>total</code>	number	int32	Number of VLUN objects returned.
<code>members</code>	array of objects	array of VLUN Property objects	VLUN properties. <i>(WSAPI 1.2 and later)</i>

Errors for VLUN query using filters

Possible errors following a query for volume information with multiple-volumes filtering are shown in [Table 122 \(page 136\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 122 VLUN query using filters error codes

API Error	HTTP Code	Description
INV_QUERY_STRING	400 Bad Request	Invalid query string. (WSAPI 1.3 and later)
INPUT_TOO_LONG	400 Bad Request	The client request is too long. (WSAPI 1.3 and later.1 MU1)

10 Performing copy operations

You can use the WSAPI server to make snapshots of volumes and VV sets, make physical copies of volumes and VV sets, resynchronize a physical copy to its parent volume or VV set, and to stop a physical-copy operation.

Licensing information

Creating snapshots

Creating virtual copies or snapshots requires the copy-on-write techniques available only with 3PAR Virtual Copy Software license.

Setting retention times for virtual volumes

The optional 3PAR Virtual Lock Software provides functionality that enforces the retention period of any volume or copy of a volume. You must purchase the Virtual Lock software license to use the `retentionHours` field.

Creating a volume snapshot

To create a snapshot of a volume, use the HTTP POST method with the following URI:

`https://<storage_system>:8080/api/v1/volumes/<volume_name>`

The `<volume_name>` parameter contains the name of the volume you want to copy.

When creating a snapshot, the message body is a JSON object with two members, `action` and `parameters`.

The `action` member is a string with the value `createSnapshot` and the `parameters` member is a JSON object with members as described in [Table 123 \(page 137\)](#).

Table 123 Message body parameters JSON object members for snapshot creation

Member	JSON type	API type	Ignored values	Description
name	string	name31	None (Required)	Specifies a snapshot volume name up to 31 characters in length. For a snapshot of a volume set, the name should be patterns that are used to form the snapshot volume name. The vv name pattern is described in "VV Name Patterns" in the 3PAR Command Line Interface Reference, which is available at the following website: HPE Storage Information Library (http://www.hpe.com/info/storage/docs)
id	number	igint32	Negative values	Specifies the ID of the snapshot. If not specified, the system chooses the next available ID. Not applicable for VV-set snapshot creation.
comment	string	print511	None	Specifies any additional information up to 511 characters for the volume.
readOnly	boolean	boolean	None	TRUE: Specifies that the copied volume is read-only. FALSE: (default) The volume is read/write.

Table 123 Message body parameters JSON object members for snapshot creation
(continued)

Member	JSON type	API type	Ignored values	Description
expirationHours	number	igint32	Negative values	Specifies the relative time from the current time that the volume expires. Value is a positive integer and in the range of 1–43,800 hours, or 1825 days.
retentionHours	number	igint32	Negative values	Specifies the relative time from the current time that the volume will expire. Value is a positive integer and in the range of 1–43,800 hours, or 1825 days.

For information about creating a physical copy of a volume or VV set, see [“Performing copy operations” \(page 137\)](#).

Creating group snapshots of a list of virtual volumes

To create a consistent group snapshot of a list of virtual volumes, use the HTTP POST method with the following URI:

https://<storage_system>/api/v1/volumes

The message body is a JSON object with two members, action (see [Table 40 \(page 80\)](#)) and parameters (see [Table 124](#)).

Table 124 Members of the parameter object for volume physical copy creation

Member	JSON type	API type	Description
volumeGroup	array of objects	array of volumeSnap objects	Specifies the volumes from which to capture group snapshots (see Table 126).
comment	string	Print511	Specifies any additional information for the volume.
readOnly	boolean	boolean	Specifies that the copied volumes are read-only.
expirationHours	number	igint32	Specifies the time relative to the current time that the copied volumes expire. Value is a positive integer with a range of 1–43,800 hours (1825 days).
retentionHours	number	igint32	Specifies the time relative to the current time that the copied volumes are retained. Value is a positive integer with a range of 1–43,800 hours (1825 days).
skipBlock	boolean	boolean	Occurs if the host IO is blocked while the snapshot is being created.

[Table 125](#) lists the volumeSnap object definitions

Table 125 volumeSnap Objects

Member	JSON type	API type	Description
volumename	string	Required	Name of the volume being copied
snapshotName	String	string	If not specified, the system generates the snapshot

Table 125 volumeSnap Objects (continued)

Member	JSON type	API type	Description
			name.
snapshotId	Number	Number	ID of the <code>snapshot</code> volume. If not specified, the system chooses an ID.

Group snapshot success

A successful operation returns the HTTP status code `300 Multiple Choice` with a message body that describes the volume-to-snapshot-volume mapping for each volume in the volume group.

The message body provides links to each volume and snapshot volume, as shown in [Table 126](#):

Table 126 Message body JSON members for volume group snapshot

Member	JSON type	API type	Description
volumeName	string	string	The volume name in the group snapshot.
snapshotVolume	string	string	The snapshot volume name for the volume.
links	Array of URL links	Array of URL links	The link to the volume <code>volumeName</code> and <code>snapshotVolume</code> .

Group snapshot errors

[Table 127](#) lists the possible errors for the group snapshot.

Table 127 Group snapshot error definitions

API error	HTTP code	Description
NON_EXISTENT_VOL	404 Not found	Specified parent volume does not exist
EXISTENT_VOL	400 Bad request	Specified snapshot volume already exists
INV_INPUT_INVALID_CHAR	400 Bad request	Invalid character in input
INV_INPUT_EXCEEDS_RANGE	400 Bad request	Volume id is out of range

Creating a physical copy of a volume

To create a physical copy of a volume, use the HTTP POST method with the following URI:

`https://<storage_system>:8080/api/v1/volumes/<volume_name>`

The `<volume_name>` parameter contains the name of the volume being copied (*not* the name of the destination volume).

The message body is a JSON object with two members, `action` and `parameters`. The `action` member must have the value `createPhysicalCopy`, and the `parameters` member is a JSON object with members as described in [Table 128](#) (page 139).

Table 128 Message body parameters JSON object members for physical copy creation

Member	JSON type	API type	Ignored Values	Description
destVolume	string	name31	Required field.	Specifies the destination volume.

Table 128 Message body parameters JSON object members for physical copy creation
(continued)

Member	JSON type	API type	Ignored Values	Description
				(WSAPI 1.3 and later)
destCPG	string	name31	Null. Required if online is true. Not accepted if online is false.	Specifies the destination CPG for an online copy. (WSAPI 1.3 and later)
online	boolean	boolean	None	true: Specifies that the physical copy is to be performed online. false: (default) The physical copy is not performed online. (WSAPI 1.3 and later)
tpvv	boolean	boolean	None	For online copy only. true: The online copy is to be a TPVV. false: (default) The online copy is not a TPVV. tpvv and tdvv cannot be set to true at the same time. (WSAPI 1.3 and later)
tdvv	boolean	boolean	None	For online copy only. true: The online copy is to be a TDVV. false: (default) The online copy is not a TDVV. tpvv and tdvv cannot be set to true at the same time.
snapCPG	string	name31	Null	For online copy only. Specifies the snapshot CPG for an online copy. (WSAPI 1.3 and later)
saveSnapshot	boolean	boolean		true: Saves the snapshot of the source volume after the copy of the volume is completed. false: (default) The snapshot of the source volume is not saved after the volume is copied. (WSAPI 1.3 and later)
priority	number	taskPriorityEnum	Zero and negative numbers.	Does not apply to online copy. See Table 129 (page 141) . (WSAPI 1.3 and later)

Enumeration for the taskPriorityEnum JSON object is shown in [Table 129 \(page 141\)](#).

Table 129 taskPriorityEnum enumeration for creating physical copy of a volume

Symbol	Value	Description
HIGH	1	High priority.
MED	2	Medium priority.
LOW	3	Low priority.

Physical copy of volume creation success

A successful operation returns the HTTP status code 200 OK. The response Location header contains the destination-volume URI. The body of the JSON object returns the task ID of the physical-copy task.

Physical copy of volume errors

Possible errors during the creation, resynchronization, or stopping of physical copies of volumes are shown in [Table 130 \(page 141\)](#).

For generic API error codes, see [Table 6 \(page 29\)](#).

Table 130 Error codes for creation, resynchronization, or stopping of physical copies of volumes

API Error	HTTP Code	Description
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	Invalid volume name or CPG name. (WSAPI 1.3 and later)
NON_EXISTENT_CPG	404 Not Found	The CPG does not exist. (WSAPI 1.3 and later)
CPG_NOT_IN_SAME_DOMAIN	403 Forbidden	The CPG is not in the current domain. (WSAPI 1.3 and later)
NON_EXISTENT_VOL	404 Not Found	The volume does not exist. (WSAPI 1.3 and later)
VV_NOT_IN_SAME_DOMAIN	403 Forbidden	The volume is not in the current domain. (WSAPI 1.3 and later)
INV_INPUT_BAD_ENUM_VALUE	400 Bad Request	The priority value is not in the valid range (1–3). (WSAPI 1.3 and later)
EXISTENT_VOL	409 Conflict	The volume already exists. (WSAPI 1.3 and later)
INV_OPERATION_VV_SYS_VOLUME	403 Forbidden	The volume is a system volume. This operation is not allowed on a system volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_NON_BASE_VOLUME	403 Forbidden	The destination volume is not a base volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_IN_REMOTE_COPY	403 Forbidden	The destination volume is involved in remote copy. (WSAPI 1.3 and later)

Table 130 Error codes for creation, resynchronization, or stopping of physical copies of volumes *(continued)*

API Error	HTTP Code	Description
INV_OPERATION_VV_EXPORTED	403 Forbidden	The volume is exported. (WSAPI 1.3 and later)
INV_OPERATION_VV_COPY_TO_SELF	403 Forbidden	The destination volume is the same as the parent volume (WSAPI 1.3 and later)
INV_OPERATION_VV_READONLY_SNAPSHOT	403 Forbidden	The parent volume is a read-only snapshot. (WSAPI 1.3 and later)
INV_OPERATION_VV_COPY_TO_BASE	403 Forbidden	The destination volume is the base volume of a parent volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_VOLUME_CONV_IN_PROGRESS	409 Conflict	The volume is in a conversion operation. (WSAPI 1.3 and later)
INV_OPERATION_VV_NO_SNAPSHOT_ALLOWED	403 Forbidden	Invalid operation: The parent volume must allow snapshots. (WSAPI 1.3 and later)
INV_OPERATION_VV_ONLINE_COPY_IN_PROGRESS	409 Conflict	The volume is the target of an online copy. (WSAPI 1.3 and later)
INV_OPERATION_VV_CLEANUP_IN_PROGRESS	403 Forbidden	Cleanup of internal volume for the volume is in progress. (WSAPI 1.3 and later)
INV_OPERATION_VV_CIRCULAR_COPY	403 Forbidden	The parent volume is a copy of the destination volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_PEER_VOLUME	403 Forbidden	The operation is not allowed on a peer volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_INTERNAL_VOLUME	403 Forbidden	The operation is not allowed on an internal volume. (WSAPI 1.3 and later)
VV_IS_BEING_REMOVED	403 Forbidden	The volume is being removed. (WSAPI 1.3 and later)
INV_OPERATION_VV_NOT_IN_NORMAL_STATE	403 Forbidden	The volume is not in the normal state. (WSAPI 1.3 and later)
VV_IN_INCONSISTENT_STATE	403 Forbidden	The volume has an internal consistency error. (WSAPI 1.3 and later)
INV_OPERATION_VV_PCOPY_IN_PROGRESS	409 Conflict	The destination volume has a physical copy in progress. (WSAPI 1.3 and later)

Table 130 Error codes for creation, resynchronization, or stopping of physical copies of volumes *(continued)*

API Error	HTTP Code	Description
INV_OPERATION_VV_FAILED_ONLINE_COPY	409 Conflict	Online copying of the destination volume has failed. (WSAPI 1.3 and later)
INV_OPERATION_VV_COPY_PARENT_TOO_BIG	409 Conflict	The size of the parent volume is larger than the size of the destination volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_NO_PARENT	403 Forbidden	The volume has no physical parent. (WSAPI 1.3 and later)
IN_USE	409 Conflict	The resynchronization snapshot is in use. (WSAPI 1.3 and later)
VV_IN_STALE_STATE	403 Forbidden	The volume is in a stale state. (WSAPI 1.3 and later)
NON_EXISTENT_VVCOPY	404 Not Found	Physical copy not found. (WSAPI 1.3 and later)

Resynchronizing a physical copy to its parent volume or stopping a physical copy

To resynchronize a physical copy to its parent volume, use the HTTP PUT method with the following URI:

https://<storage_system>:8080/api/vi/volumes/<volume_name>

The **<volume_name>** parameter contains the name of the destination volume you want to resynchronize. The message body has a single JSON object member, **action** (see [Table 131 \(page 143\)](#)).

Table 131 Message body action JSON object

Member	JSON type	API type	Description
action	number	Enum	Specifies the action to resynchronize or stop a physical copy. This cannot be used with other volume modification fields.

Enumeration for the **action** field is shown in [Table 40 \(page 80\)](#).

The request body for resynchronizing a physical copy can have a **priority** field, with enumeration as shown in [Table 129 \(page 141\)](#).

Successful resynchronization of a physical copy of a volume, or of stopping a physical copy

A successful request to resynchronize the physical copy of a volume to its parent volume returns the HTTP code **200 OK**.

The response body includes the task ID of the physical-copy resynchronization. For the physical-copy stop action, the body of the response is empty.

Errors for resynchronizing a physical copy to its volume, or for stopping a physical copy

Error codes that can occur while creating, resynchronizing, or stopping a physical copy are shown in [Table 130 \(page 141\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Promoting a virtual copy

To promote the changes from a virtual copy back onto the base volume, thereby overwriting the base volume with the virtual copy, use the HTTP PUT method on the following URI:

https://<storage_system>:8080/api/vi/volumes/<virtual_copy_name>

The <virtual_copy_name> parameter contains the name of the virtual copy to be promoted. The message body is a JSON object with members as described in [Table 132 \(page 144\)](#).

Table 132 JSON object members of the parameter object for promoting a virtual copy

Member	JSON type	API type	Ignored Values	Description
action	number	Action Enum	Required field.	Specifies the promote operation to be performed.
online	boolean	boolean		If <code>True</code> , the promote operation is executed on an online volume. The default setting is <code>False</code> .
priority	number	taskPriorityEnum	Zero and negative numbers.	Does not apply to online promote operation or to stop promote operation.

To stop the promote virtual copy operation, see [Table 40 \(page 80\)](#).

Virtual copy promotion success

A successful copy promotion returns the HTTP code 200 OK. The message body shows the task ID of the promote operation as well as an array of links which, by default, contains an href to itself ("self").

For example:

```
{
  taskid: 7650
  links: [ 1 ]
    - 0: {
      href: "https://<server_name>:8080/api/v1/volumes/vvsr11.rw"
      rel: "self"
    }
}
```

A successfully stopped virtual copy operation returns the HTTP code 200 OK with no message body.

Virtual copy promotion errors

Possible errors during the creation, resynchronization, or stopping of physical copies of volumes are shown in [Table 133 \(page 144\)](#).

For generic API error codes, see [Table 6 \(page 29\)](#).

Table 133 Virtual copy promotion error codes

API Error	HTTP Code	Description
VV_NOT_STARTED	403 Forbidden	The volume is not started.

Table 133 Virtual copy promotion error codes (continued)

API Error	HTTP Code	Description
		(WSAPI 1.3 and later)
VV_IS_BEING_REMOVED	403 Forbidden	The volume is being removed. (WSAPI 1.3 and later)
VV_IN_STALE_STATE	403 Forbidden	The volume is in a stale state. (WSAPI 1.3 and later)
INV_OPERATION_CANNOT_STOP_ONLINE_PROMOTE	403 Forbidden	Invalid operation: The online promote cannot be stopped. Instead, use canceltask. (WSAPI 1.3 and later.1 with 3PAR OS 3.1.3 MU1)
INV_OPERATION_VV_BASE_VOLUME	409 Conflict	Invalid operation: The volume is a base volume. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_VV_PCOPY_IN_PROGRESS	409 Conflict	The volume has a copy in progress. (WSAPI 1.3 and later)
INV_OPERATION_PARENT_PCOPY_IN_PROGRESS	403 Forbidden	Invalid operation: The parent is involved in a physical copy. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_VV_TUNE_IN_PROGRESS	409 Conflict	Invalid operation: Volume tuning is in progress. (WSAPI 1.3 and later)
INV_OPERATION_VV_IN_REMOTE_COPY	403 Forbidden	The volume is involved in remote copy. (WSAPI 1.3 and later)
INV_OPERATION_PARENT_VV_EXPORTED	403 Forbidden	Invalid operation: The parent volume is exported. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_VV_EXPORTED	403 Forbidden	The parent volume is exported. (WSAPI 1.3 and later)
INV_OPERATION_PROMOTE_TARGET_NOT_BASE_VV	403 Forbidden	Invalid operation: The promote target is not a base volume. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_PARENT_SIZE_HAS_INCREASED	409 Conflict	Invalid operation: The parent volume size has increased. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_PARAM_CONFLICT	409 Conflict	Invalid Input: Parameters cannot be present at the same time.
INV_OPERATION_VV_IS_BUSY	409 Conflict	Invalid operation: Volume is currently busy.

Table 133 Virtual copy promotion error codes (continued)

API Error	HTTP Code	Description
		(WSAPI 1.3 and later)
INV_OPERATION_VV_PROMOTE_IN_PROGRESS	409 Conflict	Invalid operation: Volume promotion is in progress. (WSAPI 1.3 and later)
INV_OPERATION_VV_PROMOTE_IS_NOT_IN_PROGRESS	409 Conflict	Invalid operation: Volume promotion is not in progress. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)

Creating a VV-set snapshot

- ❗ **IMPORTANT:** Any user with the Super or Edit role or any role granted `sv_create` permission (for snapshots) can create a VV-set snapshot.

To create a VV-set snapshot, use the HTTP POST in the following URI:

`https://<storage_system>:8080/api/v1/volumesets/<volume_set_name>`

The `<volume_set_name>` parameter contains the name of the VV set being copied (*not* the name of the new VV-set snapshot). The message body is a JSON object with two members, `action` and `parameters`. The `action` member must have the value `createSnapshot`, and the `parameters` member is a JSON object with members as described in [Table 123 \(page 137\)](#).

VV-set snapshot creation success

A successful creation of the VV-set snapshot returns the `Location` portion of the response header with the URI for the newly created VV-set snapshot in the following format:

`api/v1/volumesets/<volume_set_name>`

The system returns the following HTTP status code:

HTTP_CREATED

VV-set snapshot creation errors

If an error occurs, the system returns one of the error codes shown in [Table 81 \(page 109\)](#), or a generic error code as shown in [Table 134 \(page 146\)](#).

Table 134 VV-set snapshot creation error codes

API Error	HTTP Code	Description
INVALID_INPUT_VV_PATTERN	400 Bad Request	Invalid volume pattern specified. (WSAPI 1.3 and later)
NON_EXISTENT_SET	404 Not Found	The set does not exist. (WSAPI 1.3 and later)
EMPTY_SET	404 Not Found	The set is empty. (WSAPI 1.3 and later)
VV_LIMIT_REACHED	503 Service Unavailable	Maximum number of volumes has been reached. (WSAPI 1.3 and later)
NON_EXISTENT_VOL	404 Not Found	The storage volume does not exist.

Table 134 VV-set snapshot creation error codes (continued)

API Error	HTTP Code	Description
VV_IS_BEING_REMOVED	403 Forbidden	The volume is being removed. (WSAPI 1.3 and later)
INV_OPERATION_VV_READONLY_TO_READONLY_SNAP	403 Forbidden	Creating a read-only copy from a read-only volume is not permitted. (WSAPI 1.3 and later)
NO_SNAP_CPG	409 Conflict	No snapshot CPG has been configured for the volume. (WSAPI 1.3 and later)
INV_INPUT_DUP_NAME	400 Bad Request	Invalid input. (WSAPI 1.3 and later)
INV_OPERATION_VV_SNAP_PARENT_SAME_BASE	403 Forbidden	Two parent snapshots share the same base volume. (WSAPI 1.3 and later)
INV_OPERATION_VV_ONLINE_COPY_IN_PROGRESS	409 Conflict	Invalid operation. Online copy is in progress. (WSAPI 1.2 and later)
VV_ID_LIMIT_REACHED	503 Service Unavailable	Maximum number of volume IDs has been reached. (WSAPI 1.3 and later)
EXISTENT_VOL	409 Conflict	The storage volume already exists.
VV_IN_STALE_STATE	403 Forbidden	The volume is stale. (WSAPI 1.3 and later)
VV_NOT_STARTED	403 Forbidden	The volume is not started. (WSAPI 1.3 and later)
VV_UNAVAILABLE	403 Forbidden	The volume is not accessible. (WSAPI 1.3 and later)
SNAPSHOT_LIMIT_REACHED	503 Service Unavailable	Maximum number of snapshots has been reached. (WSAPI 1.3 and later)
CPG_ALLOCATION_WARNING_REACHED	503 Service Unavailable	The CPG has reached the allocation warning. (WSAPI 1.3 and later)
INV_OPERATION_VV_VOLUME_CONV_IN_PROGRESS	409 Conflict	Invalid operation: Volume conversion is in progress (WSAPI 1.2 and later)
INV_OPERATION_VV_CLEANUP_IN_PROGRESS	403 Forbidden	Internal volume cleanup is in progress. (WSAPI 1.3 and later)
INV_OPERATION_VV_PEER_VOLUME	403 Forbidden	The operation is not allowed on a peer volume. (WSAPI 1.2 and later)
INV_OPERATION_VV_ONLINE_COPY_IN_PROGRESS	409 Conflict	Invalid operation: Online copy is in progress. (WSAPI 1.2 and later)

Table 134 VV-set snapshot creation error codes (continued)

API Error	HTTP Code	Description
INV_OPERATION_VV_INTERNAL_VOLUME	403 Forbidden	The operation is not allowed on an internal volume. (WSAPI 1.2 and later)
EXISTENT_ID	409 Conflict	An ID exists.
INV_OPERATION_VV_NOT_IN_NORMAL_STATE	403 Forbidden	The volume state is not normal. (WSAPI 1.3 and later)
VV_IN_INCONSISTENT_STATE	403 Forbidden	The volume has an internal inconsistency error. (WSAPI 1.3 and later)
INV_INPUT_RETAIN_GT_EXPIRE	400 Bad Request	The volume retention time is greater than the expiration time.
INV_INPUT_TIME	400 Bad Request	Invalid time specified.
INV_OPERATION_SNAPSHOT_NOT_SAME_TYPE	403 Forbidden	Some snapshots in the volume set are read-only, some are read-write. (WSAPI 1.4 and later)

Creating a physical copy of a VV set

To create a physical copy of a VV set, use the HTTP POST method with the following URI:

https://<storage_system>:8080/api/v1/volumesets/<volume_set_name>

The **<volume_set_name>** parameter contains the name of the VV set being copied (*not* the name of the destination VV set).

The message body is a JSON object with two members, **action** and **parameters**.

The **action** member must have the value **createPhysicalCopy**. The **parameters** member is a JSON object with members as shown in [Table 135 \(page 148\)](#).

Table 135 parameters JSON object members for Creating a Physical Copy of a VV Set

Member	JSON type	API type	Ignored Values	Description
destVolume	string	name31	None. Required field.	Specifies the destination volume set. WSAPI 1.3
saveSnapshot	boolean	boolean		If True , the snapshot of the source volume is saved after the copy of the VV set is completed. WSAPI 1.3
priority	number	taskPriority Enum	Zero and negative values. The default is medium.	Task priority. See Table 129 (page 141) (WSAPI 1.3 and later)

Physical copy of VV set creation success

A successful operation returns the HTTP status code **201 Created**.

The **Location** portion of the response header contains the URI for the newly created physical copy of the VV set, in the following format:

api/v1/volumesets/<volume_set_name>

The message body returns an array of child, parent, and task ID for each volume in the parent VV set, as shown in [Table 136 \(page 149\)](#).

Table 136 Task ID JSON objects for creating a physical copy of a VV set or for resynchronizing a physical copy to a VV set

Member	JSON type	API type	Description
child	string	name31	Specifies the destination volume.
parent	string	name31	Specifies the parent volume.
taskid	integer		The task ID for the physical-cop task.

For information about checking the status of a physical-copying task, see [“Getting task status” \(page 203\)](#).

Physical copy of VV set creation errors

Possible error codes for creating physical copies of VV sets are shown in [Table 137 \(page 149\)](#) and in [Table 130 \(page 141\)](#). For generic API error codes, see [Table 6 \(page 29\)](#)

Table 137 Error codes for creating a physical copy of a VV set

API Error	HTTP Code	Description
NON_EXISTENT_SET	404 Not Found	The set does not exist. (WSAPI 1.3 and later)
SET_SIZE_NOT_SAME	400 Bad Request	The set sizes are different. (WSAPI 1.3 and later)
INV_INPUT_EMPTY_VVSET	400 Bad Request	The VV set is empty. (WSAPI 1.3 and later)

Resynchronizing or stopping a physical copy of a VV set

To resynchronize a physical copy of a VV set to its parent volume set, use the HTTP PUT method with the following URI:

https://<storage_system>:8080/api/vi/volumesets/<volume_set_name>

The <volume_set_name> parameter contains the name of the destination VV set being resynchronized. The message body has a single JSON object member, *action*.

For resynchronizing a physical-copy request, the message body can have *priority* and *action* JSON object member, as shown in [Table 138 \(page 149\)](#).

Table 138 Message body *resyncPhysicalCopy* JSON object for resynchronizing a physical copy to its VV set

Member	JSON type	API type	Ignored Values	Description
priority	number	TaskPriority Enum	Zero and negative values. The default is medium.	1: high 2: medium 3: low (WSAPI 1.3 and later)
action	number	setAction Enum	Zero and negative values.	Action to perform. See Table 139 (page 150) .

Table 138 Message body `resyncPhysicalCopy` JSON object for resynchronizing a physical copy to its VV set (continued)

Member	JSON type	API type	Ignored Values	Description
			This is required for resynchronizing or stopping a physical copy.	

JSON object members for the `action` JSON object are shown in [Table 139 \(page 150\)](#).

Table 139 Enumeration for the `action` JSON object when resynchronizing or stopping physical copy of a VV set

Symbol	Value	Description
<code>memAdd</code>	1	Adds a member to the VV set. (WSAPI 1.3 and later)
<code>memRemove</code>	2	Removes a member from the VV set. (WSAPI 1.3 and later)
<code>resyncPhysicalCopy</code>	3	Resynchronize the physical copy to its VV set. (WSAPI 1.3 and later)
<code>stopPhysicalCopy</code>	4	Stops the physical copy. (WSAPI 1.3 and later)
<code>promoteVirtualCopy</code>	5	Promote virtual copies in a VV set. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
<code>stopPromoteVirtualCopy</code>	6	Stops the promote virtual copy operations in a VV set. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)

The message body of a request to stop a physical copy of a VV set is empty.

Success response for resynchronizing a physical copy to its VV set, or stopping a physical copy of a VV set

A successful resynchronizing operation returns the HTTP status code `200 OK`, as well as an array of task IDs for each of the volumes in the VV set. For information on each member of the array, see [Table 136 \(page 149\)](#).

A successful physical-copy stop action returns the HTTP status code `200 OK` with an empty response body.

Errors for resynchronizing a physical copy to its VV set, or stopping a physical copy of a VV set

For possible errors following a request to synchronize a physical copy to its VV set, or for stopping the physical copy of a VV set, see [“Physical copy of VV set creation errors” \(page 149\)](#).

Promoting a VV-set virtual copy

To promote a VV-set virtual copy, use the HTTP PUT method on the following URI:

`https://<storage_system>:8080/api/vi/volumesets/<volume_set_name>`

where `<volume_set_name>` is the name of the VV set containing virtual copies that need to be promoted. The message body is a JSON object with members as described in [Table 140 \(page 151\)](#).

Table 140 JSON object members of the parameter object for promoting a VV-set virtual copy

Member	JSON type	API type	Ignored Values	Description
action	number	setAction Enum	Required field.	Specifies the promote operation to be performed on the VV set.
Online	boolean	boolean		If <code>True</code> , the promote operation is executed on an online volume. The default setting is <code>False</code> .
priority	number	taskPriorityEnum	Zero and negative numbers.	Does not apply to online promote operation or to stop promote operation.

To stop the promote VV-set virtual copy operation, see [Table 139 \(page 150\)](#).

VV-set virtual copy promotion success

A successful copy promotion returns the HTTP code 200 OK. The message body shows an array of task IDs for each of the virtual copies in the VV set as well as an array of links which, by default, contain an href to itself ("self").

For example:

```
{
  tasks: [2]
    -0 {
      taskid: 7650
    }
    -1 {
      taskid: 7651
    }
  links: [ 1 ]
    - 0: {
      href: "https://<server_name>:8080/api/v1/volumesets/vvset"
      rel: "self"
    }
  }
```

A successfully stopped VV-set virtual copy promote operation returns the HTTP code 200 OK with no message body.

VV-set virtual-copy promotion errors

Possible errors during the promotion of VV-set virtual copies are shown in [Table 141 \(page 151\)](#).

For generic API error codes, see [Table 6 \(page 29\)](#).

Table 141 VV-set virtual-copy promotion error codes

API Error	HTTP Code	Description
VV_NOT_STARTED	403 Forbidden	The volume is not started. (WSAPI 1.3 and later)
VV_IS_BEING_REMOVED	403 Forbidden	The volume is being removed. (WSAPI 1.3 and later)

Table 141 VV-set virtual-copy promotion error codes (continued)

API Error	HTTP Code	Description
VV_IN_STALE_STATE	403 Forbidden	The volume is in a stale state. (WSAPI 1.3 and later)
INV_OPERATION_CANNOT_STOP_ONLINE_PROMOTE	403 Forbidden	Invalid operation: The online promote cannot be stopped. Instead, use canceltask. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_VV_BASE_VOLUME	409 Conflict	Invalid operation: The volume is a base volume. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_VV_PCOPY_IN_PROGRESS	409 Conflict	The volume has a copy in progress. (WSAPI 1.3 and later)
INV_OPERATION_PARENT_PCOPY_IN_PROGRESS	403 Forbidden	Invalid operation: The parent is involved in a physical copy. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_VV_TUNE_IN_PROGRESS	409 Conflict	Invalid operation: Volume tuning is in progress. (WSAPI 1.3 and later)
INV_OPERATION_VV_IN_REMOTE_COPY	403 Forbidden	The volume is involved in remote copy. (WSAPI 1.3 and later)
INV_OPERATION_PARENT_VV_EXPORTED	403 Forbidden	Invalid operation: The parent volume is exported. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_VV_EXPORTED	403 Forbidden	The parent volume is exported. (WSAPI 1.3 and later)
INV_OPERATION_PROMOTE_TARGET_NOT_BASE_VV	403 Forbidden	Invalid operation: The promote target is not a base volume. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_PARENT_SIZE_HAS_INCREASED	409 Conflict	Invalid operation: The parent volume size has increased. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_PARAM_CONFLICT	409 Conflict	Invalid Input: Parameters cannot be present at the same time.
INV_OPERATION_VV_IS_BUSY	409 Conflict	Invalid operation: Volume is currently busy. (WSAPI 1.3 and later)
INV_OPERATION_VV_PROMOTE_IN_PROGRESS	409 Conflict	Invalid operation: Volume promotion is in progress. (WSAPI 1.3 and later)

Querying the status of a VV-set physical copy

To query the status of a VV-set physical copy, use the task ID returned in the physical-copy creation or resynchronization operation response. Be sure to check the status of the task. For information about querying task status, see [“Getting task status” \(page 203\)](#).

Updating virtual copies or VV-sets

Update a virtual copy, or volume sets containing virtual copies, with a new snapshot using the HTTP POST method with the following URI:

`https://<storage_server>:8080/api/v1/volumes/`

The message body is a JSON object with two members, action (see [Table 40 \(page 80\)](#)) and parameters (see [Table 142](#)).

Table 142 Members of the parameter object for promote virtual copy operation

Member	JSON type	API type	Ignored values	Description
volumeSnapshotList	Array of string	Name31	Required field.	List one or more volume snapshots to update. If specifying a vvset, use the following format <code>set:vvset_name</code> .
readOnly	boolean	boolean	None.	Specifies that if the virtual copy is read-write, the command updates the read-only parent volume also.

Updating virtual copies or vvsets success

A successful update returns the HTTP code 200 OK.

- ❗ **IMPORTANT:** To update each of the snapshot volume, generate an ACL using the `setuseracl` CLI command so that the user has permission to update the specified virtual volumes.

Updating virtual copies or vvsets error codes

[Table 147 \(page 156\)](#) lists the possible errors following an attempt to create a remote-copy group.

Table 143 Virtual copy update error codes

API code	HTTP code	Description
UNLICENSED_FEATURE	403 Forbidden	This system is not licensed with promote

11 Working with HPE 3PAR remote copy

- ❗ **IMPORTANT:** WSAPI 1.4 and later support several HPE 3PAR Remote Copy actions. Because the remote copy group members object defined in both WSAPI 1.4.0 and WSAPI 1.4.1 are obsolete, Hewlett Packard Enterprise recommends using WSAPI 1.4.2 or later.

For more information about using 3PAR Remote Copy, see the 3PAR Remote Copy Software user guide, available at the following website:

[HPE Storage Information Library](http://www.hpe.com/info/storage/docs) (<http://www.hpe.com/info/storage/docs>)

Licensing information

Hewlett Packard Enterprise 3PAR Remote Copy requires a minimum of two 3PAR StoreServ Storage systems. In addition, you must have 3PAR Remote Copy Software licenses for all storage systems participating in remote-copy replication. For more information about licensing and features, see the 3PAR StoreServ Storage concepts guide.

Creating a remote-copy group

To create a remote-copy group, use the HTTP POST method with the following URI:

`https://<storage_system>:8080/api/v1/remotecopygroups`

Table 144 (page 154) provides the message body definitions.

Table 144 Message body JSON objects for creating a remote-copy group

Member	JSON type	API type	Ignored Values	Description
name	string	name31	Required field.	Specifies the name of the remote-copy group to create.
domain	string	name31	Optional field.	Specifies the domain in which to create the remote-copy group.
targets	array of object	array of remoteCopyTarget	Required field.	Specifies the attributes of the target of the remote-copy group.
localUserCPG	string	name31	Required if you specify localSnapCPG; Optional otherwise.	Specifies the local snap CPG used for auto-created volumes.
localSnapCPG	string	name31	Optional field. It is required if localUserCPG is specified.	Specifies the local snap CPG used for auto-created volumes.

JSON object members for `remoteCopyTarget` are shown in Table 145 (page 154).

Table 145 Message body JSON objects for remoteCopyTarget

Member	JSON type	API type	Ignored Values	Description
targetName	string	name31	Required field.	Specifies the target name associated with the

Table 145 Message body JSON objects for `remoteCopyTarget` (continued)

Member	JSON type	API type	Ignored Values	Description
				remote-copy group to be created.
mode	number	rcopyGroupModeEnum	Required field.	Specifies the volume group mode (see Table 146 (page 155)).
userCPG	string	name31	Optional field. Required if you specify <code>localUserCPG</code> .	Specifies the user CPG used for autocreated target volumes.
snapCPG	string	name31	Optional field. Required if you specify <code>localSnapCPG</code> .	Specifies the snap CPG used for auto-created target volumes.

Enumeration for specifying the remote-copy group mode is shown in [Table 146 \(page 155\)](#).

Table 146 `rcopyGroupModeEnum` symbols and descriptions

Symbol	Value	Description
SYNC	1	Remote-copy group mode is synchronous.
PERIODIC	2	Remote-copy group mode is periodic. WSAPI 1.5 deprecates this field, but retains it for backward compatibility.
PERIODIC	3	Remote-copy group mode is periodic. (WSAPI 1.5 and later)
ASYNCH	4	Remote-copy group mode is asynchronous. (WSAPI 1.5 and later)

Remote-copy group creation success

A successful creation of a remote-copy group returns the HTTP code `201 CREATED`. The response body contains a link to the newly created remote-copy group, as shown in the following example:

```
{
  "links": [1]
-0: {
  "rel": "remoteCopyGroupCreated",
  "href": "https://<server_name>:8080/api/v1/remotecopygroups/<group_name>"
}
}
```

Remote-copy group creation errors

Possible errors following an attempt to create a remote-copy group are shown in [Table 147 \(page 156\)](#). For generic API error codes, see [Table 154 \(page 161\)](#).

Table 147 Remote-copy group creation error codes

API Error	HTTP Code	Description
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	Invalid character in the remote-copy group or volume name.
EXISTENT_RCOPY_GROUP	404 Not Found	The remote-copy group already exists.
RCOPY_GROUP_TOO_MANY_TARGETS	409 Conflict	Too many remote-copy group targets have been specified.
INV_INPUT_BAD_ENUM_VALUE	400 Bad Request	The mode is not valid.
RCOPY_GROUP_TARGET_NOT_UNIQUE	400 Bad Request	The remote-copy group target is not unique.
RCOPY_IS_NOT_READY	403 Forbidden	The remote-copy configuration is not ready for commands.
RCOPY_GROUP_MODE_NOT_SUPPORTED	403 Forbidden	The remote-copy group mode is not supported.
RCOPY_GROUP_MAX_GROUP_REACHED_PERIODIC	409 Conflict	The maximum number of remote-copy groups in periodic mode has been reached.
RCOPY_GROUP_MAX_GROUP_REACHED_SYNC	409 Conflict	The maximum number of remote-copy groups in synchronous mode has been reached.
RCOPY_GROUP_SECONDARY_GROUP_MORE_THAN_ONE_BACKUP_TARGET	403 Forbidden	Secondary groups should have only one target that is not a backup.
RCOPY_GROUP_MORE_THAN_ONE_SYNC_TARGET	503 Service Unavailable	Remote-copy groups can have no more than one synchronous-mode target.
RCOPY_GROUP_MORE_THAN_ONE_PERIODIC_TARGET	503 Service Unavailable	Remote-copy groups can have no more than one periodic-mode target.
RCOPY_GROUP_ONE_TO_ONE_CONFIG_FOR_MIXED_MODE	403 Forbidden	Mixed mode is supported in a 1-to-1 remote-copy configuration.
RCOPY_GROUP_INV_TARGET	403 Forbidden	The specified target is not a target of the remote-copy group.
RCOPY_TARGET_IN_PEER_PERSISTENCE_SYNC_GROUP_ONLY	501 NOT IMPLEMENTED	The remote-copy target is configured with peer persistence; only synchronous groups can be added.
RCOPY_TARGET_MODE_NOT_SUPPORTED	501 NOT IMPLEMENTED	The remote-copy target mode is not supported.
RCOPY_TARGET_MULTI_TARGET_NOT_SUPPORTED	501 NOT IMPLEMENTED	The remote-copy target was created in an earlier version of the 3PAR OS

Table 147 Remote-copy group creation error codes (continued)

API Error	HTTP Code	Description
		that does not support multiple targets.
RCOPY_TARGET_VOL_AUTO_CREATION_NOT_SUPPORTED	501 NOT IMPLEMENTED	The remote-copy target is in an older version of the 3PAR OS that does not support autocreation of volumes.
RCOPY_GROUP_MIXED_MODES_ON_ONE_TARGET	400 Bad Request	Remote-copy groups with different modes on a single target are not supported.
NON_EXISTENT_CPG	404 Not Found	The CPG does not exist.
CPG_NOT_IN_SAME_DOMAIN	403 Forbidden	The CPG is not in the same domain as the remote-copy group. (WSAPI 1.2 and later)
NON_EXISTENT_DOMAIN	404 Not Found	The domain does not exist.
RCOPY_GROUP_HAS_NO_CPG	403 Forbidden	No CPG has been defined for the remote-copy group on the target.
RCOPY_MAX_SYNC_TARGET_REACHED	503 Service Unavailable	The maximum number of remote-copy synchronous targets has been reached.
RCOPY_MAX_PERIODIC_TARGET_REACHED	503 Service Unavailable	The maximum number of remote-copy periodic targets has been reached.
RCOPY_GROUP_INV_POLICY_FOR_GROUP_TARGET	403 Forbidden	The policy is not valid for remote copy group's target

Removing a remote-copy group

- ❗ **IMPORTANT:** Any user with the Super or Edit role, or any role granted `rcopygroup_remove` permission, can perform this operation. Access to all domains is required for this operation.

To remove a remote-copy group, use the HTTP DELETE method with the following URI and no message body:

`https://<storage_system>:8080/api/v1/remotecopygroups/<group_name>`

To remove a remote-copy group with the option of retaining the local volume resynchronization snapshot, use the HTTP DELETE method in the following URI:

`https://<storage_system>:8080/api/v1/remotecopygroups/<group_name>[?<option>]`

The `<option>` parameter can be one of the following case-sensitive values:

- `keepSnap=true`
- `keepSnap=false`

Remote-copy group removal success

A successful group removal returns the HTTP status code 200 OK with no message body.

Remote-copy group removal errors

Possible errors following an attempt to remove a remote-copy group are shown in [Table 148 \(page 158\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 148 Remote-copy group removal error codes

API Error	HTTP Code	Description
NON_EXISTENT_RCOPY_GROUP	404 Not Found	The remote-copy group does not exist.
RCOPY_GROUP_STARTED	403 Forbidden	The remote-copy group has already been started.
RCOPY_GROUP_IS_BUSY	403 Forbidden	The remote-copy group is currently busy; retry later.
RCOPY_TARGET_IS_NOT_READY	403 Forbidden	The remote-copy group target is not ready.
RCOPY_GROUP_OPERATION_ONLY_ON_PRIMARY_SIDE	403 Forbidden	The operation should be performed only on the primary side.
RCOPY_GROUP_RENAME_RESYNC_SNAPSHOT_FAILED	403 Forbidden	Renaming of the remote-copy group resynchronization snapshot failed.
RCOPY_GROUP_IN_FAILOVER_STATE	403 Forbidden	The remote-copy group is in failover state; both the source system and the target system are in the primary state.
RCOPY_GROUP_TARGET_VOLUME_MISMATCH	404 Not Found	Secondary group on target system has a mismatched volume configuration.

Admitting a volume into a remote-copy group

To admit a volume into a remote-copy group, use either of the following HTTP methods.

- **Method 1**—Use the HTTP PUT method with the following URI:
`https://<storage_system>:8080/api/v1/remotecopygroups/<group_name>`
WSAPI 1.5 deprecates the HTTP PUT method but retains it for backward compatibility.
- **Method 2**—Use the HTTP POST method with the following URI (WSAPI 1.5 and later):
`https://<storage_system>:8080/api/v1/remotecopygroups/<group_name>/volumes`

[Table 149 \(page 158\)](#) provides definitions of the message body, which are the same for either method, except that the HTTP POST method does not have an **action** member.

Table 149 Message body JSON objects for admitting a volume into a remote-copy group

Member	JSON type	API type	Ignored Values	Description
action	number	remoteCopyGroupPUTOperation	Required field.	Specifies the action to be taken for the specified volume group (HTTP PUT method only while admitting a volume).
volumeName	string	name31	Required field.	Specifies the name of the existing virtual volume to be admitted to an existing remote-copy group.
targets	array of objects	array of targets objects	Required field.	At least one pair of <code>targetName</code> and

Table 149 Message body JSON objects for admitting a volume into a remote-copy group
(continued)

Member	JSON type	API type	Ignored Values	Description
				<code>secVolumeName</code> must be specified See Table 150 (page 159) .
<code>snapshotName</code>	string	name31	None	The optional read-only <code>snapshotName</code> is a starting snapshot when the group is started without performing a full resynchronization. Instead, for synchronized groups, the volume synchronizes deltas between this <code>snapshotName</code> and the base volume. For periodic groups, the volume synchronizes deltas between this <code>snapshotName</code> and a snapshot of the base.
<code>volumeAutoCreation</code>	boolean	boolean	None	If <code>volumeAutoCreation</code> is set to <code>true</code> , the secondary volumes should be created automatically on the target using the CPG associated with the remote-copy group on that target. This cannot be set to <code>true</code> if the snapshot name is specified.
<code>skipInitialSync</code>	boolean	boolean	None	If <code>skipInitialSync</code> is set to <code>true</code> , the volume should skip the initial sync. This is for the admission of volumes that have been pre-synced with the target volume. This cannot be set to <code>true</code> if the snapshot name is specified.

Members of `targets` JSON object for admitting volumes into a remote-copy group are shown in [Table 150 \(page 159\)](#).

Table 150 `targets` JSON object members for admitting volumes to remote-copy groups

Member	JSON type	API type	Ignored Values	Description
<code>targetName</code>	string	name31	Required field.	The target name associated with this group.
<code>secVolumeName</code>	string	name31	Required field.	Specifies the name of the secondary volume on the target system.

Enumeration for the remote-copy group PUT operation is shown in [Table 151 \(page 160\)](#).

Table 151 Enumeration for remotecopyGroupPUTOperation

Symbol	Value	Description
ADMIT_VV	1	Admit a volume into the remote-copy group.
DISMISS_VV	2	Dismiss a volume from the remote-copy group.
START_GROUP	3	Start the remote-copy group.
STOP_GROUP	4	Stop the remote-copy group.
SYNC_GROUP	5	Manually synchronize the remote-copy group.

Table 152 shows the enumeration for remote-copy group POST operations.

Table 152 Enumeration for remoteCopyGroupPOSTOperation

Symbol	Value	Description
REVERSE_GROUP	6	Changes the current direction of the remote-copy groups. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
FAILOVER_GROUP	7	Changes the secondary groups to primary groups on the active system. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
SWITCHOVER_GROUP	8	Migrates the remote-copy group from the primary system to the secondary system without impacting I/O. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
RECOVER_GROUP	9	Changes the primary remote-copy group on the backup system to the secondary remote-copy group. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
RESTORE_GROUP	10	Changes all remote-copy groups to their natural direction and starts them. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
OVERRIDE_GROUP	11	Overrides the failsafe state that is applied to the remote-copy group.

Volume admission success

A successful admission of a volume into the remote-copy group returns the HTTP code 200 OK. The Location portion of the response header contains the new URI for the updated remote copy volume group.

For the HTTP PUT method, the response header URI is:

`api/v1/remotecopygroups/<group_name>`

The response includes a message body as specified in Table 153 (page 161).

For the HTTP POST method, the response header URI is:

`/api/v1/remotecopygroups/<group_name>/volumes/<volume_name>`

Table 153 JSON objects in response for admitting a volume into a remote-copy group

Member	JSON type	API type	Description
links	array of URL links	Array of URL links	Links include the self URL

Volume admission errors

Possible errors following an attempt to admit a volume into a remote-copy group are shown in [Table 194 \(page 190\)](#). For generic API error codes, see [Table 154 \(page 161\)](#).

Table 154 Volume Admission into a remote-copy group error codes

API Error	HTTP Code	Description
NON_EXISTENT_RCOPY_GROUP	404 Not Found	The remote-copy group does not exist.
NON_EXISTENT_VOL	404 Not Found	The volume to be admitted to the remote-copy group does not exist.
NON_EXISTENT_SNAPSHOT	404 Not Found	The specified snapshot does not exist.
RCOPY_GROUP_SNAPSHOT_IS_RW	403 Forbidden	The specified snapshot can only be read-only.
RCOPY_GROUP_VOL_IS_RO	403 Forbidden	The volume to be admitted to the remote-copy group cannot be read-only.
RCOPY_GROUP_HAS_NO_CPG	403 Forbidden	The volume on the target cannot be created automatically because no CPG has been defined in the remote-copy group.
RCOPY_GROUP_EXISTENT_VOL	409 Conflict	The specified volume is already in the remote-copy group.
RCOPY_GROUP_EXISTENT_VOL_ON_TARGET	409 Conflict	The specified secondary volume to be automatically created already exists on the target.
RCOPY_GROUP_INV_TARGET	403 Forbidden	The specified target is not a target of the remote-copy group.
RCOPY_GROUP_VOL_SIZE_NOT_MATCH	403 Forbidden	The size of the volume added to the remote-copy group does not match the size of the volume on the target.
RCOPY_GROUP_NON_EXISTENT_VOL_ON_TARGET	404 Not Found	The specified secondary volume does not exist on the target.
RCOPY_GROUP_VOL_NO_SNAPSHOT_SPACE	403 Forbidden	The volume to be admitted into the remote-copy group requires that snapshot space be allocated.
RCOPY_GROUP_TARGET_VOL_NO_SNAPSHOT_SPACE	403 Forbidden	The specified secondary volumes on the target require snapshot space.
RCOPY_GROUP_VOL_IS_PHYSICAL_COPY	403 Forbidden	A physical copy cannot be added to a remote-copy group.
RCOPY_GROUP_MAX_VOL_REACHED_PERIODIC	403 Forbidden	The number of periodic-mode volumes on the system has reached the limit.
RCOPY_GROUP_MAX_VOL_REACHED_SYNC	403 Forbidden	The number of synchronous-mode volumes on the system has reached the limit.

Table 154 Volume Admission into a remote-copy group error codes *(continued)*

API Error	HTTP Code	Description
RCOPY_GROUP_MAX_VOL_REACHED	403 Forbidden	The number of volumes on the system has reached the limit.
RCOPY_IS_NOT_READY	403 Forbidden	The remote-copy configuration is not ready for commands.
RCOPY_GROUP_VOL_INTERNAL_CONSISTENCY_ERR	403 Forbidden	The volume to be admitted into the remote-copy group has an internal consistency error.
RCOPY_GROUP_IS_BEING_REMOVED	403 Forbidden	The volume to be admitted into the remote-copy group is being removed.
RCOPY_GROUPSAPSHOT_PARENT_MISMATCH	403 Forbidden	The names of the snapshot and its parent do not match.
RCOPY_GROUP_TARGET_VOL_EXPORTED	403 Forbidden	Secondary volumes cannot be admitted when they are exported.
RCOPY_GROUP_VOL_IS_PEER_PROVISIONED	403 Forbidden	A peer-provisioned volume cannot be admitted into a remote-copy group.
RCOPY_GROUP_VOL_ONLINE_CONVERSION	403 Forbidden	Online volume conversions do not support remote copy.
RCOPY_GROUP_VOL_ONLINE_PROMOTE	403 Forbidden	Online volume promotes do not support remote copy.
RCOPY_GROUP_VOL_ONLINE_COPY	403 Forbidden	Online volume copies do not support remote copy.
RCOPY_GROUP_VOL_CLEAN_UP	403 Forbidden	Cleanup of internal volume is in progress.
RCOPY_GROUP_VOL_IS_INTERNAL	403 Forbidden	Internal volumes cannot be admitted into a remote-copy group.
RCOPY_GROUP_VOL_NOT_IN_SAME_DOMAIN	403 Forbidden	The remote-copy group has a different domain than the volume.
RCOPY_GROUP_STARTED	403 Forbidden	The remote-copy group has already been started.
RCOPY_GROUP_IS_BUSY	403 Forbidden	The remote-copy group is currently busy; retry later.
RCOPY_GROUP_VOL_IN_OTHER_GROUP	403 Forbidden	The volume is already in another remote-copy group. A volume cannot be in more than one remote-copy group.
RCOPY_GROUP_INV_TARGET_NUMBER	403 Forbidden	The wrong number of targets is specified for the remote-copy group.
RCOPY_GROUP_INV_TARGET	403 Forbidden	The specified target is not the target of a remote-copy group.
RCOPY_GROUP_NOT_SUPPORT_VOL_ID	403 Forbidden	The target for the remote-copy group does not support volume IDs.
RCOPY_GROUP_IS_SELF_MIRRORED	403 Forbidden	The target is self-mirrored. Volumes cannot be mirrored to themselves.

Table 154 Volume Admission into a remote-copy group error codes *(continued)*

API Error	HTTP Code	Description
RCOPY_GROUP_TARGET_VOL_IS_RO	403 Forbidden	The remote-copy target volume cannot be read-only.
RCOPY_GROUP_OPERATION_ONLY_ON_PRIMARY_SIDE	403 Forbidden	The operation should be performed only on the primary side.
RCOPY_TARGET_IS_NOT_READY	403 Forbidden	The remote-copy group target is not ready.
RCOPY_UNSUPPORTED_TARGET_VERSION	501 NOT IMPLEMENTED	The target 3PAR OS version is not supported.
RCOPY_GROUP_MULTIPLE_VOL_IN_SAME_FAMILY	403 Forbidden	A remote-copy group cannot contain multiple volumes in the same family tree.
RCOPY_GROUP_MULTIPLE_RW_SNAPSHOT_IN_SAME_FAMILY	403 Forbidden	Only one read/write snapshot in the same family can be added to a remote-copy group.
RCOPY_GROUP_SYNC_SNAPSHOT_IN_MULTIPLE_TARGET	403 Forbidden	A synchronization snapshot cannot be set with multiple targets.
RCOPY_GROUP_ADD_VOL_FAILED	403 Forbidden	Failed to add volume to the remote-copy group.
RCOPY_GROUP_ADD_VOL_FAILED_PARTIAL	403 Forbidden	Adding volume to remote-copy group succeeded on some targets. An attempt is being made to clean up.
INV_OPERATION_SET_AUTO_CREATED	403 Forbidden	The set was created automatically Members cannot be added or removed.
RCOPY_GROUP_SECONDARY_DOES_NOT_MATCH_PRIMARY	403 Forbidden	The remote-copy group is in the failover state. Both systems are in the primary state.

Dismissing a volume from a remote-copy group

You can dismiss a volume from a remote-copy group using the HTTP PUT method with the following URI:

`https://<storage_system>:8080/api/v1/remotecopygroups/<group_name>`

WSAPI 1.5 deprecates the HTTP PUT method but retains it for backward compatibility.

[Table 155 \(page 164\)](#) lists the message body definitions.

Dismiss a volume from a remote copy group using the HTTP DELETE method with the following URI and no message body (WSAPI 1.5 and later):

**`https://<storage_system>:8080/api/v1/remotecopygroups/<group_name>/
volumes/<volume_name>[?<option>]`**

The <option> parameter is one of the following, case-sensitive values:

- keepSnap=true
- keepSnap=false

Table 155 Message body JSON objects for dismissing a volume from a remote-copy group using HTTP PUT

Member	JSON type	API type	Ignored Values	Description
action	number	remoteCopyGroupPUTOperation	Required field.	Specifies the action to be taken for the specified volume group (Required for HTTP PUT operation only while dismissing a volume).
volumeName	string	name31	Required field.	Specifies the name of the existing virtual volume to be admitted to an existing remote-copy group.
keepSnap	boolean	boolean	Not required.	If <code>true</code> , the resynchronization snapshot of the local volume is retained. The default setting is <code>false</code> .

Volume dismissal success

A successful dismissal of a volume from the remote-copy group returns the HTTP code 200 OK.

Volume dismissal errors

Possible errors following an attempt to dismiss a volume from a remote-copy group are shown in [Table 156 \(page 164\)](#). For generic API error codes, see [Table 154 \(page 161\)](#).

Table 156 Volume dismissal from a remote-copy group error codes

API Error	HTTP Code	Description
NON_EXISTENT_RCOPY_GROUP	404 Not Found	The remote-copy group does not exist.
NON_EXISTENT_VOL	404 Not Found	The volume to be dismissed from the remote-copy group does not exist.
RCOPY_IS_NOT_READY	403 Forbidden	The remote-copy configuration is not ready for commands.
RCOPY_GROUP_STARTED	403 Forbidden	The remote-copy group has already been started. The operation is allowed only on a stopped remote-copy group.
RCOPY_GROUP_IS_BUSY	403 Forbidden	The remote-copy group is currently busy.
RCOPY_GROUP_VOL_NOT_IN_GROUP	404 Not Found	The volume is not in the remote-copy group.
RCOPY_GROUP_RENAME_RESYNC_SNAPSHOT_FAILED	403 Forbidden	Renaming of the remote-copy group resynchronization snapshot failed.
RCOPY_GROUP_CREATED_MIRROR_CONFIG_OFF	409 Conflict	The remote-copy group was created when the configuration mirroring policy was turned off on the target. However, this policy is now turned on. In order to dismiss a volume from the remote-copy group, the configuration mirroring policy must be turned off. Retry after turning the policy off.

Table 156 Volume dismissal from a remote-copy group error codes *(continued)*

API Error	HTTP Code	Description
		The remote-copy group must be started before the policy can be turned on again.
RCOPY_GROUP_OPERATION_ONLY_ON_PRIMARY_SIDE	403 Forbidden	The operation should be performed only on the primary side.
RCOPY_TARGET_IS_NOT_READY	403 Forbidden	The remote-copy group target is not ready.

Starting a remote-copy group

To start a remote-copy group, use the HTTP PUT method in the following URI:

https://<storage_system>:8080/api/v1/remotecopygroups/<group_name>

with a message body as defined in [Table 157 \(page 165\)](#).

Table 157 Message body JSON objects for starting a remote-copy group

Member	JSON type	API type	Ignored Values	Description
action	number	remoteCopyGroupPUTOperation Enum	Required field.	Specifies the action to be taken for the specified volume group—in this case, <code>START_GROUP</code> .
skipInitialSync	number	boolean	None.	If <code>True</code> , the volume should skip the initial synchronization and sets the volumes to a synchronized state. The default setting is <code>False</code> .
targetName	string	name31	None	The target name associated with this group.
startingSnapshots	array of objects	array of startingSnapshotPairs See Table 158	None	When used, you must specify all the volumes in the group. While specifying the pair, the starting snapshot is optional. When not used, the system performs a full resynchronization of the volume.

[Table 158](#) shows the JSON object members of the `startingSnapshots` field.

Table 158 Members of `startingSnapshotPairs` while specifying the `startingSnapshots` field

Member	JSON type	API type	Description
volumeName	string	name31	volume name.
snapshotName	string	name31	Snapshot name.

Remote-copy group start success

A successful request to start a remote-copy group returns the HTTP code 200 OK.

The `Location` portion of the response header contains the URI for the remote-copy group:

`https://<storage_system>:8080/api/v1/remotecopygroups/<group_name>`

Unless an error occurs, the response includes a message body as specified in [Table 159 \(page 166\)](#).

Table 159 JSON objects for remote-copy group start response

Member	JSON type	API type	Description
links	array of URL links	array of URL links	Links include the remote-copy group<group_name> (see “Example Response with Remote-Copy Links”).
tasks ¹	array of task IDs	array of task IDs	Array of task IDs for each volume in the remote-copy group.

¹ The response includes the task member under the following conditions:

- The remote-copy group is in synchronous mode
- The first time only, if the remote-copy group is in periodic mode

Remote-copy group start errors

Possible errors following an attempt to start a remote-copy group are shown in [Table 160 \(page 166\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 160 Remote-copy group start error codes

API Error	HTTP Code	Description
NON_EXISTENT_RCOPY_GROUP	404 Not Found	The remote-copy group does not exist.
RCOPY_GROUP_INV_TARGET	403 Forbidden	The specified target is not a target of the remote-copy group.
RCOPY_GROUP_STARTED	403 Forbidden	The remote-copy group has already been started. The operation is allowed only on a stopped remote-copy group.
RCOPY_GROUP_EMPTY	400 Bad Request	The remote-copy group must contain volumes before being started.
RCOPY_GROUP_OPERATION_ONLY_ON_PRIMARY_SIDE	403 Forbidden	The operation should be performed only on the primary side.
RCOPY_TARGET_NOT_SPECIFIED	400 Bad Request	A target must be specified to complete this operation.
RCOPY_GROUP_NOT_ALL_VOLUMES_SPECIFIED	400 Bad Request	All the volumes in the remote-copy group must be specified to complete this operation.
RCOPY_GROUP_EXISTENT_VOL_WWN_ON_TARGET	404 Not Found	Secondary volume WWN already exists on the target.
RCOPY_GROUP_VOLUME_ALREADY_SYNCED	404 Not Found	volume is already synchronized.
RCOPY_GROUP_INCORRECT_SNAPSHOT_OR_VOLUME_SPECIFIED	400 Bad Request	An incorrect starting snapshot or volume was specified, or

Table 160 Remote-copy group start error codes (continued)

API Error	HTTP Code	Description
		the snapshot or volume does not exist.

Stopping a remote-copy group

To stop a remote-copy group, use the HTTP PUT method in the following URI:

`https://<storage_system>:8080/api/v1/remotecopygroups/<group_name>`

with a message body as defined in [Table 161 \(page 167\)](#).

Table 161 Message body JSON objects for stopping a remote-copy group

Member	JSON type	API type	Ignored Values	Description
action	number	remoteCopyGroupPUTOperation	Required field.	Specifies the action to be taken for the specified volume group—in this case, STOP_GROUP.
noSnapshot	boolean	boolean	None	If true, this option turns off creation of snapshots in synchronous and periodic modes, and deletes the current synchronization snapshots. The default setting is false.
targetName	string	name31	None	The target name associated with this group.

Remote-copy group Stop success

A successful request to stop a remote-copy group returns the HTTP code 200 OK.

The Location portion of the response header contains the URI for the remote-copy group:

`https://<storage_system>:8080/api/v1/remotecpygroups/<group_name>`

Unless an error occurs, the response includes a message body as specified in [Table 162 \(page 167\)](#).

Table 162 JSON objects for remote-copy group Stop Response

Member	JSON type	API type	Description
links	array of URL links	array of URL links	The links will include the <group_name> of the remote-copy group (see “ Example Response with Remote-Copy Links ”).

Remote-copy group Stop errors

Possible errors following an attempt to stop a remote-copy group are shown in [Table 163 \(page 168\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 163 Remote-copy group Stop error codes

API Error	HTTP Code	Description
NON_EXISTENT_RCOPY_GROUP	404 Not Found	The remote-copy group does not exist.
RCOPY_TARGET_IS_NOT_READY	403 Forbidden	The remote-copy group target is not ready.

Modifying a remote-copy group

To modify a remote-copy group, use the HTTP PUT method with the following URI:

https://<storage_system>:8080/api/v1/remotecopygroups/<group_name>

with a message body as defined in [Table 164 \(page 169\)](#).

Remote-copy modification parameter sets

Only one set of remote-copy modification parameters can be specified in a request. If more than one set of parameters is specified, the WSAPI will return an error. The sets are as follows:

- Remote-copy group `policies`
- Remote-copy group `mode`
- Remote-copy group `syncPeriod`
- Remote-copy group CPG parameters:
 - `localUserCPG`
 - `localSnapCPG`
 - `remoteUserCPG`
 - `remoteSnapCPG`
- Unset CPG parameters:
 - `unsetUserCPG`
 - `unsetSnapCPG`

SLD remote-copy modification parameters

On an SLD remote-copy setup:

- CPG parameters should be set for all the targets of the remote-copy group
- If one target is specified when policies are being set, policies will be set for the entire remote-copy group. If more than one target is specified, the WSAPI will return an error.
- The following parameters can be specified for only one target of the remote-copy group at a time:
 - `mode`
 - `syncPeriod`
 - `rmSyncPeriod`

Table 164 Message body JSON objects for Modifying a remote-copy group

Member	JSON type	API type	Ignored Values	Description
localUserCPG	string	Name31	Optional	Specifies the local user CPG that will be used for autocreated volumes. Should be specified together with: <ul style="list-style-type: none"> localSnapCPG remoteUserCPG remoteSnapCPG <i>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</i>
localSnapCPG	string	Name31	Optional	Specifies the local snap CPG that will be used for autocreated volumes. Should be specified together with: <ul style="list-style-type: none"> localSnapCPG remoteUserCPG remoteSnapCPG <i>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</i>
targets	array of objects	array of modify RemoteCopyTarget Spec	Optional	Specifies the attributes of the remote-copy group target. See Table 165 (page 169) . <i>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</i>
unsetUserCPG	number	boolean	Optional	If True, this option unsets the localUserCPG and remoteUserCPG of the remote-copy group. The default setting is False. <i>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</i>
unsetSnapCPG	number	boolean	Optional	If True, this option unsets the localSnapCPG and remoteSnapCPG of the remote-copy group. The default setting is False. <i>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</i>

Members of the modifyRemoteCopyTarget JSON object are defined in [Table 165 \(page 169\)](#).

Table 165 Members of modifyRemoteCopyTarget JSON object

Member	JSON type	API type	Ignored Values	Description
targetName	string	Name31	Optional. Required when the	Specifies the target name associated with the remote-copy group to be created.

Table 165 Members of `modifyRemoteCopyTarget` JSON object (continued)

Member	JSON type	API type	Ignored Values	Description
			<p><code>syncPeriod</code>, <code>rmSyncPeriod</code>, <code>mode</code>, and <code>CPG</code> parameters are specified.</p> <p>Not required or ignored when unset <code>CPG</code> parameters are used.</p> <p>Not mandatory when policies are specified.</p>	<p>Should be specified together with:</p> <ul style="list-style-type: none"> • <code>localSnapCPG</code> • <code>remoteUserCPG</code> • <code>remoteSnapCPG</code> <p>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</p>
<code>remoteUserCPG</code>	string	Name31	Optional	<p>Specifies the user CPG on the target that will be used for autocreated volumes.</p> <p>Should be specified together with:</p> <ul style="list-style-type: none"> • <code>localSnapCPG</code> • <code>localUserCPG</code> • <code>remoteSnapCPG</code> <p>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</p>
<code>remoteSnapCPG</code>	string	Name31	Optional	<p>Specifies the snap CPG on the target that will be used for autocreated volumes.</p> <p>Should be specified together with:</p> <ul style="list-style-type: none"> • <code>localSnapCPG</code> • <code>localUserCPG</code> • <code>remoteUserCPG</code> <p>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</p>
<code>syncPeriod</code>	number	int32	Optional	<p>Specifies that asynchronous periodic remote-copy groups should be synchronized periodically to the <code><period_value></code>. Range is 300–31622400 seconds (1 year).</p> <p>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</p>
<code>rmSyncPeriod</code>	number	boolean	Optional	<p>If <code>True</code>, this option resets the <code>syncPeriod</code> time to 0 (zero).</p>

Table 165 Members of `modifyRemoteCopyTarget` JSON object (continued)

Member	JSON type	API type	Ignored Values	Description
				<p>If False, the <code>syncPeriod</code> value is 0 (zero), then Ignore.</p> <p>If False, and the <code>syncPeriod</code> value is positive, then then the synchronizaiton period is set.</p> <p>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</p>
<code>mode</code>	number	<code>rcopyGroupModeEnum</code>	Optional	Volume group mode (see Table 146 (page 155))
<code>snapFrequency</code>	number	<code>int32</code>	Optional	<p>Async mode only.</p> <p>Specifies the interval in seconds at which Remote Copy takes coordinated snapshots. Range is 300–31622400 seconds (1 year). (WSAPI 1.5 and later)</p>
<code>rmSnapFrequency</code>	number	boolean	Optional	<p>If True, this option resets the <code>snapFrequency</code> time to 0 (zero). If False and the <code>snapFrequency</code> value is 0 (zero), then Ignore. If False, and the <code>snapFrequency</code> value is positive, sets the <code>snapFrequency</code> value. (WSAPI 1.5 and later)</p>
<code>policies</code>	object	Policy object	Optional	<p>The policy assigned to the remote-copy group.</p> <p>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</p>

Members of the remote-copy group `policies` JSON object are shown in [Table 166 \(page 171\)](#).

Table 166 Members of the Remote-Copy `policies` JSON object

Member	JSON type	API type	Ignored Values	Description
<code>autoRecover</code>	number	boolean		<p>If the remote copy is stopped as a result of links going down, the remote-copy group can be automatically restarted after the links come back up.</p> <p>(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)</p>
<code>overPeriodAlert</code>	number	boolean		<p>If synchronization of an asynchronous periodic remote-copy group takes longer to complete than its synchronization period, an alert is generated.</p>

Table 166 Members of the Remote-Copy policies JSON object (continued)

Member	JSON type	API type	Ignored Values	Description
				(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)
autoFailover	number	boolean		Automatic failover on a remote-copy group. (WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)
pathManagement	number	boolean		Automatic failover on a remote-copy group. (WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)

Remote-copy group modification success

A successful request to modify a remote-copy group returns the HTTP code 200 OK.

Unless an internal server error occurs, the `Location` portion of the response header contains the URI for the remote-copy volume group, as specified in [Table 167 \(page 172\)](#).

Table 167 JSON objects for Remote-Copy modification Request

Member	JSON type	API type	Description
links	array of URL links	array of URL links	Self URL for <group_name>. (WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)

Remote-copy group modification errors

Possible errors following an attempt to modify a remote-copy group are shown in [Table 168 \(page 172\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 168 Remote-copy group modification error codes

API Error	HTTP Code	Description
NON_EXISTENT_RCOPY_GROUP	404 Not Found	The remote-copy group does not exist. (WSAPI 1.4)
RCOPY_GROUP_OPERATION_ONLY_ON_PRIMARY_SIDE	403 Forbidden	The operation should be performed only on the primary side. Group settings can be changed only on primary remote-copy groups. (WSAPI 1.4)
RCOPY_GROUP_IS_NOT_PERIODIC	403 Forbidden	Target in group is not periodic. (WSAPI 1.4)
RCOPY_GROUP_INV_POLICY_FOR_PERIODIC_GROUP	403 Forbidden	Invalid policy for a periodic group. (WSAPI 1.4)
RCOPY_GROUP_INV_POLICY_FOR_SYNC_GROUP	403 Forbidden	Invalid policy for a synchronous target. The <code>over_per_alert</code> and <code>no_over_per_alert</code> policies are valid only for asynchronous periodic groups. The target is not in asynchronous periodic mode.

Table 168 Remote-copy group modification error codes *(continued)*

API Error	HTTP Code	Description
		<i>(WSAPI 1.4.2 and later with 3PAR OS 3.2.1 MU2)</i>
NON_EXISTENT_CPG	404 Not Found	The CPG does not exist. <i>(WSAPI 1.4)</i>
RCOPY_GROUP_INV_TARGET	403 Forbidden	The specified target is not a target of the remote-copy group. <i>(WSAPI 1.4)</i>
CPG_NOT_IN_SAME_DOMAIN	403 Forbidden	The snap CPG is not in the same domain as the user CPG. <i>(WSAPI 1.2 and later)</i>
INV_INPUT_BELOW_RANGE	400 Bad Request	The minimum allowable period is 300 seconds. <i>(WSAPI 1.3 and later)</i>
INV_INPUT_EXCEEDS_RANGE	400 Bad Request	Invalid input: the period is too long. <i>(WSAPI 1.3 and later)</i>
RCOPY_GROUP_STARTED	403 Forbidden	The remote-copy group has already been started. <i>(WSAPI 1.4)</i>
RCOPY_GROUP_INV_OPERATION_ON_MULTIPLE_TARGETS	403 Forbidden	The operation is not supported on multiple targets. <i>(WSAPI 1.4.2 and later with 3PAR OS 3.2.1 MU2)</i>
RCOPY_GROUP_TARGET_NOT_UNIQUE	400 Bad Request	The remote-copy group target is not unique. <i>(WSAPI 1.4)</i>
RCOPY_GROUP_IS_NOT_ASYNC	403 Forbidden	Target in group is not async.. <i>(WSAPI 1.5 and later)</i>
RCOPY_GROUP_INV_TARGET_NUMBER	403 Forbidden	The wrong number of targets is specified for the remote-copy group. <i>(WSAPI 1.4)</i>

Modifying a remote-copy group target

To update a remote-copy group target, use the HTTP PUT method with the following URI:

`https://<storage_system>:8080/api/v1/remotecopygroups/<groupname>/targets/<target_name>`

Table 169 lists the JSON object definitions for modifying a remote-copy group target. You can specify only one set of modification parameters in a request. Available sets are:

- Remote-copy group policies (see [Table 192 \(page 189\)](#))
- Remote-copy group mode
- Remote-copy group `syncPeriod` and `rmSyncPeriod`
- Remote-copy group `snapFrequency` and `rmSnapFrequency`

Table 169 Remote-copy group target JSON object definitions

Member	JSON type	API type	Description
snapFrequency	number	Int32	Specifies the interval in seconds at which Remote Copy takes coordinated snapshots. Range is 300–31622400 seconds (1 year). Applicable only for Async mode.
rmSnapFrequency	number	boolean	If True, this option resets the snapFrequency time to 0 (zero). If False and the snapFrequency value is 0 (zero), then Ignore. If False, and the snapFrequency value is positive, then the snapFrequency value is set.
syncPeriod	number	Int32	Specifies that asynchronous periodic mode groups should be periodically synchronized to the <period_value>. Range is 300 – 31622400 secs (1 yr).
rmSyncPeriod	number	boolean	If True, reset the syncPeriod time to 0. If False, and syncPeriod value is 0, then Ignore. If False, and syncPeriod value is positive, then set.
mode	number	rcopyGroupModeEnum	Volume group mode (see Table 146 (page 155))
policies	object	Policy object	The policies to be assigned to the group.

Modifying a remote-copy group target success

Upon successful modification of the group target, the system returns HTTP code 200 OK. The location portion of the response header contains the URI for the remote copy volume group target as follows:

Unless an error occurs, the response includes a message body as specified in [Table 170](#).

Table 170 Modifying a remote-copy group target response message body

Member	JSON type	API type	Description
links	Array of URL links	Array of URL links	Includes the self-URL for the <groupname>targets<targetname>

Modifying a remote-copy group target errors

See [Table 147 \(page 156\)](#) for possible errors following an attempt to modify a remote-copy group. For generic API error codes, see [Table 6 \(page 29\)](#).

Synchronizing a remote-copy group

To synchronize a remote-copy group manually, use the HTTP PUT method with the following URI:

https://<storage_system>:8080/api/v1/remotecopygroups/<group_name>

with a message body as defined in [Table 171 \(page 175\)](#).

Table 171 Message body JSON objects for Synchronizing a remote-copy group

Member	JSON type	API type	Ignored Values	Description
action	number	remoteCopyGroupPUTOperation	Required field.	Specifies the action to be taken on the specified group (see Table 151 (page 160)) (WSAPI 1.4.2 and later with 3PAR OS 3.1.2 MU2)
noResyncSnapshot	number	boolean	None	If <code>true</code> , does not save the resynchronization snapshot. Applicable only to remote-copy groups in asynchronous periodic mode. The default is <code>false</code> , (WSAPI 1.4.2 and later with 3PAR OS 3.1.2 MU2)
targetName	string	name31	None	The target name associated with the remote-copy group. (WSAPI 1.4.2 and later with 3PAR OS 3.1.2 MU2)
fullSync	number	boolean	None	If <code>true</code> , this option forces a full synchronization of the remote-copy group, even if the volumes are already synchronized. This option, which applies only to volume groups in synchronous mode, can be used to resynchronize volumes that have become inconsistent. The default setting is <code>false</code> . (WSAPI 1.4.2 and later with 3PAR OS 3.1.2 MU2)

Remote-copy group synchronization success

A successful request to synchronize a remote-copy group returns the HTTP code 200 OK.

Unless an internal server error occurs, the response includes a message body as specified in [Table 172 \(page 175\)](#).

Table 172 JSON objects for remote-copy synchronization request

Member	JSON type	API type	Description
links	array of URL links	array of URL links	Self URL for <group_name>.

Table 172 JSON objects for remote-copy synchronization request *(continued)*

Member	JSON type	API type	Description
			(WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)
tasks	array of task IDs	array of task IDs	Array of task IDs for each of the volumes in the remote-copy group. The JSON response does not always return the <code>tasks</code> member (WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)

Remote-copy group synchronization errors

Possible errors following an attempt to synchronize a remote-copy group are shown in [Table 173 \(page 176\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 173 Remote-copy group synchronization error codes

API Error	HTTP Code	Description
NON_EXISTENT_RCOPY_GROUP	404 Not Found	The remote-copy group does not exist. (WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)
RCOPY_GROUP_OPERATION_ONLY_ON_PRIMARY_SIDE	403 Forbidden	The operation should be performed only on the primary side. Group settings can be changed only on primary remote-copy groups. (WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)
UNLICENSED_FEATURE	403 Forbidden	The system is not licensed for this feature. (WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)
RCOPY_GROUP_INV_TARGET	403 Forbidden	The specified target is not a target of the remote-copy group. (WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)
RCOPY_TARGET_IS_NOT_READY	403 Forbidden	The remote-copy group target is not ready. (WSAPI 1.4.2 with 3PAR OS 3.1.2 MU2)
RCOPY_GROUP_INVOLVED_IN_SYNCHRONIZATION	403 Forbidden	The remote-copy group is already involved in synchronization. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
RCOPY_GROUP_STARTED	403 Forbidden	The remote-copy group has already been started. (WSAPI 1.5 and later)

Creating snapshots of remote copy group volumes

You can create both coordinated snapshots of a single remote copy group volume, or snapshots across all remote copy group volumes.

Create a coordinated snapshot of a single remote copy group volume

To create a coordinated, read-only snapshot use the HTTP POST method with the following URI:

`https://<storage_server>:8080/api/v1/remotecopygroups/<rcgroup-name>/volumes/<volume-name>`

For <volume-name>, specify the name of the volume to be captured (not the name of the new snapshot volume).

When creating a coordinated snapshot, the message body is a JSON object with two members, action and parameters.

- The action member is `remoteCopyGroupVolumeOperation` (see [Table 175](#)) with the value `CREATE_COORDINATED_SNAPSHOT`.
- The parameters member is a JSON object with members as described in [Table 174](#).

Table 174 JSON object members for parameters

Member	JSON type	API type	Ignored values	Description
name	string	name31	None (Required)	Specifies a snapshot VV name up to 31 characters in length.
comment	string	print511	None	Specifies any additional information up to 511 characters for the volume.
expirationHours	number	igint32	Negative values	Specifies the relative time from the current time when volume expires. Positive integer and in the range of 1 - 43,800 hours (1825 days).
retentionHours	number	igint32	Negative values	Specifies the amount of time, relative to the current time, that the volume is retained. Positive integer in the range of 1 - 43,800 hours (1825 days).
skipBlock	boolean	boolean	None	True —The storage system blocks host i/o to the parent virtual volume during the creation of a read-only snapshot. False —(default).

[Table 175](#) lists the description for the remote copy group volume operation definition `remoteCopyGroupVolumeOperation` Enum.

Table 175 remoteCopyGroupVolumeOperation definition

Mode	Value	Description
<code>CREATE_COORDINATED_SNAPSHOT</code>	1	Create coordinated snapshots.

Successful remote-copy group coordinated snapshot

A successful creation of the snapshot returns the HTTP response `201 CREATED`. For Remote Copy Groups in Sync mode, the response body contains an array of links that include a self-URL:

```
{ "links": [ { "href": "https://<server_name>:8080/api/v1/remotecopygroups/  
<group_name>/volumes/<volume_name>", "rel": "self" } ] }
```

For Remote Copy Groups in Async and periodic mode, the message body shows the task ID of the coordinated snapshot operation, as well as an array of links that include a self-URL:

```
{ "taskid":  
1335, "links": [ { "href": "https://<server_name>:8080/api/v1/remotecopygroups/  
<group_name>/volumes/<volume_name>", "rel": "self" } ] }
```

Creating coordinated snapshots across all remote copy group volumes

To create synchronous read only coordinated snapshots across all volumes in a remote-copy group, use the HTTP POST method with the following URI:

`https://<storage_server>:8080/api/v1/remotecopygroups/<rcgroup-name>/volumes`

When creating coordinated snapshots, the message body is a JSON object with two members, action and parameters.

- The action member is `remoteCopyGroupVolumeOperation` (see [Table 175](#)) with the value `CREATE_COORDINATED_SNAPSHOT`.
- The parameters member is a JSON object with members as described in [Table 176](#).

Table 176 JSON object members for snapshots across all volumes

Member	JSON type	API type	Ignored values	Description
name	string	name31	None (Required)	Use similar patterns as those used to form the snapshot volume names (see 3PAR Command Line Interface Reference, available from the HPE Storage Information Library (http://www.hpe.com/info/storage/docs).
comment	string	print511	None	Specifies any additional information up to 511 characters for the volume.
expirationHours	number	igint32	Negative values	Specifies the relative time from the current time that volume expires. Positive integer and in the range of 1 - 43,800 hours (1825 days).
retentionHours	number	igint32	Negative values	Specifies the amount of time, relative to the current time, that the volume will be retained. Positive integer and in the range of 1 - 43,800 hours (1825 days).
skipBlock	boolean		None.	True —The storage system blocks host i/o to the parent virtual volume during the creation of a read-only snapshot. False —(default).

Coordinated snapshot success

A successful creation of the snapshot returns the HTTP response 201 `CREATED`.

For Remote Copy Groups in Sync mode, the response body contains an array of links including an href to itself as shown in the following example:

```
{ "links": [ { "href": "http://<server_name>:8080/api/v1/remotecopygroups/<group_name>/volumes", "rel": "self" } ] }
```

For Remote Copy Groups in Async and Periodic modes, the message body shows the task ID for the coordinated snapshots operation, as well as an array of links that include an href to itself, as shown in the following example:

```
{ "taskid": 1335, "links": [ { "href": "http://<server_name>:8080/api/v1/remotecopygroups/<group_name>/volumes", "rel": "self" } ] }
```

Error mapping for coordinated snapshots

[Table 177](#) lists definitions for errors that can occur following an attempt to create a coordinated snapshot.

Table 177 Remote copy group coordinated snapshot error messages

API error	HTTP code	Description
NON_EXISTENT_RCOPY_GROUP	404	Remote copy volume group does not exist
RCOPY_GROUP_IS_BUSY	403	Remote copy group is currently busy
RCOPY_TARGET_IS_NOT_READY	403	Remote copy group target is not ready
RCOPY_GROUP_OPERATION_ONLY_ON_PRIMARY_SIDE	501	Issue this operation on primary side only
RCOPY_GROUP_VOLUME_NOT_SYNCED	501	Volume not synced
INV_INPUT_MISSING_REQUIRED	400	Invalid input: some or all required parameters missing
INV_INPUT_EXCEEDS_LENGTH	400	Invalid input: string length exceeds limits
RCOPY_NOT_STARTED	402	Remote copy not started
INV_OPERATION_RCOPY_GROUP_MODE_CONFLICT	501	Remote copy target mode not supported
UNLICENSED_FEATURE	403 Forbidden	System is not licensed for this feature or functionality
EXISTENT_VOL	409	Volume exists
RCOPY_GROUP_VOLUME_NOT_SYNCED	403	Volume not synced
INV_INPUT_ILLEGAL_CHAR	400	Illegal character in input
RCOPY_GROUP_VOL_NOT_IN_GROUP	404	Volume is not member of any remote copy group

Recovering a remote-copy group

To perform disaster recovery on a remote-copy group, use the HTTP POST method with the following URI:

https://<storage_system>:8080/api/v1/remotecopygroups/<groupname>/

Include a message body as defined in [Table 178 \(page 179\)](#).

Table 178 Message body JSON objects for recovering a remote copy group

Member	JSON type	API type	Ignored values	Description
action	number	remoteCopyGroupPOSTOperationEnum	Required field.	Specifies the action to be taken on the specified group (see Table 152 (page 160))
targetName	string	Name31	None	The target name associated with this group on which you want to perform the disaster recovery operation. If the group has multiple targets, the target must be specified.
skipStart	number	boolean	None	If <code>true</code> , groups are not started after role reversal is completed. Valid for only <code>FAILOVER</code> , <code>RECOVER</code> , and <code>RESTORE</code> operations. The default is <code>false</code> .

Table 178 Message body JSON objects for recovering a remote copy group (continued)

Member	JSON type	API type	Ignored values	Description
skipSync	number	boolean	None	If <code>true</code> , the groups are not synchronized after role reversal is completed. Valid only for <code>FAILOVER</code> , <code>RECOVER</code> , and <code>RESTORE</code> operations. The default setting is <code>false</code> .
discardNewData	number	boolean	None	If <code>true</code> and the group has multiple targets, don't check other targets of the group to see if newer data should be pushed from them. Valid only for <code>FAILOVER</code> operation. The default setting is <code>false</code> .
skipPromote	number	boolean	None	If <code>true</code> , the snapshots of the groups that are switched from secondary to primary are not promoted to the base volume. Valid only for <code>FAILOVER</code> and <code>REVERSE</code> operations. The default setting is <code>false</code> .
noSnapshot	number	boolean	None	If <code>true</code> , the snapshots are not taken of the groups that are switched from secondary to primary. Valid for <code>FAILOVER</code> , <code>REVERSE</code> , and <code>RESTORE</code> operations. The default setting is <code>false</code> .
stopGroups	number	boolean	None	If <code>true</code> , the groups are stopped before performing the reverse operation. Valid only for <code>REVERSE</code> operation. The default setting is <code>false</code> .
localGroupsDirection	number	boolean	None	If <code>true</code> , the group's direction is changed only on the system where the operation is run. Valid only for <code>REVERSE</code> operation. The default setting is <code>false</code> .

Remote-Copy Disaster Recovery success

A successful disaster recovery returns the HTTP code 200 OK. The `Location` portion of the response header contains the URI for tasks collection:

`https://<storage_system>:8080/api/v1/remotecopygroups/<groupname>`

Unless an internal server error occurs, the response includes a message body as specified in [Table 179 \(page 181\)](#):

Table 179 JSON objects for Remote-Copy Disaster Recovery success

Member	JSON type	API type	Description
links	Array of URL links	Array of URL links	Self URL for <groupname>.
tasks	Array of task IDs	Array of task IDs	An array of task IDs. One ID for every group involved in the disaster operation.

Remote copy recovery errors

Possible errors following an attempt to synchronize a remote-copy group are shown in [Table 180 \(page 181\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 180 Remote-Copy Disaster Recover error codes

API Error	HTTP Code	Description
NON_EXISTING_RCOPY_GROUP	404 Not Found.	The remote copy volume group does not exist.
UNLICENSED_FEATURE	403 Forbidden	System is not licensed for this feature.
RCOPY_GROUP_INV_TARGET	400 Bad request	Specified target is not in remote copy group.
INV_INPUT_MISSING_REQUIRED.	403 Forbidden	Invalid Operation: Group has multiple targets.
INV_OPERATION_RCOPY_GROUP_ROLE_CONFLICT	403 Forbidden	Group is not in correct role for this operation.
RCOPY_GROUP_INV_OPERATION_ON_MULTIPLE_TARGETS	403 Forbidden	The operation is not supported on multiple targets
RCOPY_GROUP_NOT_STOPPED	403 Forbidden	Remote copy group is not stopped.
INV_OPERATION_RCOPY_GROUP_ROLE_CONFLICT	403 Forbidden	Group is not in correct role for this operation.
RCOPY_GROUP_NOT_STARTED	403 Forbidden	Remote copy not started
INV_INPUT_PARAM_CONFLICT	400 Bad request	Invalid input: parameters cannot be present at the same time.
INV_OPERATION_VV_PROMOTE_IN_PROGRESS	403 Forbidden	Invalid operation: volume promotion is in progress.
RCOPY_GROUP_IS_BUSY	403 Forbidden	Remote copy group is currently busy.
RCOPY_GROUP_STARTED	403 Forbidden	Remote copy group has already been started.
RCOPY_GROUP_EMPTY	403 Forbidden	Remote copy group does not contain any volumes.
RCOPY_GROUP_OPERATION_ONLY_ON_PRIMARY_SIDE	403 Forbidden	Operation should only be issued on primary side.
RCOPY_GROUP_OPERATION_ONLY_ON_SECONDARY_SIDE	403 Forbidden	Operation should only be issued on secondary side.

Querying remote-copy information

WSAPI allows you to query overall remote copy information, query remote copy groups, and query remote copy subgroups.

Querying overall remote copy information

To query overall remote-copy information, use the HTTP GET method on the following URI with no message body:

`https://<storage_system>:8080/api/v1/remotecopy`

Remote-copy information query success

A successful query for remote-copy information returns the HTTP code 200 OK.

Unless an internal server error occurs, the response includes a message body specified in [Table 181 \(page 182\)](#).

Table 181 JSON objects for Remote-Copy Information query Response

Member	JSON type	API type	Description
mode	number	copySysModeEnum	Remote-copy system mode.
status	number	copySysStatusEnum	Remote-copy system state.
configErrDescription	string	print511	Remote-copy configuration error message. Under normal conditions, this is empty and does not add to the JSON body.
links	array of URL links	array of URL links	Links include the following URLs: <ul style="list-style-type: none">• self• remotecopygroup See “Example Response with Remote-Copy Links” .
asyncEnabled	boolean	boolean	True: Asynchronous streaming replication enabled. False: Asynchronous streaming replication disabled.

Example Response with Remote-Copy Links

The message body returned from the server includes the following links:

```
{
  ...
  "links": [4]
    0: {
      "href": " https://<storage_system>:8080/api/v1/remotecopy"
      "rel": "self"
    }
    1: {
      "href": " https://<storage_system>:8080/api/v1/remotecopygroups"
      "rel": "remotecopyGroups"
    }
  }
}
```

❗ **IMPORTANT:** Systems without remote copy configured do not return the URL links for groups as part of the JSON body.

[Table 182 \(page 183\)](#) shows enumeration for the remote-copy system mode.

Table 182 Remote-Copy rcopySysModeEnum enumeration

Symbol	Value	Description
NONE	1	Remote copy is not configured.
STARTED	2	Remote copy is configured and started.
STOPPED	3	Remote copy is configured, but it is stopped.

[Table 183 \(page 183\)](#) shows enumeration for the remote-copy system status.

Table 183 Remote-Copy rcopySysStatusEnum enumeration

Symbol	Value	Description
NORMAL	1	Remote-copy system is in normal condition.
STARTUP	2	Remote-copy system is starting up.
SHUTDOWN	3	Remote-copy system is shutting down.
ENABLE	4	Remote-copy system is enabled.
DISABLE	5	Remote-copy system is disabled.
INVALID	6	Remote-copy system is in an invalid state.
NODEUP	7	Remote-copy system is in the node-up state.
UPGRADE	8	Remote-copy system is in the upgrade state.

Remote-copy information query errors

[Table 208 \(page 200\)](#) lists the query error codes. For generic API error codes, see [Table 184 \(page 183\)](#).

Table 184 Remote-Copy Information query error codes

API Error	HTTP Code	Description
INT_SERV_ERR	500 Internal Server Error	Internal server error.
UNLICENSED_FEATURE	403 Forbidden	The system is not licensed for remote copy.

Querying remote-copy groups

You can query for information about all remote-copy volume groups (remote-copy groups), or about a single remote-copy group.

- ❗ **IMPORTANT:** The remote-copy group members object as defined in WSAPI 1.4.0 and WSAPI 1.4.1 are obsolete. Hewlett Packard Enterprise recommends using WSAPI 1.4.2 or later.

Querying all remote-copy groups

To query for information about all remote-copy groups, use the HTTP GET method with no message body:

```
https://<storage_system>:8080/api/v1/remotecopygroups
```

All remote-copy groups query success

A successful query returns the HTTP code 200 OK. Unless an internal server error occurs, the response includes a message body as specified in [Table 185 \(page 184\)](#).

Table 185 Querying remote-copy groups response JSON objects

Member	JSON type	API type	Description
total	number	int32	Total number of remote-copy groups.
members	array of objects	array of volume group property objects	Remote-copy groups.
links	array of URL links	array of URL links	Links include the self URL, which is the original request URL including the query at the end

In a 1-to-N, N-to-1, or M-to-N setup, each group has a dedicated target. However, in an SLD setup, each group can have two targets, so the target is represented as an array.

The JSON object `members` is an array of zero or more JSON objects as specified in [Table 186 \(page 184\)](#).

Table 186 `members` object JSON objects for querying remote-copy groups

Member	JSON type	API type	Description
name	string	name31	Remote-copy group name.
id	number	int32	Remote-copy group ID.
role	number	copyGroupRoleEnum	volume group role. Options are primary or secondary.
domain	string	name31	Domain to which this remote-copy group belongs.
recoveryPointObjmSecs	number	int32	Asynchronous RPO (Recovery Point Object) in milliseconds.
remoteGroupName	string	name31	Name of the remote-copy group in the remote system.
localUsrCPG	string	name31	Name for which the user space is allocated locally.
localSnpCPG	string	name31	Name for which the snapshot space is allocated locally.
volumes	array of volumes objects	array of volumes object	Lists all the properties of the volumes that are associated with the remote-copy group. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
targets	array of objects	Array of targets object	List of all the properties of the remote-copy group associated with a given target. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
links	array of URL links	array of URL links	Links include the self URL, which is the original request URL including the query at the end. Required for the Single Instance Query for <code>remoteCopyGroups</code> only.

❗ **IMPORTANT:** The remote-copy members objects as defined in WSAPI 1.4.0 and WSAPI 1.4.1 are obsolete. Hewlett Packard Enterprise recommends using WSAPI 1.4.2 or later.

[Table 187 \(page 185\)](#) list the members of the JSON `volumes` object.

Table 187 Members of the JSON `volumes` object for querying remote-copy groups

Member	JSON type	API type	Description
<code>localVolumeName</code>	string	name31	Volume name. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>localVolumeId</code>	number	int32	Volume ID. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>remoteVolumes</code>	array of objects	array of <code>remoteVolumes</code> objects	Array of remote volumes associated with each remote-copy group target. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>links</code>	array of URL links	array of URL links	Links include the self URL, which is the original request URL including the query at the end. Required for the Single Instance Query for <code>volumes</code> only.

Table 188 (page 185) lists the members of the JSON `remoteVolumes` object.

Table 188 Members of the JSON `remoteVolumes` object for querying remote-copy groups

Member	JSON type	API type	Description
<code>targetName</code>	string	name31	Target to which the volume group is mirrored. Displays only if the target is present. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>remoteVolumeName</code>	string	name31	volume name on the target system. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>remoteVolumeID</code>	number	int32	volume ID on the target system. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>resyncSnapshotName</code>	string	name31	Snapshot indicating the starting point of the remote volume. Primary array uses this snapshot to determine the delta changes to synchronize to the secondary volume. Target array uses this snapshot as a recovery point in case of a resynchronization failure. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>syncSnapshotName</code>	string	name31	Snapshot indicating the destination point of the remote copy volume on successful completion of resynchronization. Upon completion of a resynchronization, the remote base volume mirrors this synchronization snapshot. This snapshot becomes the resync snapshot when resynchronization completes. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>syncStatus</code>	number	<code>rcopyGroupVWStatusEnum</code>	Synchronization status of the volume. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>volumeIteration</code>	string	Print256	A correlator used to determine the data consistency point of the volume relative to the remote volume and/or snapshots.

Table 188 Members of the JSON `remoteVolumes` object for querying remote-copy groups
(continued)

Member	JSON type	API type	Description
			(WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>syncnIteration</code>	string	Print256	A correlator used to determine the data consistency point of the synchronization snapshot relative to the remote volume and/or snapshots. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>resyncnIteration</code>	string	Print256	A correlator used to determine the data consistency point of the resynchronization snapshot relative to the remote volume and/or snapshots. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
<code>volumeLastSnapTime</code>	string	8601	Time of last coordinated snapshot; Async mode only. (WSAPI 1.5 and later)
<code>volumeLastSnapTimeSec</code>	number	int32	Last successful coordinated snapshot in seconds since epoch; Async mode only. (WSAPI 1.5 and later)
<code>volumeLastSyncTimeSec</code>	number	int32	Last successful synchronization time in seconds since epoch. This field is displayed only if the target is present. (WSAPI 1.5 and later)
<code>volumeLastSyncTime</code>	string	8601	Last successful synchronization time. This field is displayed only if the target is present. (WSAPI 1.5 and later)
<code>volumeSyncOffset</code>	number	int64	volume synchronization offset. Relevant only if the <code>syncStatus</code> is SYNCING. (WSAPI 1.5 and later)
<code>volumeSyncLength</code>	number	int64	volume synchronization total length. Relevant only if the <code>syncStatus</code> is SYNCING. (WSAPI 1.5 and later)
<code>asyncOutstanding</code>	number	int32	Total outstanding data to be synchronized in MB. You can calculate backlog data for the Remote Copy Async group by summing up the <code>asyncOutstanding</code> value for all the volumes in the group. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)

Table 189 (page 187) lists the members of the `targets` JSON object.

Table 189 JSON object targets for querying Remote-Copy Groups

Member	JSON type	API type	Description
targetName	string	name31	Target to which the volume group is mirrored. This is the same as <code>target</code> . This field is displayed only if the target is present. (WSAPI 1.5 and later)
target	string	name31	Target to which the group is mirrored. The target JSON object will be deprecated in a future release of the WSAPI.
roleReversed	number	boolean	Remote-copy group role switched due to a failover. (WSAPI 1.5 and later)
state	number	rcpGroupStateEnum	Current status of the remote-copy group for this target. (WSAPI 1.5 and later)
mode	number	rcpGroupModeEnum	Remote-copy group mode. See Table 146 (page 155) (WSAPI 1.5 and later)
syncPeriod	number	int32	Time period in seconds for automatic resynchronization. The value must be at least five minutes and not more than one year. This field applies to periodic and async modes. (WSAPI 1.5 and later)
groupLastSyncTimeSec	number	int32	Last synchronization time in seconds since epoch. This field applies only to the periodic mode. (WSAPI 1.5 and later)
groupLastSyncTime	string	8601	Last synchronization time. This field applies only to the periodic mode. (WSAPI 1.5 and later)
policy	object	policy object	The policy assigned to the remote-copy group. See Table 192 (page 189) . (WSAPI 1.5 and later)
remoteSnpCPG	string	name31	Name for which the snapshot space is allocated on the remote target.
remoteUsrCPG	string	name31	Name for which the user space is allocated on the remote target. (WSAPI 1.5 and later)
snapFrequency	number	Int32	Specifies the interval in seconds at which Remote Copy takes coordinated

Table 189 JSON object `targets` for querying Remote-Copy Groups *(continued)*

Member	JSON type	API type	Description
			snapshots. This field applies only to Async mode.
<code>links</code>	array of URL links	array of URL links	Links include the self URL, which is the original request URL including the query at the end. Required for the Single Instance Query for <code>targets</code> only.

Enumeration for the remote-copy group role is shown in [Table 190 \(page 188\)](#).

Table 190 `rcopyGroupRoleEnum` enumeration for the remote-copy group Role

Symbol	Value	Description
PRIMARY	1	The remote-copy group role is primary.
SECONDARY	2	The remote-copy group role is secondary.

Enumeration for displaying the remote-copy group mode is shown in [Table 146 \(page 155\)](#).

Enumeration for the remote-copy group state is shown in [Table 191 \(page 188\)](#).

Table 191 `rcopyGroupStateEnum` enumeration for the remote-copy group State

Symbol	Value	Description
NEW	1	The remote-copy group role is not yet started. (WSAPI 1.5 and later)
STARTING	2	The remote-copy group role is in the process of being started. (WSAPI 1.5 and later)
STARTED	3	The remote-copy group role is currently started. (WSAPI 1.5 and later)
RESTART	4	The remote-copy group role is currently restarted. (WSAPI 1.5 and later)
STOPPED	5	The remote-copy group role is currently stopped. (WSAPI 1.5 and later)
BACKUP	6	The target of the group is the non-active target for a multitarget group. (WSAPI 1.5 and later)
FAILSAFE	7	The primary group is unable to reconcile the state of the secondary group and will be held in a failsafe state until the problem is resolved. (WSAPI 1.5 and later)
UNKNOWN	8	The remote-copy group state is unknown. (WSAPI 1.5 and later)
LOGGING	9	The remote-copy group is in logging state. (WSAPI 1.5 and later)

JSON objects for the remote-copy group policies are shown in [Table 192 \(page 189\)](#).

Table 192 JSON object members for remote-copy group policy JSON object

Member	JSON type	API type	Description
autoRecover	number	boolean	If the remote copy is stopped as a result of the links going down, the group can be automatically restarted after the links come back up. (WSAPI 1.5 and later)
overPeriodAlert	number	boolean	If synchronization of a periodic remote-copy group takes longer to complete than its synchronization period, an alert is generated. (WSAPI 1.5 and later)
autoFailover	number	boolean	Automatic failover on a remote-copy group. (WSAPI 1.5 and later)
pathManagement	number	boolean	Path management on a remote-copy group. (WSAPI 1.5 and later)

Enumeration for the remote-copy group synchronization status is shown in [Table 193 \(page 189\)](#).

Table 193 rcopyGroupVVStatusEnum enumeration for the Remote-Copy volume State

Symbol	Value	Description
NEW	1	Remote copy for the volume is not yet started. (WSAPI 1.5 and later)
SYNCING	2	The secondary volume is currently being synchronized with the primary volume. (WSAPI 1.5 and later)
SYNCED	3	The primary and secondary volumes are currently in sync (for periodic mode volumes, this indicates the last synchronization completed). (WSAPI 1.5 and later)
UNSYNC	4	The primary and secondary volumes are not in sync with one another. (WSAPI 1.5 and later)
STALE	5	The secondary volume has a valid point-in-time copy of the primary volume; however, the last attempt at synchronization failed. (WSAPI 1.5 and later)
NEWPRESYNCD	6	Remote copy for the volume has not started. When the group is started, the volume will not undergo an initial synchronization. (WSAPI 1.5 and later)
NEWSYNCDFROMSNAP	7	Remote copy for the volume has not started. When the group is started, the volume will be synchronized from the snapshot that was specified when the volume was admitted to the group. (WSAPI 1.5 and later)
STOPPED	8	Remote copy for the volume has been stopped.

Table 193 `rcopyGroupVVStatusEnum` enumeration for the Remote-Copy volume State (continued)

Symbol	Value	Description
		(WSAPI 1.5 and later)
FAILSAFE	9	The volume is unavailable for export to the attached hosts until the state of the volume on the secondary is reconciled. (WSAPI 1.5 and later)
UNKNOWN	10	The remote-copy group state is unknown. (WSAPI 1.5 and later)
LOGGING	11	The remote-copy group volume is in logging state. (WSAPI 1.5 and later)

All remote-copy groups query errors

For generic API error codes, see [Table 6 \(page 29\)](#).

Querying a single remote copy group

To query for information about a single remote-copy group, use the HTTP GET method with the following URI and no message body:

`https://<storage_system>:8080/api/v1/remotecpygroups/<group_name>`

Single remote-copy group query success

A successful query returns the HTTP code 200 OK. Unless an internal server error occurs, the response includes a message body as specified in [Table 186 \(page 184\)](#).

For the `members` of the query response, see “[Querying all remote-copy groups](#)” (page 183).

Single remote-copy group query errors

Possible errors following an attempt to query a single remote-copy group are shown in [Table 194 \(page 190\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 194 Single remote-copy group query error codes

API Error	HTTP Code	Description
NON_EXISTENT_RCOPY_GROUP	404 Not Found	The remote-copy group does not exist. (WSAPI 1.5 and later)
UNLICENSED_FEATURE	403 Forbidden	The system does not have 3PAR Remote Copy Software license. (WSAPI 1.5 and later)

Querying remote-copy group subresource information

You can query the remote copy group subresource by target or by volume.

Query target information

Use HTTP GET with the following URI to query the remote-copy group target information for the specified remote-copy group.

`https://<storage_server>:8080/v1/remotecopygroups/<groupName>/targets`

Query target success

A successful query returns HTTP code 200 OK. Unless an internal server error occurs, the response to the query includes a message body specified in [Table 195](#).

Table 195 Remote-copy group target query message body

Member	JSON type	API type	Description
total	number	Int32	Total number of targets
members	array of objects	array of target property objects	Remote-copy group targets (see Table 189 (page 187))
links	array of URL links	Array of URL links	Links include the self-URL

Query volume information

Use HTTP GET with the following URI to query all volume information for a remote copy group:

`https://<storage_server>:8080/v1/remotecopygroups/<groupName>/volumes`

A successful query returns HTTP code 200 OK. Unless an internal server error occurs, the response to the query includes a message body (see [Table 196](#)).

Table 196 Remote-copy group volume query message body

Member	JSON type	API type	Description
total	number	Int32	Total number of targets
members	array of objects	Array of volume property objects	Remote-copy group volumes (see Table 187 (page 185))
links	array of URL links	Array of URL links	Links include the self-URL

[Table 189](#) lists the properties of the target object (this is the same as the target field of the remote copy group query).

[Table 187](#) lists all properties of the volume that belongs to the remote copy group.

[Table 197](#) lists the error codes for a remote copy group query error.

Table 197 Remote copy group query error codes

API error	HTTP code	Description
INT_SERV_ERR	500 Internal Server Error	Internal Server Error
UNLICENSED_FEATURE	403 Forbidden	This system is not licensed for remote copy

Query a single instance of a remote copy group target

Use HTTP GET with the following URI to query specific target information of a given remote copy group:

`https://<server>:8080/v1/remotecopygroups/<groupName>/targets/<target name>`

A successful query for remote copy target information returns HTTP code 200 OK. Unless an error occurs, the response for a target query includes a message body specified in [Table 189](#).

Query a single instance of a remote copy group volume

Use the HTTP GET method with the following URI to query a specific volume information of a given remote copy group:

`https://<storage_server>:8080/v1/remotecopygroups/<groupName>/`

`volumes/<volumeName>`

A successful query for remote copy volume information returns HTTP code 200 OK. Unless an error occurs, the response for a volume query includes a message body specified in [Table 187 \(page 185\)](#).

[Table 198](#) lists the error codes for a remote copy group volume or target sub-resource query error.

Table 198 Error messages

API error	HTTP code	Description
INT_SERV_ERR	500 Internal Server Error	Internal Server Error
UNLICENSED_FEATURE	403 Forbidden	This system is not licensed for remote copy
RCOPY_GROUP_TARGET_NOT_IN_GROUP (for single target query)	404 Not found	The target does not exist in the remote copy group
RCOPY_GROUP_VOL_NOT_IN_GROUP (for single volume query)	404 Not found	Volume not in remote copy group

12 Working with Flash cache

As of WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2, you can use the WSAPI to perform the following flash-cache operations:

- Create and remove a flash cache
- Query flash cache information

For information about setting and querying flash-cache policy for VV sets, see [“Setting and querying a VV-set flash-cache policy” \(page 112\)](#). [“Setting and querying system flash-cache policy” \(page 207\)](#).

For information about setting and querying flash-cache policy for the entire system, see [“Working with system, version, task, and flash-cache policy information” \(page 196\)](#)

Creating flash cache

To create a flash cache, use the HTTP POST method with the following URI:

`https://<storage_system>:8080/api/v1`

with a message body as shown in [Table 199 \(page 193\)](#).

Table 199 Flash cache creation JSON objects

Member	JSON type	Mandatory	Description
sizeGiB	Number	Yes	Specifies the size of the flash cache on the system. This size is for a node pair.
mode	Number	No. The default is Real mode	Simulator: 1 Real: 2

Flash cache creation success

A successful cache creation returns the HTTP code 201 `Created`. The message body contains a link to the newly created flash cache. The `Location` portion of the header response displays the URI of the flash cache.

Flash cache creation errors

If an error occurs, the system returns one of the error codes shown in [Table 200 \(page 193\)](#), or a generic error code as shown in [Table 6 \(page 29\)](#)

Table 200 Flash cache creation error codes

API Error	HTTP Status Code	Description
NO_SPACE	400 Bad Request	Not enough space is available for the operation. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
INV_INPUT_EXCEEDS_RANGE	400 Bad Request	A JSON input object contains a name-value pair with a numeric value that exceeds the expected range. Flash cache exceeds the expected range. The HTTP ref member contains the name. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
EXISTENT_FLASH_CACHE	409 Conflict	The flash cache already exists. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
FLASH_CACHE_NOT_SUPPORTED	403 Forbidden	Flash cache is not supported.

Table 200 Flash cache creation error codes *(continued)*

API Error	HTTP Status Code	Description
		(WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
INV_FLASH_CACHE_SIZE	400 Bad Request	Invalid flash cache size. The size must be a multiple of 16 G. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)

Removing a flash cache

To remove a flash cache, use the HTTP DELETE method. Use the following URI, without a message body:

https://<storage_system>:8080/api/v1/flashcache

Flash cache removal success

A successful cache removal returns the HTTP code 200 OK with no message body.

Flash cache removal errors

If an error occurs, the system returns one of the error codes shown in [Table 201 \(page 194\)](#), or a generic error code as shown in [Table 6 \(page 29\)](#).

Table 201 Flash cache removal error codes

API Error	HTTP Status Code	Description
FLASH_CACHE_IS_BEING_REMOVED	403 Forbidden	Unable to delete the flash cache, the flash cache is being removed. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
FLASH_CACHE_NOT_SUPPORTED	403 Forbidden	Flash cache is not supported on this system. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
NON_EXISTENT_FLASH_CACHE	404 Not Found	The flash cache does not exist. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)

Querying flash cache information

To query information about a flash cache, use the HTTP GET method with the following URI, without a message body:

https://<storage_system>:8080/api/v1/flashcache

Flash-cache information query success

Unless an error occurs, the response contains a message body with members, as shown in [Table 202 \(page 194\)](#).

Table 202 Message body for flash cache query response

Member	JSON type	API type	Description
mode	number	flashCacheModeEnum	1: Simulator 2: Real (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
sizeGiB	number	int32	The total size of the flash cache on the entire system. This might differ from the sizeGiB input in the create flash cache

Table 202 Message body for flash cache query response *(continued)*

Member	JSON type	API type	Description
			request if the system has more than two nodes. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
state	number	flashCacheStateEnum	1: Normal 2: Degraded 3: Failed
usedSizeGiB	number	int32	The used size of the flash cache. (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)

Flash-cache information query errors

For generic API error codes, see [Table 6 \(page 29\)](#).

13 Working with system, version, task, and flash-cache policy information

This chapter provides information about querying the storage system as a whole, and provides other useful procedures to query and modify information.

For information about creating, querying, and removing flash cache, see [“Working with Flash cache” \(page 193\)](#). For information about setting and querying flash-cache policy for VV sets, see [“Setting and querying a VV-set flash-cache policy” \(page 112\)](#).

Getting storage system information

WSAPI 1.2 and later supports the storage system information query.

To query for storage system information, use the HTTP GET method with the following URI and no message body:

```
https://<storage_system>:8080/api/v1/system
```

Storage-system query success

A successful query for storage-system information returns the HTTP code 200 OK.

Unless an internal server error occurs, the response includes a message body as specified in [Table 203 \(page 196\)](#).

Table 203 JSON objects for storage-system query response

Member	JSON type	API type	Description
id	number	uint32	System ID.
name	string	name31	System name.
IPv4Addr	string	name31	System IPv4 address.
IPv6Addr	string	print511	System IPv6 address.
model	string	name31	System model.
serialNumber	string	name31	System serial number.
systemVersion	string	name31	Storage system software version number.
totalNodes	number	uint32	Total number of nodes in the system.
masterNode	number	uint32	Master node ID.
onlineNodes	array of number	array of uint32	Node IDs online.
clusterNodes	array of number	array of uint32	Node IDs in cluster
chunkletSize	number	uint32	Chunklet size.
totalCapacityMiB	number	uint32	Total capacity (MiB) in the system.
allocatedCapacityMiB	number	uint32	Allocated capacity (MiB) in the system.
freeCapacityMiB	number	uint32	Free capacity (MiB) in the system.
failedCapacityMiB	number	uint32	Failed capacity (MiB) in the system.
location	string	print511	Location of the system.
owner	string	print511	Owner of the system.
contact	string	print511	Contact of the system.

Table 203 JSON objects for storage-system query response *(continued)*

Member	JSON type	API type	Description
comment	string	print511	Any comment about the system.
timeZone	string	print511	Time zone where the system is located
flashCachePolicy	number	flashCacheSysPolicyEnum	1: Enabled 2: Disabled 3: Cleared (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)
licenseInfo	object	licenseInfo object	Object containing license information
parameters	object	systemParameter object	List all the system parameters (see table 208).

lists the members of the licenseInfo object.

Table 204 licenseInfo object members

Member	JSON type	API type	Description
issueTimeSec	Number	epoch	The time when the license was created, measured in seconds since 12 AM on 01/01/1970.
diskCount	Number	Int32	Number of disks for which the system is licensed. (-1 = unspecified, 0 = unlimited, >0 is the diskCount)
WWNBASE	String	WWN	WWN Base (also known as W19) number of the system
licenses	Array of License Object	License Object	License name and its expiry date
licenseState	Object	licenseState Object	Enabled or disabled state of individual license.

Table 205 lists the licenses object members.

Table 205 license object members

Member	JSON type	API type	Description
name	String	Print64	License installed in the system.
expiryTimeSec	Number	epoch	The time when the license expires, measured in seconds since 12 AM on 01/01/1970. No value returned means no expiry time set.
expiryTime8601	String	8601	The time when the license expires. No value returned means no expiry time set.

Table 206 lists the licenseState object member.

Table 206 licenseState object members

Member	Value	Description
virtualCopy	Boolean	True: Virtual Copy feature is enabled

Table 206 licenseState object members (continued)

		False: Virtual Copy feature is disabled.
remoteCopy	Boolean	True: Remote Copy feature is enabled False: Remote Copy feature is disabled
thinProvisioing	Boolean	True: Thin Provisioning feature is enabled False: Thin Provisioning feature is disabled
domains	Boolean	True: Domain feature is enabled False: Domain feature is disabled
dynamicOptimization	Boolean	True: Dynamic Optimization feature is enabled. False: Dynamic Optimization feature is disabled.
virtualLock	Boolean	True: Virtual Lock feature is enabled. False: Virtual Lock feature is disabled.
thinPersistence	Boolean	True: Thin Persistence feature is enabled. False: Thin Persistence feature is disabled.
thinConversion	Boolean	True: Thin Conversion feature is enabled. False: Thin Conversion feature is disabled.
adaptiveOptimization	Boolean	True: Adaptive Optimization feature is enabled. False: Adaptive Optimization feature is disabled.
peerVirtualization	Boolean	True: Peer Virtualization feature is enabled. False: Peer Virtualization feature is disabled.
qos	Boolean	True: Quality of Service feature is enabled. False: Quality of Service feature is disabled.
systemReporter	Boolean	True: System Reporter feature is enabled. False: System Reporter feature is disabled.
darEncryption	Boolean	True: DAR Encryption feature is enabled. False: DAR Encryption feature is disabled.
fileServices	Boolean	True: File Services feature is enabled. False: File Services feature is disabled.

Table 207 systemParameter JSON objects

Column Head	Column Head	Column Head	Column Head
rawSpaceAlertFC	number	uint32	Space alert threshold (10 to 100000 GB) for Fibre Channel type drives.
rawSpaceAlertNL	number	uint32	Space alert threshold (10 to 100000 GB) for Nearline type drives
rawSpaceAlertSSD	number	uint32	Space alert threshold (10 to 100000 GB) for Solid State Drive type drives
remoteSyslog	boolean	boolean	Enable or disable sending events as syslog messages to a remote system True – enable the message False – disable the message

Table 207 systemParameter JSON objects (continued)

Column Head	Column Head	Column Head	Column Head
remoteSyslogHost	string	name31	IP address of the system to which events will be sent as syslog messages. The value must be a valid IP address
sparingAlgorithm	string	name31	Sparing algorithm. Valid values are Default (roughly 2.5% with minimums), Minimal (roughly 2.5% without minimums), Maximal (one disk's worth in every cage), and Custom (not managed automatically by the system).
eventLogSize	number	uint32	The size of the event log in Bytes
VVRetentionTimeMax	number	uint32	The maximum value in seconds that can be set for the retention time of a volume.
upgradeNote	string	print511	A note that will be displayed when checking upgrade is running
portFailoverEnabled	boolean	boolean	Enable or disable the automatic failover of target ports to their designated partner ports True – enable automatic failover False – disable automatic failover
autoExportAfterReboot	boolean	boolean	Enable or disable automatically exporting VLUNS after a reboot. True – enable automatic exporting False – disable automatic exporting
allowR5OnNLDrives	boolean	boolean	Enable or disable support for RAID-5 on NL drives True – able to create CPGs on NL drives False – unable to create CPGs on NL drives
allowR0	boolean	boolean	Enable or disable support for RAID-0. True – able to create RAID-0 CPGs False – unable to create RAID-0 CPGs
thermalShutdown	boolean	boolean	Enable or disable to shutdown the system when the temperature gets too hot True – enable False -- disable
failoverMatchedSet	boolean	boolean	Enable or disable the automatic failover of matched-set VLUNS during a persistent port failover. This does not affect host-see VLUNS, which are always in failover mode. True - enable False - disable
sessionTimeout	number	uint32	Specifies the value in seconds that can be set for the idle timeout for a CLI session
hostDIF	boolean	boolean	Enable or disable host based T10 Data Integrity Field (DIF) support for all ports True – enable False -- disable
allowWrtbackSingleNode	boolean	boolean	Enable or disable the system going into write through if a single node state occurs

Table 207 systemParameter JSON objects (continued)

Column Head	Column Head	Column Head	Column Head
			True – enable False -- disable
allowWrtbackUpgrade	boolean	boolean	Enable or disable the system going into write through if a single node state occurs during an upgrade True – enable False -- disable
disableDedup	boolean	boolean	Enable or disable new write requests to tdvvs serviced by the system to be deduplicated. True – Not be deduplicated False – be deduplicated

Storage-system query errors

Possible error codes are shown in [Table 208 \(page 200\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 208 Storage-system query error codes

API Error	HTTP Code	Description
INT_SERV_ERR	500 Internal Server Error	Internal server error. Communication with CLI failed.

Updating storage system parameters

To update or modify the storage system parameters, use the HTTP PUT method with the following URI:

https://<storage_system>:8080/api/v1/system

[Table 209](#) lists the message body members.

Table 209 Message body members for updating storage system parameters

Member	JSON type	API type	Description
parameters	object	systemParameter object	Modify the system parameters. WSAPI 1.5 allows modification of the following parameters only: <ul style="list-style-type: none"> • FailoverMatchedSet • PortFailoverEnabled • RemoteSyslog • RemoteSyslogHost

[Table 210](#) provides descriptions of the only system parameters you can modify in WSAPI 1.5.

Table 210 systemParameter settings

Member	JSON type	API type	Description
remoteSyslog	boolean	boolean	Enable or disable sending events to a remote system as syslog messages. True – enable the message

Table 210 systemParameter settings *(continued)*

Member	JSON type	API type	Description
			False – disable the message
remoteSyslogHost	string	name31	IP address of the system to which events are sent as <code>syslog</code> messages. The value must be a valid IP address.
portFailoverEnabled	boolean	boolean	Enable or disable the automatic failover of target ports to their designated partner ports. True – enable automatic failover False – disable automatic failover
failoverMatchedSet	boolean	boolean	Enable or disable the automatic failover of matched-set VLUNs during a persistent port failover. This does not affect host-see VLUNs, which are always failover-ed. True – enable automatic failover False – disable automatic failover

Update storage system parameters success

A successful update returns the HTTP code 200 OK with no message body. The location portion of the JSON response header indicates the original URI of the storage system.

You can set all of the system parameters in one HTTP request, but some updates might fail.

Update storage system parameters error codes

An unsuccessful update returns the error code shown in [Table 211](#)

Table 211 API error messages for updating storage system parameters

API error	HTTP code	Description
INV_INPUT	400 Bad Request	Invalid input parameter or value Only the following system parameters can be modified: <ul style="list-style-type: none"> failoverMatchedSet portFailoverEnabled remoteSyslog remoteSyslogHost
PARTIAL_EXECUTION_SUCCESS	400 Bad Request	Partial attributes setting successfully and there may be some errors
ALL_EXECUTION_FAILED	400 Bad Request	All attributes setting failed

Getting version information

A client of the WSAPI can query the API server for version information by using an HTTP GET request on a URI in the following form:

```
https://<storage_system>:8080/api
```

You do not need a session key to make the request.

Version information query success

A successful query for version information returns a JSON object that describes the interface version provided by the API server (see [Table 212 \(page 202\)](#)).

Table 212 JSON objects for version information response

Member	JSON type	Description
major	number	The version major number.
minor	number	The version minor number.
build	number	A build number not meant to be interpreted by clients, but useful for identifying specific builds of versions for defect reports or support requests.

Version information query errors

An unsuccessful query for version information returns the error code shown in [Table 213](#).

Table 213 Storage-system version query error codes

API Error	HTTP Code	Description
INT_SERV_ERR	500 Internal Server Error	Internal server error.

For details about this error code, see [Table 6 \(page 29\)](#).

Getting WSAPI configuration information

To query for WSAPI configuration information, use the HTTP GET method with the following URI and no message body:

`https://<storage_system>:8080/api/v1/wsapiconfiguration`

The `systemResourceUsage` member of `wsapiconfiguration` HTTP GET operation output represents the theoretical maximum of sessions the WSAPI server can handle at any given time. The `systemResourceUsage` value, which is determined at WSAPI server process start time, depends on the array configuration and memory usage on each node on the cluster.

WSAPI configuration query success

Unless an error occurs, the response includes a message body with JSON object members as shown in [Table 214 \(page 202\)](#).

Table 214 Message body JSON objects for WSAPI configuration query

Member	JSON type	Value Range	Description
httpState	string	name31	HTTP port state. Possible values are: <ul style="list-style-type: none"> Enabled: HTTP port is enabled. Disabled: HTTP port is disabled. <i>(WSAPI 1.3 and later)</i>
httpsState	string	name31	HTTPS port state. Possible values are: <ul style="list-style-type: none"> Enabled: HTTPS port is enabled. Disabled: HTTPS port is disabled. <i>(WSAPI 1.3 and later)</i>
httpPort	number	uint32	HTTP port number on which the WSAPI is listening for unsecure connections. Value: 8080 <i>(WSAPI 1.3 and later)</i>
httpsPort	number	uint32	HTTPS port number on which the WSAPI is listening for secure connections.

Table 214 Message body JSON objects for WSAPI configuration query *(continued)*

Member	JSON type	Value Range	Description
			Value: 8080 (WSAPI 1.3 and later)
version	string	name31	The WSAPI server version. (WSAPI 1.3 and later)
sessionsInUse	number	uint32	The number of WSAPI sessions in use in the cluster. (WSAPI 1.3 and later)
systemResourceUsage	number	uint32	The SRU setting on the array. This represents the total number of concurrent sessions that the WSAPI server can handle, theoretically, at any given time. Example: 240 (WSAPI 1.3 and later)
sessionTimeout	number	uint32	The idle session timeout, in minutes, for a WSAPI session, in the range of 3-1440 minutes or (3 minutes to 24 hours). The default timeout value is 15 minutes. (WSAPI 1.4.2, with 3PAR OS 3.1.2 MU2)

The following sample response shows the SRU (`systemResourceUsage`) as 144 concurrent sessions:

```
Response: {
  httpState: "Enabled"
  httpPort: 8080
  httpsState: "Enabled"
  httpsPort: 8080
  version: "1.3.1"
  sessionsInUse: 0
  "systemResourceUsage":144,
  "sessionTimeout":15}
```

WSAPI configuration query errors

An unsuccessful query of WSAPI configuration information returns an error code as shown in [Table 215 \(page 203\)](#). For generic API error codes, see [Table 6 \(page 29\)](#)

Table 215 WSAPI configuration query response error codes

API Error	HTTP Code	Description
OTHER	400 Bad Request	Other miscellaneous errors.
INT_SERV_ERR	500 Internal Server Error	Memory allocation failure. Communication with CLI failed.

Getting task status

Querying the status of all tasks

To query the status of all tasks, use the HTTP GET method with the following URI and no message body:

`https://<storage_system>:8080/api/v1/tasks`

Successful query of tasks status

A successful query returns a message body with members as shown in [Table 216 \(page 204\)](#).

Table 216 Message body JSON objects for all-tasks status query

Member	JSON type	API type	Description
total	number	int32	Number of tasks returned.
members	array of objects	array of task objects	All task information.

Total is the number of objects in the collection. The Members object is a JSON array of zero or more JSON objects—one for each task. The task fields are the same as for the single task for physical copy. The tasks shown are tasks started within the last 24 hours.

All-tasks status query errors

For error codes following a single-task status query, see [Table 220 \(page 206\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Querying the status of a single task

To query the status of a single task, use the HTTP GET method with the following URI:

`https://<storage_system>:8080/api/v1/tasks/<task_id>`

Successful query of single-task status

A successful query of a single task returns a message body with JSON object members as shown in [Table 217 \(page 204\)](#).

Table 217 Message body JSON object members for copy single-task status query

Member	JSON type	API type	Description
Id	number	number	Task ID. (WSAPI 1.3 and later)
type	number	taskType Enum	Task type. See Table 218 (page 205) . (WSAPI 1.3 and later)
Name	string	string	Task name. (WSAPI 1.3 and later)
Status	number	taskStatus Enum	Task status. See Table 219 (page 206) . (WSAPI 1.3 and later)
completedPhases	number	number	For active tasks only; the number of completed phases. (WSAPI 1.3 and later)
totalPhases	number	number	For active tasks only; the total number of phases. (WSAPI 1.3 and later)
completedSteps	number	number	For active tasks only; the number of completed steps.

Table 217 Message body JSON object members for copy single-task status query
(continued)

Member	JSON type	API type	Description
			(WSAPI 1.3 and later)
totalSteps	number	number	For active tasks only; the total number of steps. (WSAPI 1.3 and later)
startTime	string	time	Task start time. (WSAPI 1.3 and later)
finishTime	string	time	Task end time. (WSAPI 1.3 and later)
priority	number	taskPriority Enum	Task priority. See Table 129 (page 141) . (WSAPI 1.3 and later)
User	string	string	The user who initiated the task. (WSAPI 1.3 and later)

Enumeration for the `taskTypeEnum` JSON object is shown in [Table 218 \(page 205\)](#).

Table 218 taskTypeEnum enumeration for single-task query

Symbol	Value	Description
VV_COPY	1	Track the physical copy operations.
PHYS_COPY_RESYNC	2	Track physical copy resynchronization operations.
MOVE_REGIONS	3	Track region move operations.
PROMOTE_SV	4	Track virtual-copy promotions. Requires 3PAR Virtual Copy license.
REMOTE_COPY_SYNC	5	Track remote-copy group synchronizations. Requires 3PAR Remote Copy license.
REMOTE_COPY_REVERSE	6	Track the reversal of a remote-copy group.
REMOTE_COPY_FAILOVER	7	Track the change-over of a secondary volume group to a primary volume group.
REMOTE_COPY_RECOVER	8	Track the starting of synchronization after a failover operation from the original secondary cluster to the original primary cluster.
REMOTE_COPY_RESTORE	9	Tracks the restoration process for groups that have already been recovered.
COMPACT_CPG	10	Track space consolidation in CPGs.
COMPACT_IDS	11	Track space consolidation in logical disks.
SNAPSHOT_ACCOUNTING	12	Track progress of snapshot space usage accounting.
CHECK_VV	13	Track the progress of the check-volume operation.
SCHEDULED_TASK	14	Track tasks that have been executed by the system scheduler.
SYSTEM_TASK	15	Track tasks that are periodically run by the storage system.

Table 218 `taskTypeEnum` enumeration for single-task query (continued)

Symbol	Value	Description
BACKGROUND_TASK	16	Track commands that have been started via the <code>starttask</code> command.
IMPORT_VV	17	Track tasks that migrate data to the local storage system.
ONLINE_COPY	18	Track physical copy of the volume while online. (<code>createvvcopy -online</code> command)
CONVERT_VV	19	Track tasks that are converting a volume from an FPVV to a TPVV and vice-versa.

Enumeration for the `taskStatusEnum` JSON object is shown in [Table 219 \(page 206\)](#).

Table 219 `taskStatusEnum` enumeration for physical-copy task query

Symbol	Value	Description
DONE	1	The task has finished.
ACTIVE	2	The task is in progress.
CANCELLED	3	The task was canceled.
FAILED	4	The task failed.

Single copy task query errors

Possible error codes following a single copy task query are shown in [Table 220 \(page 206\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 220 All-tasks status query error codes

API Error	HTTP Code	Description
INV_INPUT_BELOW_RANGE	400 Bad Request	Task ID must be a positive value. (WSAPI 1.3 and later)
INV_INPUT_EXCEEDS_RANGE	400 Bad Request	Task ID is too large. (WSAPI 1.3 and later)
NON_EXISTENT_TASK	404 Not Found	Task with the specified task ID does not exist. (WSAPI 1.3 and later)
INV_INPUT_WRONG_TYPE	400 Bad Request	Task ID is not an integer. (WSAPI 1.3 and later)

Canceling a task

To cancel a task, use the HTTP PUT method with the following URI:

https://<storage_system>:8080/api/v1/tasks/<task_ID>

For example, to cancel task 1, use the following URI:

PUT: https://<storage_system>:8080/api/v1/tasks/1

{"action":1}

Table 221 JSON object member for canceling a task

Member	JSON type	API type	Ignored Values	Description
action	number	taskActionEnum	Required field.	Specifies the action to be performed on the task.

Enumeration for the `taskAction` Enum JSON object is defined with a single enumeration symbol, as shown in [Table 222 \(page 207\)](#).

Table 222 taskAction enumeration for canceling a task

Symbol	Value	Description
CANCEL_TASK	1	Cancels the ongoing task. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)

Task cancellation success

A successful request to cancel a task returns the HTTP code 200 OK.

Task cancellation errors

Possible error codes following a request to cancel a task are shown in [Table 223 \(page 207\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 223 Task cancellation error codes

API Error	HTTP Code	Description
NON_ACTIVE_TASK	400 Bad Request	The task is not active at this time. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)
INV_OPERATION_CANNOT_CANCEL_TASK	409 Conflict	Invalid operation: Task cannot be canceled. (WSAPI 1.3.1 and later with 3PAR OS 3.1.3 MU1)

Setting and querying system flash-cache policy

To set flash cache usage policy for the all volumes on a system, use the HTTP PUT method with the following URI and a message body as shown in [Table 224 \(page 207\)](#).

`https://<storage_system>:8080/api/v1/system`

Table 224 System flash-cache policy setting JSON objects

Member	JSON type	API type	Description
flashCachePolicy	number	flashCacheSysPolicyEnum	1: Enable 2: Disable 3: Clear (WSAPI 1.4.2 with 3PAR OS 3.2.1 MU2)

You can get system flash-cache policy information by querying the system; see [“Getting storage system information” \(page 196\)](#).

System flash-cache policy setting success

A successful flash-cache policy setting returns the HTTP code 200 OK with no message body.

System flash-cache policy setting errors

If an error occurs, the system returns one of the error codes shown in [Table 87 \(page 113\)](#), or a generic error code as shown in [Table 6 \(page 29\)](#).

14 Querying available space

This chapter describes querying for information about overall available space on the system, and about querying available space based on CPG and LD layout.

Querying overall system capacity

Space information can be queried for the overall capacity, for a given CPG name, or for an LDLayout object.

To query overall system capacity, use the HTTP GET method with the following URI and no message body:

`https://<storage_system>:8080/api/v1/capacity`

Overall system capacity success

Unless an internal server error occurs, the response includes a message body as specified in [Table 225 \(page 209\)](#).

Table 225 JSON objects for overall capacity response

Member	JSON type	Value Range	Description
allCapacity	DeviceCapacity object	See Table 226 .	Overall system capacity, which includes a combination of FC, NL, and SSD device types. (WSAPI 1.2 and later)
FCCapacity	DeviceCapacity object		System capacity from FC devices only. (WSAPI 1.2 and later)
NLCapacity	DeviceCapacity object		System capacity from NL devices only. (WSAPI 1.2 and later)
SSDCapacity	DeviceCapacity object		System capacity from SSD devices only. (WSAPI 1.2 and later)

JSON object members for `DeviceCapacity` are shown in [Table 226](#).

Table 226 DeviceCapacity JSON objects

Member	JSON type	API type	Description
totalMiB	number	uint64	Total system capacity in MiB. (WSAPI 1.2 and later)
allocated	AllocatedCapacity	AllocatedCapacity object. See Table 227 (page 210) .	See Table 227 (page 210) . (WSAPI 1.2 and later)
freeMiB	Number	uint64	Free capacity. (WSAPI 1.2 and later)
freeInitializedMiB	Number	uint64	Free initialized capacity. (WSAPI 1.2 and later)
freeUninitializedMiB	Number	uint64	Free uninitialized capacity. (WSAPI 1.2 and later)
failedCapacityMiB	Number	uint64	Failed capacity in MiB.

Table 226 DeviceCapacity JSON objects *(continued)*

Member	JSON type	API type	Description
			(WSAPI 1.2 and later)
unavailableCapacityMiB	Number	uint64	Unavailable Capacity. (WSAPI 1.2 and later)

AllocatedCapacity is a sub-object of the overall capacity object. Its JSON object members are shown in [Table 227 \(page 210\)](#).

Table 227 AllocatedCapacity JSON objects

Member	JSON type	API type	Description
totalAllocatedMiB	number	uint64	Total allocated capacity. (WSAPI 1.2 and later)
volumes	VolumeCapacity	VolumeCapacity object	The capacity allocated to volumes. See Table 228 (page 210) . (WSAPI 1.2 and later)
system	SystemCapacity	SystemCapacity object	The allocated system capacity. See Table 229 (page 211) . (WSAPI 1.2 and later)

VolumeCapacity is a sub-object of the AllocatedCapacity object. Its JSON object members are shown in [Table 228 \(page 210\)](#).

Table 228 VolumeCapacity JSON objects

Member	JSON type	Value Range	Description
totalVolumesMiB	number	uint64	Total capacity allocated to volumes. (WSAPI 1.2 and later)
nonCPGsMiB	number	uint64	Total non-CPG capacity. (WSAPI 1.2 and later)
nonCPGUserMiB	number	uint64	The capacity allocated to non-CPG user space. (WSAPI 1.2 and later)
nonCPGSnapshotMiB	number	uint64	The capacity allocated to non-CPG snapshot volumes. (WSAPI 1.2 and later)
nonCPGAdminMiB	number	uint64	The capacity allocated to non-CPG administrative volume. (WSAPI 1.2 and later)
CPGsMiB	number	uint64	Total capacity allocated to CPGs. (WSAPI 1.2 and later)
CPGUserMiB	number	uint64	User CPG space. (WSAPI 1.2 and later)
CPGUserUsedMiB	number	uint64	The CPG (TPVVs and CPVVs) allocated to user space that is in use. (WSAPI 1.2 and later)

Table 228 VolumeCapacity JSON objects (continued)

Member	JSON type	Value Range	Description
CPGUserUsedBulkvMiB	number	uint64	The sum of CPGUserUsedMiB and the capacity allocated to user space of bulk volumes that is in use.
CPGUserUnusedMiB	number	uint64	The CPG (TPVVs and CPVVs) allocated to user space that is not in use. (WSAPI 1.2 and later)
CPGSnapshotMiB	number	uint64	Snapshot CPG space. (WSAPI 1.2 and later)
CPGSnapshotUsedBulkvMiB	number	uint64	The sum of CPGSnapshotUsedMiB and capacity allocated to snapshot space of bulk volumes that is in use.
CPGSnapshotUsedMiB	number	uint64	The CPG (TPVVs and CPVVs) allocated to snapshot space that is in use. (WSAPI 1.2 and later)
CPGSnapshotUnusedMiB	number	uint64	The CPG (TPVVs and CPVVs) allocated to snapshot space that is not in use. (WSAPI 1.2 and later)
CPGAdminMiB	number	uint64	Administrative volume CPG space. (WSAPI 1.2 and later)
CPGAdminUsedMiB	number	uint64	The CPG (TPVVs and CPVVs) allocated to administrative space that is in use. (WSAPI 1.2 and later)
CPGAdminUsedBulkvMiB	number	uint64	The sum of CPGAdminUsedMiB and the capacity allocated to admin space of bulk volumes that is in use.
CPGAdminUnusedMiB	number	uint64	The CPG (TPVVs and CPVVs) allocated to administrative space that is not in use. (WSAPI 1.2 and later)
unmappedMiB	number	uint64	Allocated volume space that is unmapped. (WSAPI 1.2 and later)
capacityEfficiency	Object	capacityEfficiency object	Capacity efficiency attributes. See Table 234 (page 213) (WSAPI 1.4.1 with 3PAR OS 3.2.1 MU1)

System is a sub-object of the AllocatedCapacity object. Its JSON object members are shown in [Table 229 \(page 211\)](#).

Table 229 System JSON objects

Member	JSON type	Value Range	Description
totalSystemMiB	number	uint64	System space capacity. (WSAPI 1.2 and later)
internalMiB	number	uint64	The system capacity allocated to internal resources. (WSAPI 1.2 and later)

Table 229 System JSON objects (continued)

Member	JSON type	Value Range	Description
spareMiB	number	uint64	Total spare capacity. (WSAPI 1.2 and later)
spareUsedMiB	number	uint64	The system capacity allocated to spare resources in use. (WSAPI 1.2 and later)
spareUnusedMiB	number	uint64	The system capacity allocated to spare resources that are unused. (WSAPI 1.2 and later)

Overall available space query errors

An unsuccessful query for overall available space can result in the `OTHER` error. For details about this error code, see [Table 6 \(page 29\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Querying available space for a CPG or LAYOUT object

To query available space for a given CPG or LAYOUT object, use the HTTP POST method with the following URI:

`https://<storage_system>:8080/api/v1/spacereporter`

The members required to query the space information for a given CPG are shown in [Table 230 \(page 212\)](#), and for a given LAYOUT object in [Table 11 \(page 60\)](#).

CPG space query members

JSON objects for a CPG space query are shown in [Table 230 \(page 212\)](#).

Table 230 JSON objects for cpg space query

Member	JSON type	API type	Description
cpg	string	name31	The CPG name. (WSAPI 1.2 and later)

LAYOUT object space query members

The members required to query space information based on an LAYOUT object are shown in [Table 232 \(page 213\)](#).

Space query success

A successful query for available space returns the HTTP code `200 OK` with a message body.

In response to a query for space information for a given CPG or LAYOUT object, the system returns a single JSON object. Members of the CPG query response for available space are shown in [Table 231](#).

Table 231 JSON objects for cpg space query response

Member	JSON type	Value Range	Description
LAYOUTCapacity	LAYOUTCapacity object	See Table 233 (page 213) .	Capacity allocated to a layout associated with the CPG name. (WSAPI 1.2 and later)

Upon querying for space information based on an `LDLayout` object, the system will return a single JSON object. Its members are described in [Table 233 \(page 213\)](#).

Table 232 JSON objects for `LDLayout` space query response

Member	JSON type	Value Range	Description
<code>LDLayout</code>	<code>LDLayout</code> object	<code>LDLayout</code> object	Capacity of a logical disk layout. See Table 11 (page 60) (WSAPI 1.2 and later)

In the response body following a query for space information in an `LDLayout` object, the system returns a single JSON object whose members are described in [Table 233 \(page 213\)](#).

Table 233 JSON objects for `LDLayoutCapacity` query response

Member	JSON type	Value Range	Description
<code>rawFreeMiB</code>	number	uint64	Raw free capacity in MiB. (WSAPI 1.2 and later)
<code>usableFreeMiB</code>	number	uint64	LD free capacity in MiB. (WSAPI 1.2 and later)
<code>capacityEfficiency</code>	Object	<code>capacityEfficiency</code> object	Capacity efficiency attributes. See Table 234 (page 213) . (WSAPI 1.4.1 with 3PAR OS 3.2.1 MU1)

Members of the `capacityEfficiency` JSON object are shown in [Table 234 \(page 213\)](#).

Table 234 Members of `capacityEfficiency` JSON object

Member	JSON type	API type	Description
<code>compaction</code>	number	float	The compaction ratio indicates the overall amount of storage space saved with 3PAR thin technology. (WSAPI 1.4.1 with 3PAR OS MU1)
<code>deduplication</code>	number	float	The deduplication ratio indicates the amount of storage space saved with 3PAR thin deduplication. (WSAPI 1.4.1 with 3PAR OS 3.2.1 MU1)

Space query errors

Possible errors following a space query are described in [Table 235 \(page 213\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 235 Space query API and HTTP error codes

API Error	HTTP Code	Description
<code>INV_SET_SIZE</code>	400 Bad Request	The set size is invalid for the selected RAID type.
<code>INV_INPUT_ONE_REQUIRED</code>	400 Bad Request	Invalid input: one of the parameters is required. (WSAPI 1.2 and later)
<code>INV_INPUT_EXCEEDS_LENGTH</code>	400 Bad Request	Invalid input: string length exceeds limit. (WSAPI 1.2 and later)

Table 235 Space query API and HTTP error codes *(continued)*

API Error	HTTP Code	Description
INV_INPUT_PARAM_CONFLICT	400 Bad Request	Invalid input: parameters cannot be present at the same time.
NO_SPACE	400 Bad Request	Insufficient space for requested operation.
BAD_CPG_PATTERN	400 Bad Request	Bad CPG pattern specified.
NON_EXISTENT_CPG	404 Not Found	CPG does not exist.

15 Querying WSAPI user and role information

This chapter contains information about querying the WSAPI server for information about users and their roles and privileges.

Querying all users

To get a list of all WSAPI users, use the HTTP GET method with the following URI and no message body:

`https://<storage_system>:8080/api/v1/users`

WSAPI all-users query success

A successful query for a list of all users returns the HTTP code 200 OK with a message body containing JSON object members as shown in [Table 236 \(page 215\)](#). In addition, the message body displays an array of links which, by default, include an href to itself ("self").

For example:

```
{
  links: [ 1 ]
    - 0: {
      href: "https://<server_name>:8080/api/v1/users"
      rel: "self"
    }
}
```

Table 236 Message body JSON objects for all-users query

Member	JSON type	API type	Description
total	number	int32	Number of users returned.
members	array of objects	array of user property objects	User properties.

Total is the number of objects in the collection. The Members object is an array of JSON objects for user information, as shown in [Table 237 \(page 215\)](#).

Table 237 Members of the users JSON object for all-users query

Member	JSON type	API type	Description
username	string	Print64	Name of the user.
privileges	array of privileges object	Privileges object	Array of domains and roles associated with the username.

Properties of the privileges object are listed in [Table 238 \(page 215\)](#).

Table 238 Members of the privileges JSON object for all-users query

Member	JSON type	API type	Description
domain	string	Print64	Name of the domain.
role	string	Print64	Role associated with the user in the domain.

All-users query errors

For generic API error codes, see [Table 6 \(page 29\)](#).

Querying a single user

To query information about a single WSAPI user, use the HTTP GET method with the following URI and no message body:

`https://<storage_system>:8080/api/v1/users/<user_name>`

WSAPI single-user query success

A successful query for information about a single user returns the HTTP code 200 OK, with a message body containing JSON object members as shown in [Table 236 \(page 215\)](#) and [Table 238 \(page 215\)](#). In addition, the message body displays an array of inks which, by default, include an href to itself ("self").

Single-user query errors

Possible errors following a query for information about a single WSAPI user are shown in [Table 239 \(page 216\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 239 Single-user query error codes

API Error	HTTP Code	Description
NON_EXISTENT_USER	400 Bad Request	User not found. (WSAPI 1.4 and later)
INV_INPUT_EXCEEDS_LENGTH	413 Request Entity Too Large	The user name is too long. (WSAPI 1.4 and later)
NON_LOCAL_USER	404 Not Found	The user is not a local user. (WSAPI 1.4 and later)

Querying all roles

To get a list of all WSAPI roles, use the HTTP GET method with the following URI and no message body:

`https://<storage_system>:8080/api/v1/roles`

WSAPI all-roles query success

A successful query for a list of all roles returns the HTTP code 200 OK with a message body containing JSON object members as shown in [Table 240 \(page 216\)](#).

Table 240 Message body JSON objects for all-roles query

Member	JSON type	API type	Description
total	number	int32	Number of roles returned.
members	array of objects	array of role property objects	Role properties.

Total is the number of objects in the collection. The Members object is an array of JSON objects for role information, as shown in [Table 241 \(page 217\)](#).

Table 241 Members of the `role` JSON objects for all-users query

Member	JSON type	API type	Description
<code>role</code>	string	Print64	Name of the role.
<code>comments</code>	string	Print64	Comments for the role.
<code>rights</code>	array of rights object	rights object	Rights associated with the role.

Properties of the `rights` object are listed in [Table 242 \(page 217\)](#).

Table 242 Members of the `rights` JSON objects for all-roles query

Member	JSON type	API type	Description
<code>right</code>	string	Print64	Right associated with the role.
<code>rightDescription</code>	string	Print256	Description of the right.

All-roles query errors

For generic API error codes, see [Table 6 \(page 29\)](#).

Querying a single role

To query information about a single WSAPI role, use the HTTP GET method with the following URI and no message body:

```
https://<storage_system>:8080/api/v1/roles/<role_name>
```

WSAPI single-role query success

A successful query for information about a single user returns the HTTP code 200 OK with a message body containing JSON object members as shown in [Table 241 \(page 217\)](#) and [Table 242 \(page 217\)](#). In addition, the message body displays an array of inks which, by default, will include an `href` to itself (`"self"`).

Single-role query errors

Possible errors following a query for information about a single WSAPI role are shown in [Table 243 \(page 217\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 243 Single-role query error codes

API Error	HTTP Code	Description
<code>NON_EXISTENT_ROLE</code>	404 Not Found	No role matches the pattern. (WSAPI 1.4 and later)

16 Querying AO configuration information

To query all AO configurations, use the HTTP GET method with the following URI and no message body:

https://<storage_server>:8080/api/v1/aoconfigurations

Unless an internal server error occurs, the response includes a message body listed in [Table 244](#).

Table 244 Members of the AOConfig collection message body

Member	JSON type	API-type	Description
total	Number	int32	Number of AO configurations returned; total number of objects in the collection.
members	Array of objects	Array of AOConfig property objects	AO configuration properties.
links	Array of URL links	Array of URL links	Links include the self-URL.

[Table 245](#) lists and describes the JSON object members.

Table 245 Members of the AOConfig JSON object

Member	JSON type	API-type	Description
id	String	Int32	Aocfg configuration ID
name	String	String	Aocfg configuration name
t0CPG	Object	TierCpg object	aocfg tier 0 CPG info (see Table 246)
t1CPG	Object	TierCpg object	aocfg tier 1 CPG info (see Table 246)
t2CPG	Object	TierCpg object	aocfg tier 2 CPG info (see Table 246)
mode	Number	Enum Mode Type	AO configuration mode. Includes the following: <ul style="list-style-type: none">• Balanced (1)• Cost (2)• Performance (3)
domain	String	String	Domain of the AO Config
domainId	Number	Int32	Id of the AO Config domain
links	Array of URL links	Array of URL links	Links include the self URL, as well as links to T0cpg, T1cpg, and T2cpg.

Table 246 TierCpg object

Member	JSON type	API type	Description
id	String	Int32	CPG ID
name	String	String	CPG name
minSpaceUtilizationMiB	Number	uint64	minimum space utilization of the CPG.
maxSpaceUtilizationMiB	Number	uint64	maximum space utilization of the CPG.

Querying a single AO configuration

To query a single instance of an AO configuration, use the HTTP GET method with the following URI and no message body:

`https://<storage_server>:8080/api/v1/aoconfigurations/<aoconfig_name>`

Unless an internal server error occurs, the response includes a message body as described in [Table 245](#).

[Table 247](#) lists the possible error messages for the single AO configuration query.

Table 247 Single AO configuration query error messages

API error	HTTP code	Description
NON_EXISTENT_AO	404 Not found	The AO configuration does not exist.

17 Requesting information from HPE 3PAR System Reporter

Beginning with WSAPI 1.5, WSAPI clients can request reports from HPE 3PAR System Reporter using Versus Time or At Time report queries. System Reporter generates reports for various components in the storage array, including space reports for objects and performance statistics reports for storage array components. For details about using 3PAR System Reporter to analyze system performance, see 3PAR System Reporter Software user's guide.

License information

To use the 3PAR System Reporter feature, you must have a valid license. If you plan to use Adaptive Optimization, you must also have a license to take advantage of the storage optimization capabilities offered by this optional component.

Requesting Versus Time or At Time reports

To request a Versus Time report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/vstime/<component>/<report identifier>[?<query expression>]
```

To request an At Time report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/attime/<component>/<report identifier>[?<query expression>]
```

Versus Time and At Time common variable definitions

- **<component>**—Represents the storage array component from which to generate the report. Options include the following:
 - `cachememorystatistics`
 - `cpgspacedata`
 - `cpgstatistics`
 - `physicaldiskcapacity`
 - `physicaldiskspacedata`
 - `physicaldiskstatistics`
 - `portstatistics`
 - `volumespacedata`
 - `vlunstatistics`
- **<report Identifier>**—Represents the last segment of the URL, and uniquely identifies the parameters of the report type you want to generate. Parameters include the mandatory sample frequency (`<samplefreq>`) and optional, component-specific parameters, including the query string (`[?<query expression>]`). The query string begins with a question mark (?) and uniquely identifies query properties for the identified component. For more information on `<query expression>`, see [Query expression parameters \(page 221\)](#).

Mandatory sample frequency parameter

As part of the report identifier, you must specify one `<samplefreq>` parameter. The `<samplefreq>` parameter indicates how often to generate the performance sample data. You may specify only one. Options are:

- hires—based on 5 minutes (high resolution)
- hourly
- daily

The most recent sample data indicates the end time of the report.

Optional parameter names and values

For the specific optional parameters available for each report, see the storage array component information in the following chapters. Except for sample frequency, other parameters use the `<parameter_name>:<parameter_value>` format. You can specify multiple `<parameter_name>` and `<parameter_value>` pairs by separating each with a semi-colon (;). To specify multiple `<parameter_value>` variables, separate each with a comma (,). For example:

- `<parameter_name1>:<parameter_value1>`
- `<parameter_name1>:<parameter_value1>;<parameter_name2>:<parameter_value2>`
- `<parameter_name1>:<parameter_value1>;<parameter_name1>:<parameter_value2>`
- `<parameter_name1>:<parameter_value1>,<parameter_value2>`

Valid characters for `<report identifier>` are:

- 0-9
- a-z
- A-Z
- dash (-)
- underscore (_)
- period (.)
- colon (:) to separate parameter key words and values
- semi-colon (;) to separate multiple-parameters
- comma (,) to separate multiple values

Query expression parameters

Depending on the report type, the `<query expression>` parameter takes multiple query field names and value pairs to filter out system report data. To filter multiple name/value pairs, use an AND operator only. System Reporter does not support any other operators.

Query expression parameters for Versus Time reports

System Reporter displays sample data in a time range. The sample data start time depends on the sample frequency:

- High resolution report (every 5 minutes)—12 hours ago
- Hourly report—7 days ago
- Daily report—90 days ago

You can use the `<sampleTime>` parameter only in the query expression for Versus Time reports. As shown in the following examples, you can request that System Reporter display the data for a specified time range:

- `?query="sampleTime GE <time format> AND sampleTime LE <time format>"`
- `?query="sampleTime GE <time format>"`
- `?query=" sampleTime LE <time format>"`

Example URL

```
https://<storage_system>:8080/api/v1/systemreporter/vstime/<component>/<samplefreq>
?query="sampleTime GE 2015-01-10T12:00:00-08:00 AND sampleTime LE
2015-01-20T20:00:00-08:00"
```

The `<sampleTime>` parameter supports only GE and LE operators. In addition, the Versus Time system report supports only the `<sampleTime>` query parameter.

Define the `<time format>` parameter in ISO 8601 format: `YYYY-MM-DDThh:mm:ssZ`

- YYYY—Year
- MM—Month
- DD—Day
- hh—Hour
- mm—Minutes
- ss—Seconds
- Z—Timezone offset. Required. Use 'Z' or '+00:00' for UTC and hour and minute offset from UTC for other timezones.

Example time formats include:

- 2008-02-21T12:00:00z
- 2008-12-01T11:22:33Z
- 2009-01-02T12:34:56-08:00
- 2009-02-02T06:23:17+01:00
- 2008-11-28T08:22:13+00:00

Query expression parameters for At Time reports

The At Time report returns sample data for a particular time based on the parameters associated with a particular component in the system. You can use the `<query expression>` parameter to filter this data based on query filter name/value pairs (`<name> EQ <value>`).

Include multiple query filter name/value pairs and time ranges at the same time using an AND operator. Except for `sampleTime` and its value, query filter name/value pair parameters support the EQ operator only.

Specify multiple query filter values separated by a comma (.). You can include a `<query expression>` using one of the following formats:

- `?query="sampleTime GE <time format> AND sampleTime LE <time format>"`
- `?query="sampleTime GE <time format>"`
- `?query="sampleTime LE <time format>"`
- `?query="<filter name1> EQ <filter value1(s)> AND <filter name2> EQ <filter value2(s)>"`

- `?query="<filter name1> EQ <filter value1(s)> AND <filter name2> EQ <filter value2(s)> AND sampleTime LE <time format>"`
- `?query="<filter name1> EQ <filter value1(s)> AND <filter name2> EQ <filter value2(s)> AND sampleTime GE <time format>"`
- `?query="<filter name1> EQ <filter value1(s)> AND sampleTime LE <time format> AND sampleTime GE <time format>"`

The valid characters for <query expression> are:

- 0-9
- a-z
- A-Z
- dash (-)
- underscore (_)
- period (.)
- comma (,) to separate multiple values

Versus Time and At Time error handling

Table 248 Error messages for system reporter queries

API error	HTTP code	Description
INT_SERV_ERR	500 Internal Server Error	Internal Server Error
UNLICENSED_FEATURE	403 Forbidden	This system is not licensed for system report
INV_REPORT_PARAM	400 Bad Request	Invalid system report parameter
INV_QUERY_STRING	400 Bad Request	Query string is invalid
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	Illegal character in input
SYSTEM_REPORTER_DATA_NOT_AVAILABLE	400 Bad request	System reporter data is not available
OTHER	400 Bad request	Errors not listed map to OTHER

Query expression error handling

Query URL errors

Use of any invalid query field name or value in the <reporter identifier> parameter returns an INV_REPORT_PARAM error.

Use of an invalid character in the <reporter identifier> returns an INV_INPUT_ILLEGAL_CHAR error.

Query string errors

Use of any invalid query field name or value in the <query expression> parameter returns an array size of zero.

Use of any invalid character in the <reporter identifier> parameter returns an INV_INPUT_ILLEGAL_CHAR error.

The query filter name/value pair supports use of the EQ operator only. Using any other operator results in a INV_QUERY_STRING error.

Use of multiple query filter name/value pairs supports the use of the AND operator only. Use of any other operator or a mix of operators returns an INV_QUERY_STRING error.

Use of duplicated query field names returns a INV_QUERY_STRING error.

The <sampleTime> query field name supports LE and GE operators only. Use of any other operator returns an INV_QUERY_STRING error.

The system ignores any invalid query field value in the <query expression> parameter.

Requesting cache memory statistics data

You can request cache memory statistics data using either Versus Time or At Time reports.

Requesting a Versus Time cache memory statistics report

To request a Versus Time cache memory statistics report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/  
vstime/cachememorystatistics/<samplefreq>;node:  
<nodeid>[?<query expression>]
```

Versus Time cache memory data report parameters

In addition to the mandatory <samplefreq> parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

<node>—Provides cache memory data for the specified nodes, in the range of 0 to 7. For example specify `node:1,3,2`. With no node specified, the system calculates cache memory data for all nodes in the system.

Requesting an At Time cache memory statistics report

To request a At Time cache memory statistics report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/attime/  
cachememorystatistics/<samplefreq>;groupby:<groupby>[?<query expression>]
```

At Time cache memory statistics report parameters

In addition to the mandatory <samplefreq> parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

<groupby>—Requests cache memory data grouped by category. With no groupby variable specified, the system groups data into all categories. You can specify the node category only. For example, specify `groupby:node`.

Using cache memory statistics query expression parameters

Cache memory statistics report data queries default to all nodes in the system at a particular time. You can make modifications using the optional <query expression> parameter.

For Versus Time query expressions, you can use the sampleTime parameter only (see [Query expression parameters for Versus Time reports \(page 221\)](#)).

For At Time query expressions, you can use the sampleTime parameter, as well as filtering data based on node.

Usage examples include:

- `?query="sampleTime GE <time1> AND sampleTime LE <time2>"`
- `?query="node EQ 2,3,4"`
- `?query="node EQ 2,3,4 AND sampleTime LE <time format>"`
- `?query="node EQ 1,2 AND sampleTime GE <time format> AND sampleTime LE <time2>"`
- `?query="sampleTime GE <time format> AND sampleTime LE <time format>"`

Cache memory statistics report response

A successful query returns the HTTP code 200 OK.

Versus Time cache memory statistics report response

The Versus Time cache memory statistics report contains an array of performance sample data. The response displays each instance of sample data with a time stamp. [Table 249](#) lists the message body specifics.

Table 249 Versus Time cache memory statistics response message body

Member	JSON type	API type	Description
total	number	Int32	Total number of sample data
members	array of objects	Array of cache memory sample data	Cache memory statistics sample data with time stamp
links	array of URL links	Array of URL links	Links include the self-URL, except when using the query expression.

The members object is a JSON array of zero or more JSON objects, as listed in [Table 250](#).

Table 250 Versus Time cache memory statistics performance JSON object members

Member	JSON type	API type	Description
sampleTime	string	8601	Cache memory statistics sample time
sampleTimeSec	number	Int32	Cache memory statistics sample time in seconds
hitIO	object	rwAccessCount object	Number of Read/Write I/Os per second in which data was already in cache
missIO	object	rwAccessCount object	Number of Read/Write I/Os per second in which data was not already in cache
accessIO	object	rwAccessCount object	Number of read/write I/Os per second
hitPct	object	rwAccessCount object	Hits divided accesses displayed in percentage
totalAccessIO	number	uint64	Number of total read and write I/Os per second
lockBulkIO	number	uint64	Number of pages being modified per second by host I/O that are being written to disk by the flusher
pageStatistic	object	pageStatistic object	Page statistic information

Table 251 lists the rwAccessCount object definitions.

Table 251 Versus Time cache memory rwAccessCount objects

Member	JSON type	API type	Description
read	number	uint64	Read statistic
write	number	uint64	Write statistic

Table 252 lists the pageStatistic object definitions.

Table 252 Versus Time cache memory pageStatistic objects

Member	JSON type	API type	Description
pageStates	object	pageStates object	Information on page states
dirtyPages	object	pageInforPerDeviceType object	Current number of dirty cluster memory pages per device type class in the system
maxDirtyPages	object	pageInforPerDeviceType object	Maximum allowed number of dirty cluster memory pages per device type class in the system
delayAckPages	object	pageInforPerDeviceType object	Number of delayed acknowledgements (per device type class) to the host in order to throttle the host's IO writes due to cache resource constraints

Table 253 lists the pageStates descriptions.

Table 253 Versus Time cache memory pageStates objects

Member	JSON type	API type	Description
free	number	Int32	Number of cache pages without valid data on them
clean	number	Int32	Number of clean cache pages (valid data on page). A page is clean when data in cache matches data on disk.
writeOnce	number	Int32	Number of dirty pages that have been modified exactly 1 time. A page is dirty when it has been modified in cache but not written to disk
writeMultiple	number	Int32	Number of dirty pages that have been modified more than 1 time
writeScheduled	number	Int32	Number of pages scheduled to be written to disk
writing	number	Int32	Number of pages being currently written by the flusher to disk
dcowpend	number	Int32	Number of pages waiting for delayed copy on write resolution

Table 254 defines page information for specified device type class.

Table 254 Versus Time pageInforPerDeviceType information by device type class

Member	JSON type	API type	Description
FC_10	number	Int32	Page numbers associate with FC 10
FC_15	number	Int32	Page numbers associate with FC 15
NL_7	number	Int32	Page numbers associate with NL 7
SSD_100	number	Int32	Page numbers associate with SSD 100
SSD_150	number	Int32	Page numbers associate with SSD 150

At Time cache memory statistics response

The cache memory statistics response report contains an array of performance sample data for a particular time interval. The report groups each instance of sample data into one or more categories. [Table 255](#) lists the message body descriptions.

Table 255 At Time cache memory statistics response message body

Member	JSON type	API type	Description
sampleTime	string	8601	Cache memory statistics time stamp
sampleTimeSec	number	Int32	Cache memory statistics time stamp in seconds
total	number	Int32	Total number of sample data
members	array of objects	Array of cache memory statistics sample data	Cache memory statistics groups in categories
links	array of URL links	Array of URL links	Except for System Reporter query, the links returned include the self URL

The members object is a JSON array of zero or more JSON objects as shown in [Table 250](#).

Cache memory statistics report error mapping

[Versus Time and At Time error handling \(page 223\)](#) lists the error messages possible when querying cache memory statistics.

Requesting CPG space data reports

You can request CPG space data using either Versus Time or At Time reports.

Requesting a Versus Time CPG space data report

To request a Versus Time CPG space data report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/vstime/cpgspacedata/
<samplefreq>;name:<cpg_name>;diskType:<disktype>;RAIDType:<raidtype>
[?<query expression>]
```

Versus Time CPG space data report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameters:

- **<cpg_name>**—Indicates the CPG space sample data is only for the specified CPG names. With no name specified, the system calculates the CPG space sample data for all CPGs.
- **<disktype>**—Defined in [Table 16 \(page 62\)](#), and indicates the CPG space sample data is for the specified disk types. With no disk type specified, the system calculates the CPG space sample data is for all the disk types in the system. You can specify one or more disk types separated by a comma (.). For example, specify `diskType:1,2,3`.
- **<raidtype>**—Indicates that the CPG space sample data is for the specified raid types (see [Table 12](#)). With no type specified, the system calculates the CPG space sample data for all the raid types in the system. You can specify one or more raid types separated by a comma (.). For example, specify `RAIDType:1,2,3`.

Requesting an At Time CPG space data report

To request an At Time CPG space data report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/attime/cpgspacedata/  
<samplefreq>;groupby:<groupby>[?<query expression>]
```

At Time CPG space data report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

<groupby>—domain | id | name | diskType | RAIDType

Groups CPG space sample data into categories. With no group specified, the system groups data into all categories. To specify one or more categories, separate them with a comma (.). For example, specify `groupBy:id,diskType,RAIDType`.

Using CPG space data query expression parameters

CPG space data report queries default to all CPGs in the system at a particular time. You can make modifications using the optional `<query expression>` parameter. For Versus Time query expressions, you can use the `sampleTime` parameter only (see [Query expression parameters for Versus Time reports \(page 221\)](#)).

For At Time query expressions, you can use the `sampleTime` parameter, as well as filtering data based on `diskType` (see [Table 16 \(page 62\)](#)), `RAIDType` (see ???), or `name`. Use the **AND** operator to combine one or more filters.

Usage examples include:

- `?query="sampleTime GE <time format> AND sampleTime LE <time format>"`
- `?query="diskType EQ <disktype1,disktype2,...> AND RAIDType EQ <raidtype1, raidtype2,...> AND sampleTime LE <time format>"`
- `?query="name EQ <cpg_name>`

CPG space data report response

A successful query returns an empty and the HTTP code 200 OK.

Versus Time CPG space data report response

The Versus Time CPG space data report contains an array of space sample data. The response displays each instance of sample data with a time stamp. [Table 256](#) lists the message body specifics.

Table 256 Versus Time CPG space data response message body

Member	JSON type	API type	Description
total	number	Int32	Total number of sample data
members	array of objects	Array of CPG space sample data	CPG space sample data with time stamp
links	array of URL links	Array of URL links	Links include the self-URL, except when using the query expression.

The members object is a JSON array of zero or more JSON objects, as listed in [Table 257](#).

Table 257 Versus Time CPG space data JSON object members

Member	JSON type	API type	Description
sampleTime	string	8601	CPG space data sample time.
sampleTimeSec	number	Int32	CPG space data sample time in seconds.
usedSpace	object	Object CPG space data	Used CPG space data (see).
freeSpace	object	Object CPG space data	Free CPG space data (see).
totalSpace	object	Object CPG space data	Total CPG space data (see).
growthMiB	number	uint64	growth CPG space in MiB
capacityEfficiency	object	capacityEfficiency object	Capacity efficiency attributes (see Table 234).

[Table 258](#) lists the CPG space data object descriptions.

Table 258 Versus Time CPG space data

Member	JSON type	API type	Description
adminMiB	number	uint64	Admin CPG space MiB
snapMiB	number	uint64	Snap CPG space MiB
userMiB	number	uint64	User CPG space in MiB
totalMiB	number	uint64	TotalCPG space in MiB

At Time CPG space data response

The CPG space data response report contains an array of CPG space sample data for a particular time interval. The report groups each instance of sample data into one or more categories. [Table 259](#) lists the message body descriptions.

Table 259 At Time CPG space data response message body

Member	JSON type	API type	Description
sampleTime	string	8601	CPG space data time stamp
sampleTimeSec	number	Int32	CPG space data time stamp in seconds

Table 259 At Time CPG space data response message body (continued)

total	number	Int32	Total number of sample data
members	Array of objects	Array of CPG space sample data	CPG space data groups in categories
links	Array of URL links	Array of URL links	Except for System Reporter query, the links returned include the self URL

The members object is a JSON array of zero or more JSON objects as shown in [Table 260](#).

Table 260 At Time CPG space data members JSON objects

Member	JSON type	API type	Description
id	number	Int32	CPG ID
domain	string	Print64	Domain name
name	string	Name31	CPG name
diskType	number	CPG diskType Enumeration	The disk type of the CPG. (See Table 16 (page 62))
RAIDType	number	RAIDType Enumeration	Raid value of the CPG. (See Table 12 (page 60))
usedSpace	object	Object CPG space data	Used CPG space data (see).
freeSpace	object	Object CPG space data	Free CPG space data (see).
totalSpace	object	Object CPG space data	Total CPG space data (see)
growthMiB	number	UInt64	Growth CPG space in MiB
capacityEfficiency	object	capacityEfficiency object	Capacity efficiency attributes (see Table 234).

CPG space data report error mapping

[Versus Time and At Time error handling \(page 223\)](#) lists the error messages possible when querying CPG space data statistics.

Requesting CPG statistical data

You can request CPG statical data using either Versus Time or At Time reports.

Requesting a Versus Time CPG statistical data report

To request a Versus Time CPG statistical data report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/vstime/cpgstatistics/
<samplefreq>;name:<cpgName>[?<query expression>]
```

Versus Time CPG statistical data report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

<name>—Indicates that the CPG statistics sample data is only for the specified CPGs. For example, specify `name: cpg1, cpg2, cpg3`. With no name specified, the system calculates CPG statistics sample data for all CPGs in the system.

Requesting an At Time CPG statistical data report

To request an At Time CPG statistical data report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/attime/cpgstatistics/  
<samplefreq>;groupby:<groupby>[?<query expression>]
```

At Time CPG statistical data report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

`<groupby>`—name | domain

You can group the CPG statistical data into categories. With no `groupby` parameter specified, the system groups the data into all categories. You can specify one or more `groupby` categories by separating them with a comma (.). For example, specify `groupby:name, domain`.

Using CPG statistical data query expression parameters

CPG statistical data queries default to all CPGs in the system at a particular time. You can make modifications using the optional `<query expression>` parameter.

For Versus Time query expressions, you can use the `sampleTime` parameter only (see [Query expression parameters for Versus Time reports \(page 221\)](#)).

For At Time query expressions, you can use the `sampleTime` parameter, as well as filtering data based on CPG `name`. Use the `AND` operator to combine filters.

Usage examples include:

```
query="name EQ <cpg1> AND sampletime LE <time format>"
```

CPG statistical data report response

A successful query returns the HTTP code 200 OK.

Versus Time CPG statistical data report response

The Versus Time CPG statistical data report contains an array of CPG statistical data. The response displays each instance of sample data with a time stamp. [Table 261](#) lists the message body specifics.

Table 261 Versus Time CPG statistical data response message body

Member	JSON type	API type	Description
total	number	Int32	Total number of sample data
members	Array of objects	Array of CPG statistical data	CPG statistical data with time stamp
links	Array of URL links	Array of URL links	Links include the self-URL, except when using the query expression.

The `members` object is a JSON array of zero or more JSON objects, as listed in [Table 262](#).

Table 262 Versus Time CPG statistical data JSON object members

Member	JSON type	API type	Description
sampleTime	string	8601	CPG statistical data sample time
sampleTimeSec	number	rwtAccessCount	CPG statistical data sample time in seconds

Table 262 Versus Time CPG statistical data JSON object members *(continued)*

IO	Object	rwtAccessCount	Number of IO per second, which includes read, write, and total.
Kbytes	Object	rwtAccessCount	Number of kilobytes per second, which includes read, write, and total.
serviceTimeMS	Object	rwtAccessCount	Service time in milliseconds, which includes read, write, and total.
IOsizeKB	Object	rwtAccessCount	Object IO size in kilobytes, which includes read, write, and total
queueLength	Number	uint64	Queue length
busyPct	Number	int32	Busy percentage

At Time CPG statistical data response

The CPG statistical data response report contains an array of sample data for a particular time interval. The report groups each instance of sample data into one or more categories. [Table 263](#) lists the message body descriptions.

Table 263 At Time CPG statlcal data response message body

Member	JSON type	API type	Description
sampleTime	string	8601	Data time stamp
sampleTimeSec	number	Int32	Data time stamp in seconds
total	number	Int32	Total number of sample data records
members	Array of objects	Array of CPG statistics sample data	CPG data sample groups in categories
links	Array of URL links	Array of URL links	Except for System Reporter query, the links returned include the self URL

The members object is a JSON array of zero or more JSON objects as listed in [Table 264](#).

Table 264 At Time CPG statistical data members JSON objects

Member	JSON type	API type	Description
name	String	String	Name of the CPG
domain	String	String	Domain name of the CPG
IO	object	rwtAccessCount	Number of IO per second, which includes read, write, and total
Kbytes	object	rwtAccessCount	Number of Kilobytes per second, which includes read, write, and total
serviceTimeMS	object	rwtAccessCount	Service time in millisecond statistic data, which includes read, write, and total
IOsizeKB	object	rwtAccessCount	Object IO size in kilobytes statistic data, which includes read, write, and total

Table 264 At Time CPG statistical data members JSON objects *(continued)*

Member	JSON type	API type	Description
queueLength	Number	uint64	Queue length
busyPct	Number	Int32	Busy percentage

CPG statistical data report error mapping

[Versus Time and At Time error handling \(page 223\)](#) lists the error messages possible when querying CPG statistical data.

Requesting physical disk capacity

You can request physical disk capacity data using either Versus Time or At Time reports.

Requesting a Versus Time physical disk capacity report

To request a Versus Time physical disk capacity report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/vstime/
physicaldiskcapacity/<samplefreq>;id:<id>;type:<disktype>;
RPM:<speed>[?<query expression>]
```

Versus Time physical disk capacity data report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameters:

- **<id>**—Requests disk capacity data for the specified disks only. For example, specify `id:1,3,2`. With no `id` specified, the system calculates physical disk capacity for all disks in the system.
- **<diskType>**—Defined in [Table 16 \(page 62\)](#). Specifies the disk types to query for physical disk capacity sample data. With no `disktype` specified, the system calculates physical disk capacity for all disk types in the system. To specify one or more disk types, separate them with a comma (,). For example, specify `diskType:1,2,3`.
- **<speed>**—Specifies the RPM speeds to query for physical disk capacity data. With no `speed` indicated, the system calculates physical disk capacity data for all speeds in the system. You can specify one or more disk RPM speeds by separating them with a comma (,). For example, specify `RPM:7,15,150`. Valid RPM values are: 7,10,15,100,150.

Requesting an At Time physical disk capacity report

To request an At Time physical disk capacity report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/attime/physicaldiskcapacity/
<samplefreq>;groupby:<groupby>[?<query expression>]
```

At Time physical disk capacity report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

<groupby>—`id | cageID | cageSide | mag | diskPos | type | RPM`

Groups the physical disk capacity sample data into categories. With no categories specified, the system groups data into all categories. You can specify one or more `groupby` categories separated by a comma (,). For example, specify `groupby:id,type,RPM`.

Using physical disk capacity query expression parameters

Physical disk capacity data queries default to all nodes in the system at a particular time. You can make modifications using the optional `<query expression>` parameter.

For Versus Time query expressions, you can use the `sampleTime` parameter only (see [Query expression parameters for Versus Time reports \(page 221\)](#)).

For At Time query expressions, you can use the `sampleTime` parameter, as well as filtering data based on `type` (see [Table 16 \(page 62\)](#)), `id (pdid)`, or `RPM`. Use the AND operator to combine filters.

Usage examples include:

```
query="type EQ 1,2,3 AND id EQ <pdid,pdid,pdid> AND sampleTime LE <time format>"
```

Physical disk capacity report response

A successful query returns the HTTP code 200 OK.

Versus Time physical disk capacity report response

The Versus Time physical disk capacity report contains an array of sample data. The response displays each instance of sample data with a time stamp. [Table 265](#) lists the message body descriptions.

Table 265 Versus Time physical disk capacity response message body

Member	JSON type	API type	Description
total	number	Int32	Total number of sample data
members	Array of objects	Array of physical disk capacity sample data	Physical disk capacity sample data with time stamp
links	Array of URL links	Array of URL links	Links include the self-URL, except when using the query expression.

The members object is a JSON array of zero or more JSON objects, as listed in [Table 266](#).

Table 266 Versus Time physical disk capacity JSON object members

Member	JSON type	API type	Description
sampleTime	string	8601	Physical disk capacity performance statistic sample time
sampleTimeSec	number	Int32	Physical disk capacity performance statistic sample time in seconds
allocatedMiB	Number	uint64	Allocated physical disk capacity in the system.
freeMiB	Number	UInt64	Free physical disk capacity in the system.
failedMiB	Number	Unit64	Failed physical disk capacity in the system.
totalMiB	Number	UInt64	Total physical disk capacity in the system.

At Time physical disk capacity response

The physical disk capacity response report contains an array of sample data for a particular time interval. The report groups each instance of sample data into one or more categories. [Table 267](#) lists the message body descriptions.

Table 267 At Time physical disk capacity response message body

Member	JSON type	API type	Description
sampleTime	string	8601	Physical disk capacity time stamp
sampleTimeSec	number	Int32	Physical disk capacity time stamp in seconds
total	number	Int32	Total number of sample data
members	Array of objects	Array of physical disk capacity sample data	Physical disk capacity groups in categories
links	Array of URL links	Array of URL links	Except for System Reporter query, links include the self URL, which is the original request URL including the query at the end

The members object is a JSON array of zero or more JSON objects as shown in [Table 268](#).

Table 268 At Time Physical disk capacity performance group view members JSON objects

Member	JSON type	API type	Description
id	number	Int32	Physical disk ID
cageID	number	Int32	Cage ID.
cageSide	number	Int32	Cage Side.
mag	number	Int32	Disk Magazine within the cage.
diskPos	number	Int32	Disk position within the magazine.
type	number	diskType Enum	The disk type can be FC, NL, or SSD (see Table 16 (page 62))
RPM	number	int32	RPM of the physical disk
allocatedMiB	number	uint64	Allocated physical disk capacity in the system.
freeMiB	number	uint64	Free physical disk capacity in the sytem.
failedMiB	number	unit64	Failed physical disk capacity in the system.
totalMiB	number	uint64	Total physical disk capacity in the system.

Physical disk capacity report error mapping

[Versus Time and At Time error handling \(page 223\)](#) lists the error messages possible when querying physical disk capacity.

Requesting physical disk statistics reports

You can request physical disk statistics reports using either Versus Time or At Time reports.

Requesting a Versus Time physical disk statistics report

To request a Versus Time physical disk statistics report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/vstime/physicaldiskstatistics/  
<samplefreq>;id:<pdid>;type:<disktype>;RPM:<speed>[?<query expression>]
```

Versus Time physical disk statistics report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

- **<id>**—Requests sample data for the specified disks only. For example, specify `id:1,3,2`. With no `id` specified, the system calculates physical disk capacity for all disks in the system.
- **<diskType>**—Requests sample data for the specified disks. With no `type` specified, the system calculates performance data for all disks in the system. You can specify one or more disk types by separating them with a comma (.). For example, specify `type:1,2,3` (see [Table 16 \(page 62\)](#)).
- **<speed>**—Specifies the RPM speeds to use for performance sample data. With no RPM speed specified, the system calculates performance sample data for all speeds in the system. You can specify one or more disk RPM speeds by separating them with a comma (.). For example, specify `RPM:7,15,150`. Valid values for RPM are 7,10,15,100,150.

Requesting an At Time physical disk statistics report

To request an At Time physical disk performance data report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/attime/  
physicaldiskstatistics/<samplefreq>;groupby:<groupby>[?<query  
expression>]
```

At Time physical disk statistics report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

<groupby>—`id | node | slot | cardPort | type | RPM`

Requests sample data grouped by category. You can specify one or more categories by separating them with a comma; for example, specify `groupby:id,type,RPM`.

Using physical disk performance query expression parameters

Physical disk statistics queries default to all disks in the system at a particular time. You can make modifications using the options `<query expression>` parameter.

For Versus Time query expressions, you can use the `sampleTime` parameter only (see [Query expression parameters for Versus Time reports \(page 221\)](#)).

For At Time query expressions, you can use the `sampleTime` parameter, and filter data based on `type` (see [Table 16 \(page 62\)](#)), `id` (`pdid`), or `RPM`. Use the AND operator to combine filters.

Usage examples include:

- `?query="sampleTime GE <time1> AND sampleTime LE <time2>"`
- `?query="type EQ 1,2,3"`
- `?query="id EQ 2,3,4"`
- `?query="type EQ 1,2 AND id EQ 2,3,4"`

- `?query="type EQ 1,2 AND id EQ 2,3,4 AND sampleTime LE <time format>"`
- `?query="type EQ 1,2 AND sampleTime GE <time format> AND sampleTime LE <time2>"`
- `?query="id EQ 2,3,4 AND sampleTime LE <time format>"`

Physical disk statistics report response

A successful query returns the HTTP code 200 OK.

Versus Time report response

The response for a physical disk statistics report is an array of performance sample data. Each sample data is displayed with a time stamp. The message body is specified in the following table.

Table 269 Versus Time physical disk statistics response message body

Member	JSON type	API type	Description
total	number	Int32	Total number of sample data
members	array of objects	Array of physical disk performance sample data	Physical disk performance sample data with time stamp
links	array of URL links	Array of URL links	Links include the self-URL, except when using the query expression.

The members object is a JSON array of zero or more JSON objects, as listed in [Table 270](#).

Table 270 Versus Time physical disk statistics JSON object members

Member	JSON type	API type	Description
sampleTime	string	8601	Physical disk statistic sample time.
sampleTimeSec	number	Int32	Physical disk statistic sample time in seconds.
IO	object	rwAccessCount object	Number of IO per second (see Table 271 (page 237)).
KBytes	object	rwAccessCount object	Number of kilobytes per second (see Table 271 (page 237)).
serviceTimeMS	object	rwAccessCount object	Service time in millisecond statistic data (see Table 271 (page 237)).
IOSizeKB	object	rwAccessCount object	IO size in kilobytes statistic data (see Table 271 (page 237)).
queueLength	number	uint64	Queue length
busyPct	number	int32	Busy percentage

[Table 271](#) lists the rwAccessCount object definitions.

Table 271 Versus Time physical disk statistics rwAccessCount objects

Member	JSON type	API type	Description
read	number	uint64	Read statistic
write	number	uint64	Write statistic
total	number	uint64	Total of read and write statistic

At Time report response

The response for physical disk statistics report is an array of performance sample data at a particular time interval, and groups each data sample into one or more categories. [Table 272](#) lists the message body descriptions.

Table 272 At Time physical disk statistics response message body

Member	JSON type	API type	Description
sampleTime	string	8601	Physical disk performance statistic time stamp
sampleTimeSec	number	Int32	Physical disk performance statistic time stamp in seconds
total	number	Int32	Total number of sample data
members	array of objects	Array of physical disk performance sample data	Physical disk performance sample data with time stamp
links	array of URL links	Array of URL links	Links include the self-URL, except when using the query expression.

The members object is a JSON array of zero or more JSON objects as shown in [Table 273](#).

Table 273 At Time physical disk statistics group view members JSON objects

Member	JSON type	API type	Description
id	number	Int32	Physical disk ID.
type	number	diskType Enum	The disk type can be FC, NL, or SSD (see Table 16 (page 62)).
RPM	number	Int32	Speed of the physical disk.
node	number	Int32	Node number for primary port of the physical disk.
slot	number	Int32	PCI slot number for the primary port of the physical disk.
cardPort	number	Int32	Port number for the primary port of the physical disk.
IO	object	rwtAccessCount object	Number of IO per second (see Table 271 (page 237)).
KBytes	object	rwtAccessCount object	Number of kilobytes per second (see Table 271 (page 237)).
serviceTimeMS	object	rwtAccessCount object	Service time in millisecond statistic data (see Table 271 (page 237)).
IOSizeKB	object	rwtAccessCount object	IO size in kilobytes statistic data (see Table 271 (page 237)).
queueLength	number	uint64	Queue length
busyPct	number	Int32	Busy percentage

Physical disk statistics report error mapping

[Versus Time and At Time error handling \(page 223\)](#) lists the error messages possible when querying physical disk statistics.

Requesting physical disk space data reports

You can request physical disk space data reports using either Versus Time or At Time reports.

Requesting a Versus Time physical disk space data report

To request a Versus Time physical disk space data report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/vstime/  
physicaldisksspacedata/<samplefreq>;id:<id>;type<disktype>;  
RPM:<speed>[?<query expression>]
```

Versus Time physical disk space data report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

<id>—Requests physical disk space sample data for the specified disks only. For example, specify `id:1,3,2`. With no `id` specified, the system calculates performance data for all disks in the system.

<disktype>—Requests physical disk space sample data for the specified disk types. With no type specified, the system calculates performance data for all disks in the system. You can specify one or more disk types by separating them with a comma (,). For example, specify `type:1,2,8`. [Table 279](#) lists the parameter enumerations.

<speed>—Requests physical disk space sample data for the specified RPM speeds. With no RPM specified, the system returns physical disk space sample data for all speeds in the system. You can specify one or more disk RPM speeds, separated by a comma (,). For example, specify `RPM:7,10,15`. Valid values for RPM are 7,10,15,100,150.

Requesting an At Time physical disk space data report

To request an At Time physical disk performance data report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/attime/  
physicaldiskspacedata/<samplefreq>;groupby: <groupby>  
[?<query expression>]
```

At Time physical disk space data report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

<groupby>—`id | cageID | cageSide | mag | diskPOS | type | RPM`

Requests performance sample data grouped by categories. You can specify one or more group categories by separating them with a comma (,). For example, specify `groupby:id,type,RPM`.

Using physical disk space data query expression parameters

Physical disk space data queries default to all disks in the system at a particular time. You can make modifications using the options `<query expression>` parameter.

For Versus Time query expressions, you can use the `sampleTime` parameter only (see [Query expression parameters for Versus Time reports \(page 221\)](#)).

For At Time query expressions, you can use the `sampleTime` parameter, and filter data based on `type` (see [Table 16 \(page 62\)](#)) or `id (pdid)`. Use the AND operator to combine filters.

Usage examples include:

```
query="type EQ 1,2,3 AND id EQ <pdid, pdid, pdid> AND sampletime LE <time  
format>"
```

Physical disk space data report response

A successful query returns the HTTP code 200 OK.

Versus Time report response

The response for a physical disk space data report is an array of space sample data. Each sample displays with a time stamp. [Table 274](#) lists the message body response definitions.

Table 274 Versus Time physical disk space data response message body

Member	JSON type	API type	Description
total	number	Int32	Total number of sample data
members	array of objects	Array of physical disk space sample data	Physical disk space sample data with time stamp
links	array of URL links	Array of URL links	Links include the self URL, which includes the original request URL and the query at the end

The members object is a JSON array of zero or more JSON objects, as listed in [Table 275](#).

Table 275 Versus Time physical disk space data JSON object members

Member	JSON type	API type	Description
sampleTime	string	8601	Physical disk space data statistic sample time.
sampleTimeSec	number	Int32	Physical disk space data statistic sample time in seconds.
normalChunklets	object	Object of chunklets data	Normal chunklets data (see Table 276).
spareChunklets	object	Object of chunklets data	Spare chunklets data (see Table 276).
lifeLeftPct	number	Int32	Percentage of life left.
temperatureC	number	Int32	Temperature in Celsius.

[Table 276](#) lists the statistic data object definitions.

Table 276 Versus Time physical disk space statistic chunklet data objects

Member	JSON type	API type	Description
usedOK	number	Int32	Used good chunklets
usedFailed	number	Int32	Used failed chunklets
availClean	number	Int32	Available clean chunklets
availDirty	number	Int32	Available dirty chunklets
availFailed	number	Int32	Available failed chunklets

At Time report response

The response for a physical disk space data report is an array of space sample data. Each sample displays with a time stamp. [Table 277](#) lists the message body response definitions.

Table 277 At Time physical disk space data response message body

Member	JSON type	API type	Description
sampleTime	string	8601	Physical disk space data time stamp
sampleTimeSec	number	Int32	Physical disk space data time stamp in seconds
total	number	Int32	Total number of sample data
members	array of objects	Array of physical disk space sample data	Physical disk space sample data with time stamp
links	array of URL links	Array of URL links	Links include the self URL, which includes the original request URL and the query at the end

The members object is a JSON array of zero or more JSON objects, as listed in [Table 278](#).

Table 278 At Time physical disk space data JSON object members

Member	JSON type	API type	Description
id	string	8601	Physical disk ID
cageID	number	Int32	Cage ID
cageSide	number	Int32	Cage Side
mag	number	Int32	Disk magazine within the cage
diskPos	number	Int32	Disk position within the magazine
type	number	diskType Enum	Disk type (see Table 16 (page 62))
RPM	number	Int32	Physical disk RPM
normalChunklets	object	Object of chunklets data	Normal chunklets data (see Table 276).
spareChunklets	object	Object of chunklets data	Spare chunklets data (see Table 276).
lifeLeftPct	number	Int32	Percentage of life left
temperatureC	number	Int32	Temperature in Celcius

Physical disk space data error mapping

[Versus Time and At Time error handling \(page 223\)](#) lists the error messages possible when querying physical disk space data.

Requesting port statistics reports

You can request a port statistics report using either Versus Time or At Time reports.

Requesting a Versus Time port performance report

To request a Versus Time port statistics data report, use the HTTP GET method with the following URI:

`https://<storage_system>:8080/api/v1/systemreporter/vstime/`

```
portstatistics/<samplefreq>;portPos:<n:s:p>;type:
<porttype>[?<query expression>]
```

Versus Time port statistics report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameters:

Optional parameters include the following:

- **<portPos>**—Requests sample data for the specified ports only using `n:s:p`. For example, specify `port:1:0:1,2:1:3,6:2:1`. With no `portPos` specified, the system calculates performance data for all ports in the system.
- **<type>**—Requests sample data for the specified port type. With no type specified, the system calculates performance data for all port types in the system. You can specify one or more port types by separating them with a comma (.). For example, specify `type:1,2,8`. [Table 279](#) lists the parameter enumerations.

Requesting an At Time port statistics report

To request an At Time port statistics data report, use the HTTP GET method with the following URI:

```
https://<storage_system>8080/api/v1/systemreporter/attime/portstatistics/;
<samplefreq>;groupby:<groupby>[?<query expression>]
```

At Time port statistics report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

<groupby>—`node | slot | cardPort | type | speed`

Groups the sample data into categories. With no `groupby` variable specified, the system groups data into all categories. You can specify one or more `groupby` categories separated by a comma (.). For example, specify `groupby:node,slot,cardPort,type,speed`.

Using port statistics query expression parameters

Port statistics queries default to all ports in the system at a particular time. You can make modifications using the optional `<query expression>` parameter.

For Versus Time query expressions, you can use the `sampleTime` parameter only (see [Query expression parameters for Versus Time reports \(page 221\)](#)).

For At Time query expressions, you can use the `sampleTime` parameter, and filter data based on `type` (see [Table 279 \(page 243\)](#)) or `portPos`. Use the AND operator to combine filters.

Usage examples include:

- `?query="sampleTime GE <time1> AND sampleTime LE <time2>"`
- `?query="type EQ 1,2,3"`
- `?query="portPos EQ 0:0:1,1:1:2,2:3:1"`
- `?query="type EQ 5,7,8 AND portPos EQ 0:0:1,1:1:2,2:3:1"`
- `?query="type EQ 1,2 AND portPos EQ 3:1:1,2:1:2,2:3:1" AND sampleTime LE <time format>"`

- `?query="type EQ 3,5,8 AND sampleTime GE <time format> AND sampleTime LE <time2>"`
- `?query="portPos EQ 1:0:1,1:1:2,2:3:1" AND sampleTime LE <time format>"`

Table 279 Versus time port statistics type parameter enumeration

Symbol	Value
host	1
disk	2
free	3
rcfc	5
rcip	7
iscsi	8

Port statistics report response

A successful query returns the HTTP code 200 OK.

Versus Time port statistics response

The Versus Time port statistics report contains an array of performance sample data. The response displays each instance of sample data with a time stamp. [Table 280](#) lists the message body specifics.

Table 280 Versus Time port statistics response message body

Member	JSON type	API type	Description
total	number	Int32	Total number of sample data
members	array of objects	Array of port statistics sample data	Port statistics sample data with time stamp
links	array of URL links	Array of URL links	Links include the self-URL, except when using the query expression.

The members object is a JSON array of zero or more JSON objects, as listed in [Table 281](#).

Table 281 Versus Time port statistics JSON object members

Member	JSON type	API type	Description
sampleTime	string	8601	Port performance statistic sample time.
sampleTimeSec	number	Int32	Port performance statistic sample time in seconds.
IO	object	rwtAccessCount object	Number of IO per second (see Table 271 (page 237)).
KBytes	object	rwtAccessCount object	Number of kilobytes per second (see Table 271 (page 237)).
serviceTimeMS	object	rwtAccessCount object	Service time in millisecond statistic data (see Table 271 (page 237)).

Table 281 Versus Time port statistics JSON object members (continued)

IOSizeKB	object	rwtAccessCount object	IO size in kilobytes statistic data (see Table 271 (page 237)).
queueLength	number	uint64	Queue length
busyPct	number	Int32	Busy percentage

[Table 282](#) lists the port statistics data object definitions.

Table 282 Versus Time port statistics data objects

Member	JSON type	API type	Description
read	number	uint64	Read statistic
write	number	uint64	Write statistic
total	number	uint64	Total of read and write statistic

At Time port statistics response

The port statistics response contains an array of performance sample data for a particular time interval. The report groups each instance of sample data into one or more categories. [Table 283](#) lists the message body descriptions.

Table 283 At Time port statistics response message body

Member	JSON type	API type	Description
sampleTime	string	8601	Port statistics time stamp
sampleTimeSec	number	Int32	Port statistics time stamp in seconds
total	number	Int32	Total number of sample data
members	array of objects	Array of port statistics sample data	Port statistics sample groups in categories
links	array of URL links	Array of URL links	Except for System Reporter query, links include the self URL, which is the original request URL including the query at the end

The members object is a JSON array of zero or more JSON objects as shown in [Table 284](#).

Table 284 At Time port statistics members JSON objects

Member	JSON type	API type	Description
node	number	Int32	Node number of the port.
slot	number	Int32	PCI slot number of the port.
cardPort	number	Int32	Port number.
type	number	diskType Enum	The disk type (see Table 16 (page 62)).
speed	number	Int32	Port speed.
IO	object	rwtAccessCount object	Number of IO per second (see Table 271 (page 237)).
KBytes	object	rwtAccessCount object	Number of kilobytes per second (see Table 271 (page 237)).

Table 284 At Time port statistics members JSON objects *(continued)*

serviceTimeMS	object	rwtAccessCount object	Service time in millisecond statistic data (see Table 271 (page 237))
IOSizeKB	object	rwtAccessCount object	IO size in kilobytes statistic data (see Table 271 (page 237)).
queueLength	number	uint64	Queue length.
busyPct	number	Int32	Busy percentage.

Port statistics report error mapping

[Versus Time and At Time error handling \(page 223\)](#) lists the error messages possible when querying port statistics.

Requesting VLUN statistics data

You can request VLUN statistics data using either Versus Time or At Time reports.

Requesting a Versus Time VLUN statistics report

To request a Versus Time VLUN statistics report, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/vstime/
vlnstatistics/<samplefreq>;lun:<vlunid>;volumeName:<vv_name>;
hostname:<host_name>;volumeName:set:<vvset_name>;hostname:set:<hostset_name>;
portPos:<n:s:p...>[?<query expression>]
```

Versus Time VLUN statistics data report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameters:

- `<lun>`—Requests data for the specified VLUNs only. For example, specify `lun:1,2,4`. With no `lun` specified, the system calculates performance data for all VLUNs in the system.
- `<volumeName>`—Retrieves data for the specified volume or volumeset only. Specify the volumeset as `volumeName:set:<vvset_name>`. With no `volumeName` specified, the system calculates VLUN performance data for all the VLUNs in the system.
- `<hostname>`—Retrieves data for the specified host or hostset only. Specify the hostset as `hostname:set:<hostset_name>`. With no `hostname` specified, the system calculates VLUN performance data for all the hosts in the system.
- `<portPos>`—Retrieves data for the specified ports. For example, specify `portPos:1:0:1,2:1:3,6:2:1`. With no `portPos` specified, the system calculates VLUN performance data for all ports in the system.

At Time VLUN statistics report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

```
<groupby>—domain | volumeName | hostname | lun | hostWWN | node | slot | cardPort
| vvsetName | hostsetName
```

Groups the data into categories. With no `groupby` specified, the system groups data into all categories. You can specify one or more `groupby` categories by separating them with a comma (,). For example, specify `groupby:lun,hostname,vvsetName`.

Using VLUN statistics report query expression parameters

VLUN statistics queries default to all VLUNs in the system at a particular time. You can make modifications using the optional `<query expression>` parameter.

For Versus Time query expressions, you can use the `sampleTime` parameter only (see [Query expression parameters for Versus Time reports \(page 221\)](#)).

For At Time query expressions, you can use the `sampleTime` parameter, and filter data based on the following parameters. Use the AND operator to combine filters:

- `lun`
- `volumeName`
- `vvsetName`
- `hostname`
- `hostsetName`
- `portPos`
- `node`
- `slot`
- `cardPort`

Usage examples include:

- `?query="sampleTime GE <time format> AND sampleTime LE <time format>"`
- `?query="lun EQ 1,2,3"`
- `?query="volumeName EQ vvname1 AND lun EQ 1"`
- `?query="hostname EQ host1 AND volumeName EQ vvname1,vvname2"`
- `?query="vvsetName EQ vvsetname1 AND hostsetName EQ hostsetname1"`
- `?query="node EQ 2 AND slot EQ 2"`
- `?query="node EQ 1,2 AND cardPort EQ 2"`
- `?query="lun EQ 1,2,3 AND hostname EQ <name1,name2,.. > AND sampleTime LE <time format>"`

VLUN statistics report response

A successful query returns the HTTP code 200 OK.

Versus Time VLUN statistics report response

The Versus Time VLUN statistics report contains an array of sample data. The response displays each instance of sample data with a time stamp. [Table 285](#) lists the message body specifics.

Table 285 Versus Time VLUN statistics response message body

Member	JSON type	API type	Description
total	number	Int32	Total number of sample data

Table 285 Versus Time VLUN statistics response message body (continued)

members	array of objects	Array of VLUN statistics sample data	VLUN statistics sample data with time stamp
links	array of URL links	Array of URL links	Links include the self-URL, except when using the query expression.

The members object is a JSON array of zero or more JSON objects, as listed in [Table 286](#).

Table 286 Versus Time VLUN statistics JSON object members

Member	JSON type	API type	Description
sampleTime	string	8601	VLUN statistics sample time.
sampleTimeSec	number	Int32	VLUN statistics sample time in second.
IO	object	rwtAccessCount object	Number of IO per second (see Table 271 (page 237)).
KBytes	object	rwtAccessCount object	Number of kilobytes per second (see Table 271 (page 237))
serviceTimeMS	object	rwtAccessCount object	Service time in millisecond statistic data (see Table 271 (page 237))
IOSizeKB	object	rwtAccessCount object	IO size in kilobytes statistic data (see Table 271 (page 237))
queueLength	number	uint64	Queue length.
busyPct	number	int32	Busy percentage.

At Time VLUN statistics response

The VLUN statistics response report contains an array of performance sample data for a particular time interval. The report groups each instance of sample data into one or more categories. ??? lists the message body descriptions.

Table 287 At Time VLUN statistics response message body

Member	JSON type	API type	Description
sampleTime	string	8601	VLUN statistics time stamp
sampleTimeSec	number	Int32	VLUN statistics time stamp in seconds
total	number	Int32	Total number of sample data
members	array of objects	Array of VLUN statistics sample data	VLUN statistics sample groups in categories
links	array of URL links	Array of URL links	Except for System Reporter query, the links returned include the self URL

The members object is a JSON array of zero or more JSON objects as shown in [Table 288](#).

Table 288 At Time VLUN statistics JSON objects

Member	JSON type	API type	Description
lun	number	Int32	VLUN ID
domain	string	Print64	Domain name.
volumeName	string	Name31	VLUN volume name.
hostname	string	Name31	VLUN hostname.
node	number	Int32	Node port number for the VLUN.
slot	number	Int32	PCI slot number for the VLUN.
cardPort	number	Int32	Port number for the VLUN.
vvsetName	string	Name31	VLUN volume set name.
hostsetName	string	Name31	VLUN host set name.
IO	object	rwtAccessCount object	Number of IO per second (see Table 271 (page 237)).
KBytes	object	rwtAccessCount object	Number of kilobytes per second (see Table 271 (page 237)).
serviceTimeMS	object	rwtAccessCount object	Service time in millisecond statistic data (see Table 271 (page 237)).
IOSizeKB	object	rwtAccessCount object	IO size in kilobytes statistic data (see Table 271 (page 237)).
queueLength	number	uint64	Queue length.
busyPct	number	Int32	Busy percentage.

VLUN statistics report error mapping

[Versus Time and At Time error handling \(page 223\)](#) lists the error messages possible when querying VLUN statistics.

Requesting volume space data reports

You can request volume space data using either Versus Time or At Time reports.

Requesting a Versus Time volume space data report

To request a Versus Time volume space data reports, use the HTTP GET method with the following URI:

```
https://<storage_system>:8080/api/v1/systemreporter/vstime/
volumespacedata/<samplefreq>;name:<vv_name>;name:set<vvset_name>;
userCPG:<usercpge_name>;snapCPG:<snapcpge_name>;provType:<prov_type>
[?<query expression>]
```


Versus Time volume space data report parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameters:

- **<name>**—Requests volume space sample data for the specified volume (`vv_name`) or volume set (`vvset_name`) only. Specify `vvset` as `name:set:<vvset_name>`. With no `name` specified, the system calculates volume space data for all volumes in the system.
- **<userCPG>**—Retrieves volume space data for the specified `userCPG` volumes only. With no `userCPG` specified, the system calculates space data for all volumes in the system.
- **<snapCPG>**—Retrieves space data for the specified `snapCPG` volumes only. With no `snapCPG` specified, the system calculates space data for all volumes in the system.
- **<provType>**—Retrieves space data for volumes that match the specified . With no `provtype` specified, the system calculates space data for all volumes in the system. [Table 289](#) lists the `provtype` parameter enumerations.

Table 289 provisioningType parameter enumeration

Symbol	Value	Description
FULL	1	Fully-provisioned virtual volume (FPVV) or commonly-provisioned virtual volume (CPVV)
TPVV	2	Thin-provisioned virtual volume (TPVV), or TPSD (old-style thinly provisioned virtual volume)
SNP	3	Snapshot (Type vcopy)
PEER	4	Peer volume
TDVV	6	De-duplicated volume

Requesting an At Time volume space data report

To request an At Time volume space report, use the HTTP GET method with the following URI:

`https://<storage_system>:8080/api/v1/systemreporter/vstime/`

`volumespacedata/<samplefreq>;groupby:<groupby>[?<query_expression>]`

At Time volume space data parameters

In addition to the mandatory `<samplefreq>` parameter (see [Mandatory sample frequency parameter \(page 221\)](#)), you can use the following, optional parameter:

`<groupby>`—`domain` | `id` | `name` | `baseId` | `wnn` | `snapCPG` | `userCPG` | `provisioningType` | `copyType` | `vvsetName`

Groups the volume space data into categories. With no `groupby` variable specified, the system groups data into all categories. You can specify one or more `groupby` categories separated by a comma (,). For example, specify `groupby:domain,id,name`.

Using volume space data query expression parameters

Volume space data queries default to all volumes in the system at a particular time. You can make modifications using the optional `<query expression>` parameter.

For Versus Time query expressions, you can use the `sampleTime` parameter only (see [Query expression parameters for Versus Time reports \(page 221\)](#)).

For At Time query expressions, you can use the `sampleTime` parameter, and filter data based on the following:

- `provType`
- `name`
- `vvsetName`
- `userCPG`
- `snapCPG`

Usage examples include:

- `?query="sampleTime GE <time format> AND sampleTime LE <time format>"`
- `?query="provType EQ <type1, type2..> AND snapCPG EQ <cpg1, cpg2...> AND userCPG EQ <cpg1, cpg2,.. > AND name EQ <vvname1, vvname2...> AND vvsetName EQ <vvset1, vvset2..> AND sampleTime LE <time format>"`
- `?query="provType EQ <type1, type2..> AND sampleTime GE <time format> AND sampleTime LE <time format>"`

Volume space data report response

A successful query returns the HTTP code 200 OK.

Versus Time volume space response

The volume space response contains an array of volume space data. Each instance of sample data displays with a time stamp. [Table 290](#) lists the message body specifics:

Table 290 Versus Time volume space response message body

Member	JSON type	API type	Description
<code>total</code>	number	Int32	Total number of sample data
<code>members</code>	array of objects	Array of volume space data	Volume space data with time stamp
<code>links</code>	array of URL links	Array of URL links	Links include the self URL, which is the original request URL including the query at the end

The members object is a JSON array of zero or more JSON objects, as listed in [Table 291](#).

Table 291 Versus Time volume space JSON object members

Member	JSON type	API type	Description
<code>sampleTime</code>	string	8601	Volume space data sample time
<code>sampleTimeSec</code>	number	Int32	Volume space data sample time in seconds
<code>rawReserved</code>	object	<code>rawReservedSpace</code> object	Raw reserved space data (see Table 292).
<code>userSpace</code>	object	<code>userSpaceData</code> object	User space data (see Table 293).
<code>snapSpace</code>	object	<code>snapAdminSpaceData</code> object	Snap space data (see Table 294).
<code>adminSpace</code>	object	<code>snapAdminSpaceData</code> object	Admin space data (see Table 294).

Table 291 Versus Time volume space JSON object members *(continued)*

totalSpace	number	totalSpaceData object	Total space data (see Table 295).
capacityEfficiency	object	capacityEfficiency object	Capacity efficiency attributes (see Table 234).

[Table 292](#) lists the rawReservedSpace object member descriptions.

Table 292 Versus Time rawReservedSpace object members

Member	JSON type	API type	Description
userMiB	number	Uint64	Raw reserved user space in MiB
snapMiB	number	Uint64	Raw reserved snap space in MiB
adminMiB	number	Uint64	Raw reserved admin space in MiB
totalMiB	number	Uint64	Raw reserved total space in MiB

[Table 293](#) lists the userSpaceData object member descriptions.

Table 293 Versus Time userSpaceData object members

Member	JSON type	API type	Description
usedMiB	number	Uint64	Used user space in MiB
freeMiB	number	Uint64	Free user space in MiB
reservedMiB	number	Uint64	Reserved user space in MiB

[Table 294](#) lists the snapAdminData object member descriptions.

Table 294 Versus Time snapAdminData object members

Member	JSON type	API type	Description
usedMiB	number	Uint64	Used snapshot space in MiB
freeMiB	number	Uint64	Free snapshot space in MiB
reservedMiB	number	Uint64	Reserved snapshot space in MiB
VcopyMiB	number	Uint64	Snapshot virtual copy space in MiB

[Table 295](#) lists the totalSpaceData object member descriptions.

Table 295 Versus Time totalSpaceData object members

Member	JSON type	API type	Description
usedMiB	number	Uint64	Total used space in MiB
virtualSizeMiB	number	Uint64	Total virtualSize in MiB
reservedMiB	number	Uint64	Total reserved space in MiB
VcopyMiB	number	Uint64	Total virtual copy size in MiB

[Table 234](#) (page 213) lists the capacityEfficiency object member descriptions.

At Time volume space response

The At Time volume space response contains an array of performance sample data for a particular time interval. The report groups each instance of sample data into one or more categories.

[Table 296](#) lists the message body descriptions.

Table 296 At Time volume space message body description

Member	JSON type	API type	Description
sampleTime	string	8601	Volume space data sample time
sampleTimeSec	number	Int32	Volume space data sample time in seconds
members	Array of objects	Array of volume space sample data	Volume space data sample groups in categories
links	Array of URL links	Array of URL links	Links include the self URL, which is the original request URL including the query at the end

The members object is a JSON array of zero or more JSON objects as shown in [Table 297](#).

Table 297 At Time volume space group view members JSON objects

Member	JSON type	API type	Description
domain	string	Print64	Domain name
id	number	uint32	Volume ID
name	string	Name31	Volume name
baseId	number	uint32	Base volume ID
wwn	string	WWN	Volume WWN
snapCPG	string	name31	Snapshot CPG
userCPG	string	name31	User CPG
provisioningType	number	provisioningTypeEnum	Volume provisioning type
copyType	number	copyTypeEnum	Volume type
vvsetName	string	Name31	VVSet name (if volume belongs to a vvset)
rawReserved	object	rawReservedSpace object	Raw reserved space data (see Table 292).
userSpace	object	userSpaceData object	User space data (see ???).
snapSpace	object	snapAdminSpaceData object	Snap space data (see Table 294).
adminSpace	object	snapAdminSpaceData object	Admin space data (see Table 294).
totalSpace	number	totalSpaceData object	Total space data (see Table 295).
VVSET_NAME	object	Object of statistic data	IO size in kilobytes statistic data which includes read, write, and total
capacityEfficiency	object	capacityEfficiency object	Capacity efficiency attributes (see Table 234).

Volume space data report error mapping

[Versus Time and At Time error handling \(page 223\)](#) lists the error messages possible when querying volume space data.

18 WSAPI support for HPE 3PAR priority optimization

HPE 3PAR Priority Optimization software uses quality-of-service rules to manage and control the I/O capacity of 3PAR StoreServ Storage system across multiple workloads. Application of the rules enables co-location of the data from workloads of different types (such as sequential, random, and transactional, among others), with different I/O packet sizes on a single 3PAR storage system.

Licensing information

Using HPE 3PAR Priority Optimization requires a license on the 3PAR StoreServ Storage system. The 3PAR Priority Optimization has its own license key. The license is spindle-based, available a-la-carte and as part of the Data Optimization Suite available for 3PAR StoreServ 7000 and 3PAR StoreServ 10000 systems. Consult your Hewlett Packard Enterprise representative or authorized Hewlett Packard Enterprise partner for more information on 3PAR Priority Optimization licensing.

Creating QoS rules

To create a QoS rule, use the HTTP POST method with the following URI:

`https://<storage_system>:8080/api/v1/qos`

with message body members as shown in [Table 298 \(page 253\)](#). The `name` and `type` JSON objects are required, and at least one of the other JSON objects in [Table 298 \(page 253\)](#) must be specified as well.

QoS rule creation

- The QoS rule can be applied to VV sets. By using `sys:all_others`, you can apply the rule to all volumes in the system for which no QoS rule has been defined.
- `ioMinGoal` and `ioMaxLimit` must be used together to set I/O limits. Similarly, `bwMinGoalKB` and `bwMaxLimitKB` must be used together.
- If `ioMaxLimitOP` is set to 2 (no limit), `ioMinGoalOP` must also be set to 2, and vice versa. They cannot be set to "no limit" individually. Similarly, if `bwMaxLimitOP` is set to 2 (no limit), then `bwMinGoalOP` must also be set to 2.
- If `ioMaxLimitOP` is set to 1 (zero), `ioMinGoalOP` must also be set to 1, and vice versa. Similarly, if `bwMaxLimitOP` is set to 1 (zero), then `bwMinGoalOP` must also be set to 1.
- The `ioMinGoalOP` and `ioMaxLimitOP` fields take precedence over the `ioMinGoal` and `ioMaxLimit` fields unless they contain ignored values (see [Table 298 \(page 253\)](#)).
- The `bwMinGoalOP` and `bwMaxLimitOP` fields take precedence over the `bwMinGoalKB` and `bwMaxLimitKB` fields unless they contain ignored values. See [Table 298 \(page 253\)](#).

Table 298 Message body JSON object members for QoS rule creation

Member	JSON type	API type	Ignored Values	Description
<code>name</code>	string	<code>name31</code>	None. Required field.	The name of the target object on which the new QoS rules will be created. (WSAPI 1.3 and later)
<code>type</code>	number	<code>targetType Enum</code>	Zero and negative values. Required field.	Type of QoS target. (WSAPI 1.3 and later)

Table 298 Message body JSON object members for QoS rule creation (continued)

Member	JSON type	API type	Ignored Values	Description
priority	number	priority Enum	Zero and negative values.	QoS priority. (WSAPI 1.3 and later)
bwMinGoalKB	number	uint64	Zero and negative values.	Bandwidth rate minimum goal in kilobytes per second. (WSAPI 1.3 and later)
bwMaxLimitKB	number	uint64	Zero and negative values.	Bandwidth rate maximum limit in kilobytes per second. (WSAPI 1.3 and later)
ioMinGoal	number	uint32	Zero and negative values.	I/O-per-second minimum goal. (WSAPI 1.3 and later)
ioMaxLimit	number	uint32	Zero and negative values.	I/O-per-second maximum limit. (WSAPI 1.3 and later)
bwMinGoalOP	number	ZeroNoneOperation Enum	Zero and negative values.	When set to 1, the bandwidth minimum goal is 0. When set to 2, the bandwidth minimum goal is none (NoLimit) (WSAPI 1.3 and later)
bwMaxLimitOP	number	ZeroNoneOperation Enum	Zero and negative values.	When set to 1, the bandwidth maximum limit is 0. When set to 2, the bandwidth maximum limit is none (NoLimit) (WSAPI 1.3 and later)
ioMinGoalOP	number	ZeroNoneOperation Enum	Zero and negative values.	When set to 1, the I/O minimum goal is 0. When set to 2, the I/O minimum goal is none (NoLimit) (WSAPI 1.3 and later)
ioMaxLimitOP	number	ZeroNoneOperation Enum	Zero and negative values.	When set to 1, the I/O maximum limit is 0. When set to 2, the I/O maximum limit is none (NoLimit) (WSAPI 1.3 and later)
latencyGoal	number	uint32	Zero and negative values	Latency goal in milliseconds. (WSAPI 1.3 and later)
defaultLatency	boolean	boolean		If True, set latencyGoal to the default value.

Table 298 Message body JSON object members for QoS rule creation (continued)

Member	JSON type	API type	Ignored Values	Description
				If <code>False</code> and the <code>latencyGoal</code> value is positive, then set the value. Default is <code>False</code> . (WSAPI 1.3 and later)
<code>enable</code>	<code>boolean</code>	<code>boolean</code>		If <code>True</code> , enable the QoS rule for the target object. If <code>False</code> , disable the QoS rule for the target object. (WSAPI 1.3 and later)

Enumeration for the `ZeroNoneOperation` JSON object is shown in [Table 299 \(page 255\)](#).

Table 299 ZeroNoneOperation enumeration for QoS rule creation or modification

Symbol	Value	Description
<code>ZERO</code>	1	The minimum goal or maximum limit is set to zero. (WSAPI 1.3 and later)
<code>NOLIMIT</code>	2	The minimum goal or maximum limit is set to none (<code>NoLimit</code>). (WSAPI 1.3 and later)

QoS rule creation success

A successful creation of a QoS rule returns the HTTP code 201 `Created` with no message body.

QoS rule creation and modification errors

Possible error codes for QoS rule creation and modification are shown in [Table 300 \(page 255\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Table 300 QoS rule creation and modification error codes

API Code	HTTP Code	Description
<code>INV_INPUT_EXCEEDS_RANGE</code>	400 <code>Bad Request</code>	Invalid input: number exceeds expected range. (WSAPI 1.3 and later)
<code>NON_EXISTENT_QOS_RULE</code>	404 <code>Not Found</code>	QoS rule does not exist. (WSAPI 1.3 and later)
<code>INV_INPUT_ILLEGAL_CHAR</code>	400 <code>Bad Request</code>	Illegal character in the input.
<code>EXISTENT_QOS_RULE</code>	400 <code>Bad Request</code>	QoS rule already exists. (WSAPI 1.3 and later)
<code>INV_INPUT_IO_MIN_GOAL_GRT_MAX_LIMIT</code>	400 <code>Bad Request</code>	The I/O-per-second maximum limit should be greater than the minimum goal. (WSAPI 1.3 and later)

Table 300 QoS rule creation and modification error codes (continued)

API Code	HTTP Code	Description
INV_INPUT_BW_MIN_GOAL_GRT_MAX_LIMIT	400 Bad Request	The bandwidth maximum limit should be greater than the minimum goal. (WSAPI 1.3 and later)
INV_INPUT_BELOW_RANGE	400 Bad Request	I/O-per-second limit is below range. Bandwidth limit is below range. (WSAPI 1.3 and later)
UNLICENSED_FEATURE	403 Forbidden	This system is not licensed for QoS.

Modifying QoS rules

To create a QoS rule, use the HTTP PUT method with the following URI:

https://<storage_system>:8080/api/v1/qos/<targetType>:<targetName>

where:

- **targetType** can be `vvset` or `sys`.
- **targetName** is the name of the target. When **targetType** is `sys`, **targetName** must be `sys:all_others`.

Message body members are shown in [Table 301 \(page 256\)](#)

QOS rule modification

- The QoS rule can be applied to VV sets. By using `sys:all_others`, you can apply the rule to all volumes in the system for which no QoS rule has been defined.
- `ioMinGoal` and `ioMaxLimit` must be used together to set I/O limits. Similarly, `bwMinGoalKB` and `bwMaxLimitKB` must be used together.
- If `ioMaxLimitOP` is set to 2 (no limit), `ioMinGoalOP` must also be set to 2 (no limit) and vice versa. They cannot be set to “none” individually. Similarly, if `bwMaxLimitOP` is set to 2 (no limit), then `bwMinGoalOP` must also be set to 2.
- If `ioMaxLimitOP` is set to 1 (zero), `ioMinGoalOP` must also be set to 1 (zero) and vice versa. Similarly, if `bwMaxLimitOP` is set to 1 (zero), then `bwMinGoalOP` must also be set to 1.
- The `ioMinGoalOP` and `ioMaxLimitOP` fields take precedence over the `ioMinGoal` and `ioMaxLimit` fields.
- The `bwMinGoalOP` and `bwMaxLimitOP` fields take precedence over the `bwMinGoalKB` and `bwMaxLimitKB` fields.

Table 301 Message body JSON object members for QoS rule modification

Member	JSON type	API type	Ignored Values	Description
<code>priority</code>	number	priority Enum	Zero and negative values.	QoS priority. (WSAPI 1.3 and later)
<code>bwMinGoalKB</code>	number	uint64	Zero and negative values.	Bandwidth rate minimum goal in kilobytes per second. (WSAPI 1.3 and later)
<code>bwMaxLimitKB</code>	number	uint64	Zero and negative values.	Bandwidth rate maximum limit in kilobytes per second.

Table 301 Message body JSON object members for QoS rule modification *(continued)*

Member	JSON type	API type	Ignored Values	Description
				<i>(WSAPI 1.3 and later)</i>
ioMinGoal	number	uint32	Zero and negative values.	I/O-per-second minimum goal. <i>(WSAPI 1.3 and later)</i>
ioMaxLimit	number	uint32	Zero and negative values.	I/O-per-second maximum limit. <i>(WSAPI 1.3 and later)</i>
bwMinGoalOP	number	ZeroNoneOperationEnum	Zero and negative values.	When set to 1, the bandwidth minimum goal is 0. When set to 2, the bandwidth minimum goal is none (NoLimit) <i>(WSAPI 1.3 and later)</i>
bwMaxLimitOP	number	ZeroNoneOperationEnum	Zero and negative values.	When set to 1, the bandwidth maximum limit is 0. When set to 2, the bandwidth maximum limit is none (NoLimit) <i>(WSAPI 1.3 and later)</i>
ioMinGoalOP	number	ZeroNoneOperationEnum	Zero and negative values.	When set to 1, the I/O minimum goal is 0. When set to 2, the I/O minimum goal is none (NoLimit) <i>(WSAPI 1.3 and later)</i>
ioMaxLimitOP	number	ZeroNoneOperationEnum	Zero and negative values.	When set to 1, the I/O maximum limit is 0. When set to 2, the I/O maximum limit is none (NoLimit) <i>(WSAPI 1.3 and later)</i>
latencyGoal	number	uint32	Zero and negative values	Latency goal in milliseconds. <i>(WSAPI 1.3 and later)</i>
defaultLatency	boolean	boolean		If True, set latencyGoal to the default value. If False and the latencyGoal value is positive, then set the value. The default setting is False. <i>(WSAPI 1.3 and later)</i>
enable	boolean	boolean		If True, enable the QoS rule for the target object. If False, disable the QoS rule for the target object. <i>(WSAPI 1.3 and later)</i>

QoS rule modification success

A successful modification of a QoS rule returns the HTTP code 200 OK with no message body.

QoS rules modification errors

Possible error codes for QoS rule modification are shown in [Table 300 \(page 255\)](#). For generic API error codes, see [Table 6 \(page 29\)](#).

Deleting QoS rules

Scheduling of the QoS rule can be turned off, and the setting can be cleared, by using the HTTP DELETE method. The URI is in the following format:

`https://<storage_system>:8080/api/v1/qos/<targetType>:<targetName>`

where:

- `targetType` can be `vvset` or `sys`.
- `targetName` is the name of the target. When `targetType` is `sys`, `targetName` must be `sys:all_others`.

QoS rules deletion success

A successful deletion of a QoS rule returns the HTTP code 200 OK with no message body.

QoS rules deletion errors

[Table 302 \(page 258\)](#) shows possible QoS deletion error codes. For generic API error codes, see [Table 6 \(page 29\)](#).

Table 302 QoS rules deletion error codes

API Code	HTTP Code	Description
NON_EXISTENT_QOS_RULE	404 Not Found	QoS rule does not exist. (WSAPI 1.3 and later)
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	Illegal character in the input.

Querying QoS rules

Querying all QoS rules

To query for information about all QoS rules, use the HTTP GET method with the following URI and no message body:

`https://<storage_system>:8080/v1/qos`

All-QoS rule query success

Unless an internal server error occurs, the response for a successful query for QoS rule information includes a message body with members as specified in [Table 303 \(page 258\)](#).

Table 303 Message body JSON objects for All-QoS rule query

Member	JSON type	API type	Description
<code>total</code>	number	int32	Number of QoS target objects returned. (WSAPI 1.3 and later)
<code>members</code>	array of objects	array of <code>QoSProperty</code> objects.	QoS rule properties. (WSAPI 1.3 and later)

The `Members` object is a JSON array of zero or more JSON objects, one for each QoS target on the system. These JSON objects are described in [Table 304 \(page 259\)](#).

Table 304 JSON object members for `Members` object in all-QoS rule query

Member	JSON type	API type	Description
<code>id</code>	number	uint32	ID of the QoS target. (WSAPI 1.3 and later)
<code>type</code>	number	targetType Enum	Type of QoS target. See Table 305 (page 259) . (WSAPI 1.3 and later)
<code>name</code>	string	Name27	Name of the target. (WSAPI 1.3 and later)
<code>domain</code>	string	name31	Name of the domain. (WSAPI 1.3 and later)
<code>enabled</code>	boolean	boolean	QoS state of the target. (WSAPI 1.3 and later)
<code>priority</code>	number	priority Enum	QoS priority. See Table 306 (page 260) . (WSAPI 1.3 and later)
<code>bwMinGoalKB</code>	number	uint64	Bandwidth minimum goal in kilobytes per second. (WSAPI 1.3 and later)
<code>bwMaxLimitKB</code>	number	uint64	Bandwidth maximum limit in kilobytes per second. (WSAPI 1.3 and later)
<code>ioMinGoal</code>	number	uint32	I/O-per-second minimum goal. (WSAPI 1.3 and later)
<code>ioMaxLimit</code>	number	uint32	I/O-per-second maximum limit. (WSAPI 1.3 and later)
<code>latencyGoal</code>	number	uint32	Latency goal in milliseconds. (WSAPI 1.3 and later)
<code>latencyGoaluSecs</code>	number	uint32	Latency goal in microseconds (WSAPI 1.5 and later)

[Table 305 \(page 259\)](#) shows QoS targetType enumeration.

Table 305 QoS targetType enumeration

Symbol	Value	Description
VVSET	1	The QoS target type is VV set.
SYS	2	The QoS target type applies to all volumes in the system that do not have any QoS rule set.

[Table 306 \(page 260\)](#) shows QoS priority enumeration.

Table 306 QoS priority enumeration

Symbol	Value	Description
LOW	1	The QoS priority is low.
NORMAL	2	The QoS priority is normal.
HIGH	3	The QoS priority is high.

All-QoS rule query errors

For generic API error codes, see [Table 6 \(page 29\)](#).

Querying a single QoS rule

To query for information about a single QoS, use the HTTP GET method with the following URI:

`https://<storage_system>:8080/api/v1/qos/<targetType>:<targetName>`

where:

- **targetType** can be `vvset` or `sys`.
- **targetName** is the name of target . When **targetType** is `sys`, **targetName** must be `all_others`.

Single QoS-rule query success

A successful single QoS-rule query returns the HTTP code 200 OK and a response body as shown in [Table 304 \(page 259\)](#)

-
- ❗ **IMPORTANT:** Only one QoS rule can be assigned to a QoS target object, so a single-instance query always returns only a single object.
-

Single QoS-rule query errors

[Table 307 \(page 260\)](#) shows possible QoS rule query errors. For generic API error codes, see [Table 6 \(page 29\)](#).

Table 307 QoS rule query error codes

API Code	HTTP Code	Description
NON_EXISTENT_QOS_RULE	404 Not Found	QoS rule does not exist. (WSAPI 1.3 and later)
INV_INPUT_ILLEGAL_CHAR	400 Bad Request	Illegal character in the input.

19 Support and other resources

Accessing Hewlett Packard Enterprise Support

- For live assistance, go to the Contact Hewlett Packard Enterprise Worldwide website:
www.hpe.com/assistance
- To access documentation and support services, go to the Hewlett Packard Enterprise Support Center website:
www.hpe.com/support/hpesc

Information to collect

- Technical support registration number (if applicable)
- Product name, model or version, and serial number
- Operating system name and version
- Firmware version
- Error messages
- Product-specific reports and logs
- Add-on products or components
- Third-party products or components

Accessing updates

- Some software products provide a mechanism for accessing software updates through the product interface. Review your product documentation to identify the recommended software update method.
 - To download product updates, go to either of the following:
 - Hewlett Packard Enterprise Support Center **Get connected with updates** page:
www.hpe.com/support/e-updates
 - Software Depot website:
www.hpe.com/support/softwaredepot
 - To view and update your entitlements, and to link your contracts and warranties with your profile, go to the Hewlett Packard Enterprise Support Center **More Information on Access to Support Materials** page:
www.hpe.com/support/AccessToSupportMaterials
- ① **IMPORTANT:** Access to some updates might require product entitlement when accessed through the Hewlett Packard Enterprise Support Center. You must have an HP Passport set up with relevant entitlements.

Websites

Website	Link
Hewlett Packard Enterprise Information Library	www.hpe.com/info/enterprise/docs
Hewlett Packard Enterprise Support Center	www.hpe.com/support/hpesc

Website	Link
Contact Hewlett Packard Enterprise Worldwide	www.hpe.com/assistance
Subscription Service/Support Alerts	www.hpe.com/support/e-updates
Software Depot	www.hpe.com/support/softwaredepot
Customer Self Repair	www.hpe.com/support/selfrepair
Insight Remote Support	www.hpe.com/info/insightremotesupport/docs
Serviceguard Solutions for HP-UX	www.hpe.com/info/hpux-serviceguard-docs
Single Point of Connectivity Knowledge (SPOCK) Storage compatibility matrix	www.hpe.com/storage/spock
Storage white papers and analyst reports	www.hpe.com/storage/whitepapers

Customer self repair

Hewlett Packard Enterprise customer self repair (CSR) programs allow you to repair your product. If a CSR part needs to be replaced, it will be shipped directly to you so that you can install it at your convenience. Some parts do not qualify for CSR. Your Hewlett Packard Enterprise authorized service provider will determine whether a repair can be accomplished by CSR.

For more information about CSR, contact your local service provider or go to the CSR website:

www.hpe.com/support/selfrepair

Remote support

Remote support is available with supported devices as part of your warranty or contractual support agreement. It provides intelligent event diagnosis, and automatic, secure submission of hardware event notifications to Hewlett Packard Enterprise, which will initiate a fast and accurate resolution based on your product's service level. Hewlett Packard Enterprise strongly recommends that you register your device for remote support.

For more information and device support details, go to the following website:

www.hpe.com/info/insightremotesupport/docs

Documentation feedback

Hewlett Packard Enterprise is committed to providing documentation that meets your needs. To help us improve the documentation, send any errors, suggestions, or comments to Documentation Feedback (docsfeedback@hpe.com). When submitting your feedback, include the document title, part number, edition, and publication date located on the front cover of the document. For online help content, include the product name, product version, help edition, and publication date located on the legal notices page.

Glossary

For additional information about the 3PAR operating system, see the 3PAR StoreServ Storage concepts guide, available at the following website:

[HPE Storage Library](http://www.hpe.com/info/storage/docs) (<http://www.hpe.com/info/storage/docs>)

A

ALPA	arbitrated loop physical address
AO	Adaptive Optimization
API	application programming interface

B

Boolean	A setting which, when used for uninitialized attributes by a Jackson JSON processor, results in a value of null.
boolean	A setting which, when used for uninitialized attributes by a Jackson JSON processor, results in a value of 0 (zero).

C

CNA	converged network adapter
CPG	common provisioning group
CRLF	carriage-return and linefeed
cURL	A command line tool for retrieving or transmitting files using URL syntax.

D

DHCP	Dynamic Host Configuration Protocol
-------------	-------------------------------------

F

FC	Fibre Channel
FCoE	Fibre Channel over Ethernet
FPVV	fully-provisioned virtual volume

H

HA	high availability
HBA	host bus adapter
HTTPS	Hypertext Transfer Protocol Secure

I

IETF	Internet Engineering Task Force
iSCSI	Internet Small Computer System Interface
ISO	International Organization for Standardization

J

JSON	JavaScript Object Notation
-------------	----------------------------

L

LD	logical disk
-----------	--------------

M

MAC address	Media Access Control address
MB	megabyte (1,000,000 or 10^6 bytes)
Mb	megabit (1,048,576 or 2^{20} bits)
MC	HPE 3PAR Management Console
MiB	mebibyte (1,048,576 or 2^{20} bytes)
MU	maintenance update

N

NL	near-line; near-online
-----------	------------------------

P

Pct	percent
PD	physical disk
PFC	primary flow control
PLOGI ACC	Port Login Accept Payload
PRLI	Process Login

Q

QoS	Quality of service. HPE 3PAR Priority Optimization software provides quality-of-service rules to manage and control the I/O capacity of an HPE 3PAR StoreServ Storage system across multiple workloads.
------------	---

R

RCFC	remote copy over Fibre Channel
RCIP	remote copy over IP
RFC	request for comments
RO	read-only
RW	read-write

S

SDK	software developer's kit
SLD	synchronous long distance
SRU	system resource usage
SSD	solid-state drive
SSL	Secure Sockets Layer

T

TDVV	thinly-provisioned deduplicated virtual volume
TLS	Transport Layer Security
TPVV	thinly-provisioned virtual volume

U

URI	Uniform Resource Identifier
UTF	Uniform Transformation Format
UUID	universally unique identifier

V

VCN	VLUN change notification
VLUN	virtual logical unit number
VM	virtual machine
VV	virtual volume

W

WSAPI	HPE 3PAR Web Services API
WWN	World Wide Name

Index

A

- Accept
 - client HTTP header, 22, 23
- Accept-Language
 - client HTTP header, 23
- accessing
 - updates, 261
 - WSAPI, 21, 55
- Action
 - JSON object
 - for promoting a virtual copy, 144
- action
 - JSON Object
 - for resynchronizing physical copy to parent volume, 143
 - JSON object
 - for creating a physical copy of a VV set, 148
 - for physical-copy of volume creation, 139
 - for promoting a VV-set virtual copy, 151
 - for snapshot creation, 137
 - JSON object member
 - for admitting a volume into a remote-copy group, 158
 - for canceling a task, 207
 - for dismissing a volume from a remote-copy group, 164
 - for host-set or VV-set creation, 110
 - for resynchronizing or stopping physical copy to its VV set, 149
 - for starting a remote-copy group, 165
 - for stopping a remote-copy group, 167
 - for synchronizing a remote-copy group, 175, 179
 - for tuning a volume, 82
- ACTIVE
 - enumeration for port operations, 117
 - enumeration for querying the status of a copy task, 206
- active
 - JSON object member
 - for all-VLUNs query response, 131
 - for single-VLUN query response, 134
- ACTIVE_DOWN
 - enumeration for port operations, 117
- ACTIVE_FAILED
 - enumeration for port operations, 117
- adaptive optimization
 - configure, 218
- ADD
 - enumeration for host modification, 97
- additionalStates
 - JSON object
 - for CPG query, 69
 - JSON object member
 - for all-volumes query, 89
- adminSpace
 - JSON object
 - for volume operations, 73
 - JSON object member
 - for all-volumes query, 89
- adminSpaceMiB
 - distributing volumes, 87
- admission of volume into remote-copy group
 - success response, 160
- ADMIT_VV
 - enumeration for remote-copy group operations, 160
- admitting
 - a volume from a remote-copy group, 163
 - a volume into a remote-copy group, 158
- agent
 - JSON object
 - for host query, 103
 - JSON object member
 - for host query, 101
- AIX_LEGACY
 - enumeration for host modification, 97
- all remote-copy groups query
 - success response, 183
- all-ports query, 117
 - error codes, 120
 - success response, 117
- all-QoS rule query
 - error codes, 260
- all-roles query
 - success response, 216
- all-tasks status
 - querying, 203
 - success response, 204
- all-tasks status query
 - error codes, 204
- all-users query
 - error codes, 215, 217
 - success response, 215, 216, 217
- all-VLUNs query, 130
 - error codes, 132
 - example, 131
 - success response, 130
- all-volumes query
 - success response, 88
- ALL_EXECUTION_FAILED
 - CPG creation and modification API error, 54
- allCapacity
 - JSON object member
 - for overall system capacity query response, 209
- allocated
 - JSON object member
 - overall system capacity query response, 209
- AllocatedCapacity
 - JSON object
 - overall system capacity query response, 210
- allocatedCapacityMB
 - JSON object member
 - for storage-system query response, 196
- ALPA_WAIT
 - enumeration for port operations, 115

- AO configuration
 - JSON object members, 218
 - single user instance query, 219
- AO configuration query, 218
- API type
 - epoch, 26
 - float, 26
 - Hex, 26
 - igint32, 26
 - int32, 26
 - ISO 8601, 26
 - MAC, 26
 - Name16, 26
 - name223, 27
 - name27, 26
 - name31, 27
 - Print255, 27
 - print511, 27
 - uint32, 27
 - WWN, 27
- API types, 26
- application program interface *see* WSAPI
- architecture
 - JSON object member
 - for host query, 103
- ASYNCR
 - enumeration for remote-copy group mode, 155
- asyncEnabled
 - JSON object member
 - for remote-copy information query response, 182
- asyncOutstanding
 - JSON object member
 - for volume properties in a remote-copy group, 186
- attributes
 - Boolean vs. boolean, 25
 - Integer vs. int, 25
 - uninitialized, 25
- AUTO_LUN_ID_UNAVAILABLE, 34
 - VLUN creation API error, 127
- autoFailover
 - JSON object member
 - for modifying a remote-copy group, 172
 - for remote-copy group policy, 189
- autoLun
 - JSON object
 - for VLUN template creation, 126
- autoRecover
 - JSON object member
 - for modifying a remote-copy group, 171
 - for remote-copy group policy, 189
- available space
 - querying, 209
- B**
- BACKGROUND_TASK
 - enumeration for single-task status query, 206
- BACKUP
 - enumeration for remote-copy group state, 188
- BAD_CPG_PATTERN, 34
 - CPG creation and modification API error, 65
 - space query API error, 214
- BAD_PORT_TYPE, 32
 - VLUN creation API error, 127
- BASE
 - enumeration for volume operations, 71
- base volume
 - creating, 73
- baseld
 - JSON object member
 - for all-volumes query, 89
- Boolean vs. boolean attributes, 25
- BRIDGE
 - enumeration for FC-switches query, 123
- bufferToBufferCredit
 - JSON object member
 - for port-device query, 122
- build
 - JSON object member
 - for storage-system version query response, 202
- bwMaxLimitKB
 - JSON object
 - for QoS rule creation, 254
 - for QoS rule modification, 256
 - JSON object member
 - for all-QoS rule query, 259
- bwMaxLimitOP
 - JSON object
 - for QoS rule creation, 254
 - for QoS rule modification, 257
- bwMinGoalKB
 - JSON object
 - for QoS rule creation, 254
 - for QoS rule modification, 256
 - JSON object member
 - for all-QoS rule query, 259
- bwMinGoalOP
 - JSON object
 - for QoS rule creation, 254
 - for QoS rule modification, 257
- C**
- Cache-Control
 - server HTTP header, 24
- Caching
 - JSON object
 - for volume operations, 73
- CAGE
 - enumeration for CPG operations, 61
- cageList
 - JSON object member
 - for CPG operations, 61
- CANCEL_TASK
 - enumeration for single-task status query, 207
- canceled
 - tasks, 206
- CANCELLED
 - enumeration for single-task status query, 206
- capacityEfficiency

- JSON object
 - for CPG query, 213
- JSON object member
 - for all-volumes query, 89, 211
- cardPort
 - JSON object member
 - for host query, 103
 - for VLUN operations, 124
- chapName
 - JSON object member
 - for host modification, 96
- chapOperation
 - JSON object
 - for host modification, 97
 - JSON object member
 - for host modification, 96
- chapOperationMode
 - JSON object
 - for host modification, 97
 - JSON object member
 - for host modification, 96
- chapRemoveTargetOnly
 - JSON object member
 - for host modification, 96
- chapSecret
 - JSON object member
 - for host modification, 96
- chapSecretHex
 - JSON object member
 - for host modification, 96
- CHECK_VV
 - enumeration for single-task status query, 205
- child
 - JSON object member
 - for resynchronizing physical copy to its VV set, 149
- chunking
 - in all-VLUNs query, 130
 - in all-volume queries, 88
- chunkletPosPref
 - enumeration for CPG operations, 61
 - JSON object member
 - for CPG operations, 60
- chunkletSize
 - JSON object member
 - for storage-system query response, 196
- classes
 - Java client code samples storage-entity, 20
- clearing
 - system flash cache policy, 207
- CLI, 18, 21, 56
 - commands, 19
 - starting the WSAPI, 19
 - volume creation, 73
- Client code samples
 - Java, 20
 - Perl, 20
- client header
 - example for creating a CPG, 23
 - example for querying CPGs, 23
- HTTP, 22
- client HTTP header
 - Accept, 23
 - Accept-Language, 23
 - Content-Length, 23
 - Content-Type, 23
 - example, 22
 - format, 22
 - Host, 23
 - X-HP3PAR-WSAPI-SessionKey, 23
- CLOSING
 - enumeration for volume operations, 72
- CLRF
 - in chunked all-VLUNs query responses, 130
- clusterId
 - JSON object member
 - for host query, 104
- clusterName
 - JSON object member
 - for host query, 104
- clusterNodes
 - JSON object member
 - for storage-system query response, 196
- clusters, 57
- clusterSoftware
 - JSON object member
 - for host query, 104
- clusterVersion
 - JSON object member
 - for host query, 104
- CNA
 - enumeration for port operations, 116
- code
 - JSON object member
 - error codes, 28
- command line interface *see* CLI
- comment
 - JSON object member
 - for all-volumes query, 89
 - for base-volume creation, 74
 - for host query, 102
 - for host-set or VV-set creation, 108, 110
 - for querying all host sets or all VV sets, 114
 - for storage-system query response, 197
 - for volume modification, 76
 - remote-copy group snapshot, 177
- comments
 - JSON object member
 - for all-roles query, 217
- common provisioning group *see* CPG
- common variables
 - system reporter, 220
- commonFeatures
 - JSON object member
 - for port-device query, 122
- commonly provisioned virtual volume (CPVV) *see* TPVV
- COMPACT_CPG
 - enumeration for single-task status query, 205
- COMPACT_IDS

- enumeration for single-task status query, 205
- compaction
 - JSON object member
 - for CPG operations, 213
- completedPhases
 - JSON object member
 - for single-task status query, 204
- completedSteps
 - JSON object member
 - for copy task status query, 204
- CONFIG_WAIT
 - enumeration for port operations, 115
- configErrDescription
 - JSON object member
 - for remote-copy information query response, 182
- configuration objects
 - for CPGs, 60
- configuring
 - ports, 115
 - VLUNs, 124
 - volumes, 70
- Connection
 - server HTTP header, 24
- contact
 - JSON object member
 - for host query, 102
 - for storage-system query response, 196
- contacting Hewlett Packard Enterprise, 261
- Content-Length
 - client HTTP header, 23
- Content-Type
 - client HTTP header, 23
 - server HTTP header, 24
- conversionOperation
 - JSON object member
 - for tuning a volume, 83
- CONVERT_VV
 - enumeration for single-task status query, 206
- CONVERTING
 - enumeration for volume operations, 72
- COPY_FAILED
 - enumeration for volume operations, 72
- COPY_SOURCE
 - enumeration for volume operations, 72
- COPY_TARGET
 - enumeration for volume operations, 72
- copyOf
 - JSON object member
 - for all-volumes query, 89
- CopyType
 - enumeration for volume operations, 71
- copyType
 - JSON object
 - for enumerating physical copy operations, 143
 - JSON object member
 - for all-volumes query, 89
- COREDUMP
 - enumeration for port operations, 115
- CPG
 - configuration objects for, 60
 - enumeration objects for, 60
 - modifying, 66
 - removing, 67
 - single CPG query, 69
 - space query, 212
 - with FPVVs, 60
 - with TPVVs, 60
- cpg
 - JSON object member
 - for base-volume creation, 74
 - for CPG space query, 212
- CPG creation
 - error codes, 65
 - success response, 65
- CPG modification
 - error codes, 65, 67
 - success response, 67
- CPG query
 - error codes, 69
 - success response, 69
- CPG removal
 - error codes, 67
 - success response, 67
- CPG_ALLOCATION_WARNING_REACHED, 40
 - VV-set snapshot creation API error, 147
- cpg_create
 - permissions for, 64
- CPG_NOT_IN_SAME_DOMAIN, 35
 - CPG creation and modification API error, 65
 - creating, resynchronizing, or stopping physical copy
 - of volumes API error, 141
 - remote-copy group creation API error, 157
 - remote-copy group modification API error, 173
 - volume modification API error, 78
 - volume tuning API error, 84
- cpg_remove
 - permissions for, 67, 157
- cpg_set
 - permissions for, 66
- CPGAdminMiB
 - JSON object member
 - overall system capacity query response, 211
- CPGAdminUnusedMiB
 - JSON object member
 - overall system capacity query response, 211
- CPGAdminUsedBulkvvMiB
 - JSON object member
 - overall system capacity query response, 211
- CPGAdminUsedMiB
 - JSON object member
 - overall system capacity query response, 211
- cpgName
 - distributing volumes, 87
- CPGs
 - distributing volumes, 86
- CPGsMiB
 - JSON object member
 - overall system capacity query response, 210

- CPGSnapshotMiB
 - JSON object member
 - overall system capacity query response, 211
- CPGSnapshotUnusedMiB
 - JSON object member
 - overall system capacity query response, 211
- CPGSnapshotUsedBulkvMiB
 - JSON object member
 - overall system capacity query response, 211
- CPGSnapshotUsedMiB
 - JSON object member
 - overall system capacity query response, 211
- CPGUserMiB
 - JSON object member
 - overall system capacity query response, 210
- CPGUserUnusedMiB
 - JSON object member
 - overall system capacity query response, 211
- CPGUserUsedBulkvMiB
 - JSON object member
 - overall system capacity query response, 211
- CPGUserUsedMiB
 - JSON object member
 - overall system capacity query response, 210
- createPhysicalCopy
 - JSON object
 - for creating a physical copy of a VV set, 148
- createSnapshot
 - JSON object
 - for snapshot creation, 137
- createvv
 - CLI command, 73
- CREATING
 - enumeration for volume operations, 72
- creating
 - a remote-copy group, 154
 - base volume, 73
 - CPG, 64
 - credentials, 56
 - flash cache, 193
 - host, 94
 - host sets, 108
 - JSON object, 24
 - physical copy of volumes, 139
 - physical copy of VV set, 148
 - QoS rule, 253
 - session key, 56
 - snapshots, 137
 - storage volume, 73
 - VLUN, 125
 - VV sets, 108
 - VV-set snapshots, 146
- creation of remote-copy group
 - success response, 155
- creationTime8601
 - JSON object member
 - for all-volumes query, 89
- creationTimeSec
 - JSON object member

- for all-volumes query, 89
- CRLF
 - in chunked all-volume query responses, 88
- cURL command-line utility
 - creating a session key, 56
 - deleting a session key, 59
 - using for WSAPI operations, 57
- current
 - distributing volumes, 87
- customer self repair, 262
- D
- Date
 - server HTTP header, 24
- DEDUP_OPERATION_NOT_SUPPORTED, 52
 - volume creation API error, 75
- dedupCapable
 - JSON object
 - for CPG query, 69
- deduplication
 - JSON object member
 - for CPG operations, 213
- defaultLatency
 - JSON object
 - for QoS rule creation, 254
 - for QoS rule modification, 257
- DEGRADED
 - enumeration for CPG operations, 63
 - enumeration for volume operations, 71
- DEGRADED_AVAIL
 - enumeration for volume operations, 72
- DEGRADED_PERF
 - enumeration for volume operations, 72
- degradedStates
 - JSON object
 - for CPG query, 69
 - JSON object member
 - for all-volumes query, 89
- DELETE *see* HTTP DELETE
- deleting
 - a QoS rule, 258
- desc
 - JSON object member
 - error codes, 54
- descriptors
 - JSON object
 - for host query, 101
 - JSON object member, 94
 - for host modification, 96
 - for host query, 101
- destCPG
 - JSON object member
 - for physical copy of volume creation, 140
- destVolume
 - JSON object member
 - for creating a physical copy of a VV set, 148
 - for physical copy of volume creation, 139
- DetailedState
 - enumeration for CPG operations, 63

- enumeration for volume operations, 71
- device
 - JSON object member
 - for port query, 118
- DeviceCapacity
 - JSON object
 - overall system capacity query response, 209
- DHCP_IN_PROGRESS
 - enumeration for port operations, 116
- DISABLE
 - enumeration for remote-copy system status, 183
- disableAutoGrow
 - JSON object
 - for CPG creation, 65
 - JSON object member
 - for modifying CPGs, 67
- disabling
 - system flash-cache policy, 207
- disaster
 - remote-copy recovery, 179
- disaster recovery of remote-copy
 - errors response, 181
 - success response, 180
- discardNewData
 - JSON object member
 - disaster recovery for remote-copy , 180
- DISK
 - enumeration for port operations, 116
- diskList
 - JSON object member
 - for CPG operations, 62
- diskModels
 - JSON object member
 - for CPG operations, 62
- diskPatterns
 - JSON object
 - for CPG operations, 61
 - JSON object member
 - for CPG operations, 60
- diskPosList
 - JSON object member
 - for CPG operations, 62
- diskType
 - enumeration for CPG operations, 62
 - JSON object member
 - for CPG operations, 62
- DISMISS_VV
 - enumeration for remote-copy group operations, 160
- dismissal of volume from remote-copy group
 - success response, 164
- display
 - vv space distribution, 86
- distributing volumes
 - adminSpaceMiB member for CPGSpace, 87
 - current member for spaceDistribution, 87
 - INT_SERV_ERR, 87
 - links member, 86
 - links member for spaceDistribution, 87
 - members, 86
 - new member for spaceDistribution, 87
 - snapshotSpaceMiB member for CPGSpace, 87
 - success response, 86, 87
 - total member, 86
 - userSpaceMiB member for CPGSpace, 87
 - volumeName, 86
- documentation
 - providing feedback on, 262
- Domain
 - JSON object
 - for CPG query, 68
- domain
 - AO configuration JSON object member, 218
 - JSON object
 - for CPG creation, 65
 - JSON object member, 94
 - for all-QoS rule query, 259
 - for all-users query, 215
 - for all-volumes query, 89
 - for creating a remote-copy group, 154
 - for host query, 101
 - for host-set or VV-set creation, 108
 - for querying all host sets or all VV sets, 114
 - for querying remote-copy groups, 184
- domainID
 - AO configuration JSON object member, 218
- DONE
 - enumeration for single-task status query, 206
- driverVersion
 - JSON object member
 - for host query, 102, 103

E

- EGENERA
 - enumeration for host modification, 97
- EMPTY
 - enumeration for VLUN operations, 124
- EMPTY_HTTP_HOST_HDR
 - generic API error, 31
- EMPTY_SET, 39
 - VV-set snapshot volume API error, 146
- ENABLE
 - enumeration for remote-copy system status, 183
- enable
 - JSON object
 - for QoS rule creation, 255
 - for QoS rule modification, 257
- enabled
 - JSON object member
 - for all-QoS rule query, 259
- enabling
 - system flash-cache policy, 207
- encoding
 - for chunked all-VLUNs query, 130
 - for chunked all-volume query responses, 88
 - for JSON characters, 28
 - for single-VLUN query, 133
- enodeMACAddr
 - JSON object member

- for port query, 119
- enumeration, 25
 - chunkletPosPref
 - for CPG operations, 61
 - conversionOperationEnum
 - for converting a volume, 83
 - CopyType
 - for volume operations, 71
 - DetailedState
 - for CPG operations, 63
 - for volume operations, 71
 - diskType
 - for CPG operations, 62
 - fabricType
 - for FC-switch query, 123
 - failedPathPol
 - for VLUN operations, 125
 - HA
 - for CPG operations, 61
 - multipathing
 - for VLUN operations, 124
 - provisioningType
 - for volume operations, 70
 - RAIDType
 - enumeration for CPG operations, 60
 - rcopySysModeEnum
 - for remote-copy information query, 182
 - rcopySysStatusEnum
 - for remote-copy information query, 183
 - state
 - for CPG operations, 63
 - for volume operations, 71
 - taskPriorityEnum
 - for creating physical copy of volumes, 140
 - tuneOperationEnum
 - for tuning a volume, 83
 - VLUNtype
 - for VLUN operations, 124
 - vvPhysicalCopyActionEnum
 - for physical copy operations, 143
- enumeration objects
 - for CPGs, 60
- epoch
 - API type, 26
- error codes
 - all-QoS rule query, 260
 - all-users query, 215, 217
 - all-VLUNs query, 132
 - canceling a task, 207
 - chunked encoding, 91
 - CPG creation and modification, 65
 - CPG query, 69
 - CPG removal, 67
 - creating physical copy of volume, 141
 - FC-switch query, 123
 - flash cache, 194
 - flash cache creation, 193
 - flash cache query, 195
 - flash-cache policy setting, 208
 - host creation, 95
 - host modification, 98
 - host query, 104
 - host removal, 100
 - host set query, 114
 - host-set creation, 109
 - host-set modification, 111
 - host-set removal, 112
 - HTTP, 55
 - LDLayout space query, 213
 - overall capacity, 213
 - physical copy of VV set creation, 149
 - physical-copy of volume resynchronization, 141
 - port-device query, 122
 - QoS modification, 258
 - QoS rule creation, 255
 - QoS rule deletion, 258
 - QoS rule modification, 255
 - querying a single volume, 91
 - querying all volumes, 90
 - querying all-tasks status, 204
 - querying host information with WWN filtering, 105
 - querying physical-copy task status, 206
 - querying volume information with multiple-volumes filter, 93
 - querying volume information with WWN filter, 92
 - remote-copy group creation, 155
 - remote-copy group modification, 172
 - remote-copy group query, 191
 - remote-copy group removal, 158
 - remote-copy group start, 166
 - remote-copy group stop, 167
 - remote-copy group synchronization, 176
 - remote-copy information query, 183
 - session key deletion, 59
 - single host-set query, 114
 - single QoS-rule query, 260
 - single remote-copy group query, 190
 - single VV-set query, 114
 - single-CPG query, 69
 - single-port query, 120
 - single-user query, 216, 217
 - single-VLUN query, 134
 - stopping physical copy of volume, 141
 - storage removal, 88
 - storage-system query, 200
 - storage-system version query, 202
 - unsupported HTTP version, 22
 - virtual copy or vvsets, 153
 - virtual-copy promotion, 144
 - VLUN creation, 126
 - VLUN query using filters, 135
 - VLUN removal, 129
 - volume admission into remote-copy group, 161
 - volume creation, 75
 - volume dismissal from remote-copy group, 164
 - volume growth, 80
 - volume modification, 78
 - volume tuning, 84

- VV set query, 114
- VV-set flash cache policy setting, 113
- VV-set flash-cache policy disablement, 113
- VV-set modification, 111
- VV-set removal, 112
- VV-set virtual-copy promotion, 151
- WSAPI configuration information query, 203
- ERROR_STATE
 - enumeration for port operations, 115
- errors response
 - disaster recovery remote-copy, 181
- EXISTENT_CPG, 32
 - CPG creation and modification API error, 65
- EXISTENT_FLASH_CACHE, 53
 - flash cache API error, 193
- EXISTENT_HOST, 32
 - host creation API error, 95
 - host modification API error, 99
- EXISTENT_ID, 34
 - volume creation API error, 75
 - VV-set snapshot creation API error, 148
- EXISTENT_LUN, 32
 - VLUN creation API error, 127
- EXISTENT_PATH, 34
 - host creation API error, 95
 - host modification API error, 99
- EXISTENT_QOS_RULE, 37
 - QoS rule modification API error, 255
- EXISTENT_RCOPY_GROUP, 49
 - remote-copy group creation API error, 156
- EXISTENT_SET, 37
 - host-set or VV-set creation API error, 109
 - host-set or VV-set modification API error, 111
- EXISTENT_VOL, 32
 - creating, resynchronizing, or stopping physical copy of volumes API error, 141
 - volume creation API error, 75
 - VV-set snapshot creation API error, 147
- expirationHours
 - JSON object member
 - for base-volume creation, 75
 - for snapshot creation, 138
 - for volume modification, 76
 - remote-copy group snapshot, 177
- expirationTime8601
 - JSON object member
 - for all-volumes query, 89
- expirationTimeSec
 - JSON object member
 - for all-volumes query, 89
- EXPORTED_VLUN, 33
 - host modification API error, 100
 - host-set or VV-set removal API error, 112
- F
- FAILBACK_PENDING
 - enumeration for port operations, 117
- FAILED
 - enumeration for CPG operations, 63
 - enumeration for single-task status query, 206
 - enumeration for volume operations, 71
- FAILED_OVER
 - enumeration for port operations, 117
- failedCapacityMB
 - JSON object member
 - for storage-system query response, 196
- failedCapacityMiB
 - JSON object member
 - overall system capacity query response, 209
- failedPathInterval
 - JSON object member
 - for all-VLUNs query response, 131
 - for single-VLUN query response, 134
- failedPathPol
 - enumeration for VLUN operations, 125
 - JSON object member
 - for all-VLUNs query response, 131
 - for single-VLUN query response, 134
- failedStates
 - JSON object
 - for CPG query, 68
 - JSON object member
 - for all-volumes query, 89
- FAILOVER
 - enumeration for VLUN operations, 125
- FAILOVER_GROUP
 - enumeration for remote-copy group operations, 160
- FAILOVER_PENDING
 - enumeration for port operations, 117
- failoverState
 - JSON object member
 - for port query, 119
- FAILSAFE
 - enumeration for remote-copy group state, 188
 - enumeration for remote-copy synchronization status, 190
- FC
 - enumeration for CPG operations, 62
 - enumeration for port operations, 117
 - port connection, 117
- FC switches
 - querying, 122
- FC-switch query
 - error codes, 123
- FCCapacity
 - JSON object member
 - for overall system capacity query response, 209
- FCOE
 - enumeration for port operations, 117
- FCoE
 - port connection, 116, 117, 118
- FCPaths
 - JSON object
 - for host query, 102
 - JSON object member
 - for host query, 101
- FCswitches
 - JSON object

- for port-device query, 122
- FCWWNs
 - JSON object member, 94
 - for host modification, 96
- Fiber Channel over Ethernet *see* FCoE
- filtering
 - in queries, 27
 - multiple volumes in volume information query, 92
 - multiple volumes in volume query, 92
 - VLUN queries, 135
 - WWNs in volume query, 92
- finishTime
 - JSON object member
 - for single-task status query, 205
- firmwareVersion
 - JSON object member
 - for host query, 102, 103
- FIRST
 - enumeration for CPG operations, 61
- flash cache
 - creating, 193
 - querying, 194
 - removing, 194
- flash cache creation
 - error codes, 193
 - success response, 193
- flash cache policy
 - clearing, 207
- flash cache policy disablement
 - error codes, 208
- flash cache query
 - error codes, 195
- flash cache querying
 - success, 194
- flash cache removal
 - success response, 194
- flash-cache policy
 - disabling, 207
 - enabling, 207
- flash-cache policy setting
 - success, 207
- FLASH_CACHE_IS_BEING_REMOVED, 53
 - flash cache removal API error, 194
- FLASH_CACHE_NOT_SUPPORTED, 53
 - flash cache API error, 193
 - flash cache removal API error, 194
- flashCachePolicy
 - JSON object member
 - for flash cache, 112, 207
 - for querying all host sets or all VV sets, 114
 - for storage-system query response, 197
- flashCachePolicyEnum
 - API type
 - for flash cache, 112
- forcePathRemoval
 - JSON object member
 - for host modification, 96
- forceTearDown
 - JSON object member, 94
- FPVV, 60
 - enumeration for changing the snap CPG of a volume, 83
- frameLength
 - JSON object member
 - for port-device query, 122
- FREE
 - enumeration for port operations, 116
- freeCapacityMB
 - JSON object member
 - for storage-system query response, 196
- freeChunkletsGreaterThan
 - JSON object member
 - for CPG operations, 62
- freeChunkletsLessThan
 - JSON object member
 - for CPG operations, 62
- freelInitializedMiB
 - JSON object member
 - overall system capacity query response, 209
- freeMiB
 - JSON object member
 - for volume space operations, 73
 - overall system capacity query response, 209
- freeUninitializedMiB
 - JSON object member
 - overall system capacity query response, 209
- FS
 - enumeration for port operations, 116
- FULL
 - enumeration for volume operations, 70
- fullSync
 - JSON object member
 - for synchronizing a remote-copy group, 175
- fully-provisioned virtual volume *see* FPVV
- FWDEAD
 - enumeration for port operations, 116
- G
- gateway
 - iSCSI port property, 119
- GENERIC
 - enumeration for host modification, 97
- GENERIC_ALUA
 - enumeration for host modification, 97
- GENERIC_LEGACY
 - enumeration for host modification, 97
- GET *see* HTTP GET
- glob-style pattern
 - for adding hosts to host set , 109
 - for adding volumes to VV set , 109
- group volumes
 - remote-copy snapshots, 176
- groupLastSyncTime
 - JSON object member
 - for querying remote-copy groups, 187
- groupLastSyncTimeSec
 - JSON object member
 - for querying remote-copy groups, 187

- GROW_VOLUME
 - enumeration for growing volume, 80
- growing volumes
 - success response, 80
- growthIncrementMiB
 - JSON object
 - for CPG creation, 64
- growthLimitMiB
 - JSON object
 - for CPG creation, 64
- H
- HA
 - enumeration for CPG operations, 61
 - JSON object member
 - for CPG operations, 60
- hardAddr
 - JSON object member
 - for port-device query, 122
- HAS_CHILD, 33
 - volume removal API error, 88
- HAS_RO_CHILD, 33
 - volume removal API error, 88
- Hex
 - API type, 26
- HIGH
 - enumeration for creating physical copy of volume, 141
- high-availability setting *see* HA
- HOST
 - enumeration for port operations, 116
 - enumeration for VLUN operations, 124
- Host
 - client HTTP header, 23
- host creation
 - error codes, 95
 - success response, 95
- host modification
 - error codes, 98
 - success response, 98
- host query
 - error codes, 104
 - success response, 100
- host query with WWN filtering
 - error codes, 105
 - success response, 105
- host removal
 - error codes, 100
 - success response, 100
- host set
 - creating, 108
 - modifying, 110
 - querying, 113
 - removing, 112
- host-set creation
 - error codes, 109
 - success response, 109
- host-set modification
 - success response, 111
- host-set query
 - error codes, 114
- host-set removal
 - error codes, 112
 - success response, 112
- host_create
 - permissions for, 94
- HOST_IN_SET, 35
 - host removal API error, 100
- HOST_SET
 - enumeration for VLUN operations, 124
- host_set
 - permissions for, 96, 100
- hostDeviceName
 - JSON object member
 - for all-VLUNs query response, 131
 - for single-VLUN query response, 134
- hosted
 - JSON object member
 - for host query, 104
- hostEditOperation
 - enumeration for host modification, 97
- hostname
 - example, 22
 - JSON object
 - for VLUN template creation, 125
 - JSON object member
 - for all-VLUNs query response, 130
 - for single-VLUN query response, 133
- hostPersona
 - JSON object
 - for host modification, 97
- hosts
 - creating, 94
 - modifying, 96
 - querying, 100, 104
 - removing, 100
- hostset_set
 - permissions for, 108
- hostSpeed
 - JSON object member
 - for host query, 102, 103
- HPE 3PAR Command Line Interface *see* CLI
- HPE 3PAR F-Class
 - maximum WSAPI sessions, 58
- HPE 3PAR Management Console *see* MC
- HPE 3PAR storage system
 - hostname, 22
- HPE 3PAR StoreServ 10400 Storage
 - maximum WSAPI sessions, 58
- HPE 3PAR StoreServ 10800 Storage
 - maximum WSAPI sessions, 58
- HPE 3PAR StoreServ 7200 Storage
 - maximum WSAPI sessions, 58
- HPE 3PAR StoreServ 7400 Storage
 - maximum WSAPI sessions, 58
- HPE 3PAR StoreServ 7450 Storage
 - maximum WSAPI sessions, 58
- HPE 3PAR T-Class
 - maximum WSAPI sessions, 58

- HPUX
 - enumeration for host modification, 98
- HPUX_LEGACY
 - enumeration for host modification, 97
- HTTP
 - error codes, 28, 55
 - example of failed client request, 55
 - requests and replies, 21
 - status codes, 28
- HTTP DELETE
 - for QoS rule deletion, 258
 - for removing a CPG, 67
 - for removing a flash cache, 194
 - for removing a host, 100
 - for removing a host set, 112
 - for removing a remote-copy group, 157
 - for removing a session key, 59
 - for removing a storage volume, 87
 - for removing a VLUN, 128
 - for removing a VV set, 112
 - for removing remote-copy group while retaining resynchronization snapshot, 157
 - supported, 22
- HTTP GET
 - creating flash cache, 193
 - for displaying space distribution, 86
 - for filtering WWNs during volume query, 92
 - for querying a flash cache, 194
 - for querying a single CPG, 69
 - for querying a single host set, 114
 - for querying a single QoS, 260
 - for querying a single remote-copy group, 190
 - for querying a single role, 217
 - for querying a single user, 216
 - for querying a single VLUN, 132
 - for querying a single volume, 91
 - for querying a single VV set, 114
 - for querying all CPGs, 68
 - for querying all host sets, 113
 - for querying all ports, 117
 - for querying all QoS rules, 258
 - for querying all remote-copy groups, 183
 - for querying all volumes, 88
 - for querying all VV sets, 113
 - for querying all-tasks status, 203
 - for querying FC switches, 122
 - for querying overall remote-copy information, 182
 - for querying overall system capacity, 209
 - for querying port devices, 121
 - for querying single-task status, 204
 - for querying system information, 196
 - for querying version information, 201
 - for querying VLUNs using filters, 135
 - for querying WSAPI configuration information, 202
 - for querying WSAPI roles, 216
 - for querying WSAPI users, 215
 - for remote-copy disaster recovery, 179
 - for volume information query with multiple volumes, 92
 - number of WSAPI sessions, 59
 - processed on network node, 58
 - supported, 22
- HTTP headers
 - client, 22
 - server, 24
- HTTP method
 - DELETE, 22
 - GET, 22
 - POST, 22
 - PUT, 22
- HTTP POST
 - for creating a CPG, 64
 - for creating a host, 94
 - for creating a host set, 108
 - for creating a physical copy of a VV set, 148
 - for creating a QoS rule , 253
 - for creating a remote-copy group, 154
 - for creating a VLUN, 125
 - for creating a VV set, 108
 - for creating a VV-set snapshot, 146
 - for creating base volumes, 73
 - for creating physical copies of volumes, 139
 - for creating snapshots, 137
 - for querying CPG space, 212
 - for querying LAYOUT space, 212
 - supported, 22
- HTTP PUT
 - for admitting a volume into a remote-copy group, 158
 - for canceling a task, 206
 - for dismissing a volume into a remote-copy group, 163
 - for growing volumes, 79
 - for modifying a CPG, 66
 - for modifying a host, 96
 - for modifying a host set, 110
 - for modifying a QoS rule , 256
 - for modifying a remote-copy group, 168
 - for modifying a volume, 76
 - for modifying a VV set , 110
 - for promoting a virtual copy, 144
 - for promoting a VV-set virtual copy, 150
 - for resynchronizing a physical copy to parent volume, 143
 - for resynchronizing a physical copy to parent VV set, 149
 - for starting a remote-copy group, 165
 - for stopping a physical copy of a volume, 143
 - for stopping a physical copy of a VV set, 149
 - for stopping a remote-copy group, 167
 - for synchronizing a remote-copy group, 174
 - for tuning volumes, 82
 - supported, 22
- HTTP request
 - format, 22
- httpPort
 - JSON object member
 - for WSAPI configuration query, 202
- HTTPS, 21
- httpsPort
 - JSON object member

- for WSAPI configuration query, 202
- httpsState
 - JSON object member
 - for WSAPI configuration query, 202
- httpState
 - JSON object member
 - for WSAPI configuration query, 202
- HUB
 - enumeration for FC-switches query, 123
- HWAddr
 - JSON object member
 - for port query, 118
- Hypertext Transfer Protocol *see* HTTP
- Hypertext Transfer Protocol Secure *see* HTTPS
- I
- Id
 - JSON object member
 - for single-task status query, 204
- id
 - AO configuration JSON object member, 218
 - AO configuration TierCPG object, 218
 - JSON object
 - for CPG query, 68
 - JSON object member
 - for all-QoS rule query, 259
 - for all-volumes query, 89
 - for base-volume creation, 74
 - for querying all host sets or all VV sets, 113
 - for querying remote-copy groups, 184
 - for snapshot creation, 137
 - for storage-system query response, 196
- idle timeout, 59
- IDLE_FOR_RESET
 - enumeration for port operations, 116
- igint32
 - API type, 26
- IMPORT_VV
 - enumeration for single-task status query, 206
- IMPORTING
 - enumeration for volume operations, 72
- IN_USE
 - CPG creation and modification API error, 65
 - CPG removal API error, 67
 - creating, resynchronizing, or stopping physical copy of volumes API error, 143
 - generic API error, 30
 - volume removal API error, 88
- incrementMiB
 - JSON object member
 - for CPG operations, 63
- INITIATOR
 - enumeration for host modification, 97
 - enumeration for port operations, 115
- initiatorChapEnabled
 - JSON object member
 - for host query, 101
- initiatorChapName
 - JSON object member
 - for host query, 101
- initiatorEncryptedChapSecret
 - JSON object member
 - for host query, 101
- INPUT_EOF
 - generic API error, 29
- INPUT_TOO_LONG
 - generic API error, 29
 - volume query with multiple-volumes filtering API error, 93, 136
- INQUIRY
 - enumeration for VLUN operations, 125
- int32
 - API type, 26
- INT_SERV_ERR
 - all-volumes query API error, 90
 - CPG query API error, 69
 - distributing volumes, 87
 - generic API error, 29
 - host query API error, 104
 - remote-copy information query API error, 183
 - single-VLUN query API error, 134
 - storage-system query API error, 200, 202
 - volume modification API error, 79
 - WSAPI configuration query API error, 203
- Integer vs. int attributes, 25
- INTERNAL_CONSISTENCY_ERROR
 - enumeration for volume operations, 71
- internalMiB
 - JSON object member
 - overall system capacity query response, 211
- Internet Small Computer System Interface *see* iSCSI
- INV_FLASH_CACHE_SIZE, 53
 - flash cache API error, 194
- INV_HTTP_HEADER
 - generic API error, 31
- INV_HTTP_REQ
 - generic API error, 31
- INV_INPUT
 - CPG creation and modification API error, 66
 - generic API error, 29
 - host modification API error, 98
 - host query API error, 104
 - VLUN creation API error, 127
 - VLUN removal API error, 129
 - volume creation API error, 75
- INV_INPUT_ALL_WHITE_SPACES_STR
 - generic API error, 31
 - single-port query API error, 120
- INV_INPUT_BAD_ENUM_VALUE, 34
 - creating, resynchronizing, or stopping physical copy of volumes API error, 141
 - host modification API error, 99
 - remote-copy group creation API error, 156
- INV_INPUT_BAD_LENGTH, 35
 - host modification API error, 99
- INV_INPUT_BELOW_RANGE, 38
 - all-tasks status query API error, 206
 - QoS rule modification API error, 256

- remote-copy group modification API error, 173
- INV_INPUT_BW_MIN_GOAL_GRT_MAX_LIMIT, 37
 - QoS rule modification API error, 256
- INV_INPUT_DUP_NAME, 33
 - host-set or VV-set creation API error, 109
 - host-set or VV-set modification API error, 111
 - VV-set snapshot creation API error, 147
- INV_INPUT_DUP_PATH, 36
 - host modification API error, 100
- INV_INPUT_EMPTY_STR, 33
 - host creation API error, 95
- INV_INPUT_EMPTY_VVSET, 40, 149
 - VLUN creation API error, 127
- INV_INPUT_EXCEEDS_LENGTH
 - CPG creation and modification API error, 66
 - flash cache policy setting API error, 113
 - generic API error, 30
 - host creation API error, 95
 - host modification API error, 99
 - single-user query API error, 216
 - space query API error, 213
 - volume creation API error, 75
 - volume growth API error, 81
 - volume modification API error, 78
- INV_INPUT_EXCEEDS_RANGE, 33
 - all-tasks status query API error, 206
 - CPG creation and modification API error, 66
 - flash cache API error, 193
 - QoS rule modification API error, 255
 - remote-copy group modification API error, 173
 - single-VLUN query API error, 135
 - VLUN removal API error, 129
- INV_INPUT_ILLEGAL_CHAR
 - CPG creation and modification API error, 66
 - creating, resynchronizing, or stopping physical copy of volumes API error, 141
 - generic API error, 31
 - host creation API error, 95
 - host modification API error, 99
 - host query API error, 104
 - QoS rule modification API error, 255
 - QoS rules modification API error, 258
 - QoS rules query API error, 260
 - remote-copy group creation API error, 156
 - single-CPG query API error, 69
 - single-VLUN query API error, 135
 - single-volume query API error, 91
 - volume tuning API error, 84
- INV_INPUT_IO_MIN_GOAL_GRT_MAX_LIMIT
 - QoS rule modification API error, 255
- INV_INPUT_IO_MIN_GOAL_GRT_MAX_LIMIT, 37
- INV_INPUT_MATCHED_HOSTSET, 40
 - VLUN creation API error, 127
- INV_INPUT_MISSING_REQUIRED
 - CPG creation and modification API error, 66
 - generic API error, 30
 - host creation API error, 95
 - host modification API error, 99
 - remote-copy disaster recovery API error, 181
- single-VLUN query API error, 134
- VLUN creation API error, 127
- VLUN removal API error, 129
- INV_INPUT_NO_REQ
 - generic API error, 31
- INV_INPUT_NOT_JSON_OBJ
 - generic API error, 30
- INV_INPUT_ONE_REQUIRED, 35
 - host modification API error, 99
 - space query API error, 213
- INV_INPUT_PARAM_CONFLICT, 33
 - host creation API error, 95
 - host modification API error, 98
 - host-set or VV-set modification API error, 111
 - remote-copy disaster recovery API error, 181
 - space query API error, 214
 - VLUN creation API error, 127
- INV_INPUT_PORT_SPECIFICATION, 34
 - single-port query API error, 120
 - single-VLUN query API error, 134
 - VLUN creation API error, 127
 - VLUN removal API error, 129
- INV_INPUT_QOS_PATTERN, 38
- INV_INPUT_QOS_TARGET_OBJECT, 38
- INV_INPUT_RETAIN_GT_EXPIRE, 34
 - volume creation API error, 75
 - volume modification API error, 78
 - VV-set snapshot creation API error, 148
- INV_INPUT_TIME, 34
 - volume creation API error, 75
 - volume modification API error, 78
 - VV-set snapshot creation API error, 148
- INV_INPUT_TOO_MANY_WWN_OR_ISCSI, 34
 - host creation API error, 95
 - host modification API error, 99
- INV_INPUT_UNREC_NAME, 33
- INV_INPUT_USR_ALERT_NON_TPVV, 34
 - volume creation API error, 75
 - volume modification API error, 78
- INV_INPUT_VV_GROW_SIZE, 40
 - volume growth API error, 81
- INV_INPUT_VV_IS_FPVV, 43
 - volume tuning API error, 84
- INV_INPUT_VV_IS_TDVV, 52, 84
- INV_INPUT_VV_IS_TPVV, 43
 - volume modification API error, 79
 - volume tuning API error, 84
- INV_INPUT_VV_POLICY, 34
 - volume creation API error, 76
 - volume modification API error, 78
- INV_INPUT_VV_TARGET_OF_QOS_RULE, 41
- INV_INPUT_WARN_GT_LIMIT, 34
 - CPG creation and modification API error, 66
 - volume creation API error, 76
 - volume modification API error, 78
- INV_INPUT_WRONG_TYPE
 - all-tasks status query API error, 206
 - generic API error, 30
 - host creation API error, 95

host modification API error, 99
 single-VLUN query API error, 134
 INV_OPERATION_AO_CONFIG_CONFLICT, 41
 INV_OPERATION_CANNOT_CANCEL_TASK, 42
 task cancellation API error, 207
 INV_OPERATION_CANNOT_STOP_ONLINE_PROMOTE, 41
 virtual-copy promotion API error, 145
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_CPG_NOT_IN_AO_CONFIG, 41
 INV_OPERATION_CPG_RAID0_DISABLED, 36
 CPG creation and modification API error, 66
 INV_OPERATION_CPG_RAID5_NL_DISABLED, 36
 CPG creation and modification API error, 66
 INV_OPERATION_GROW_SIZE_TOO_SMALL, 36
 CPG creation and modification API error, 66
 INV_OPERATION_PARAM_CONFLICT
 virtual-copy promotion API error, 145
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_PARENT_PCOPY_IN_PROGRESS, 42
 virtual-copy promotion API error, 145
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_PARENT_SIZE_HAS_INCREASED, 42
 virtual-copy promotion API error, 145
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_PARENT_VV_EXPORTED, 42
 virtual-copy promotion API error, 145
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_PROMOTE_TARGET_NOT_BASE_VV, 42
 virtual-copy promotion API error, 145
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_RC_TASK, 42
 INV_OPERATION_RCOPY_GROUP_MODE_CONFLICT
 CPG creation and modification API error, 54
 INV_OPERATION_RCOPY_GROUP_ROLE_CONFLICT, 53
 remote-copy disaster recovery API error, 181
 INV_OPERATION_SET_AUTO_CREATED, 51
 INV_OPERATION_SNAPSHOT_CPG_TUNE_NEEDED, 51
 INV_OPERATION_SNAPSHOT_NOT_SAME_TYPE, 51
 volume modification API error, 79, 148
 INV_OPERATION_UNSUPPORTED_VV_TYPE, 40
 volume growth API error, 81
 volume tuning API error, 84
 INV_OPERATION_VLUN_PCOPY_TARGET_VV, 36
 VLUN creation API error, 127
 INV_OPERATION_VV_PROMOTE_IN_PROGRESS
 virtual-copy promotion API error, 146
 volume growth API error, 82
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_VV_BASE_VOLUME, 42
 virtual-copy promotion API error, 145
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_VV_CIRCULAR_COPY, 39
 creating, resynchronizing, or stopping physical copy
 of volumes API error, 142
 INV_OPERATION_VV_CLEANUP_IN_PROGRESS, 38
 creating, resynchronizing, or stopping physical copy
 of volumes API error, 142
 volume growth API error, 81
 volume tuning API error, 85
 VV-set snapshot creation API error, 147
 INV_OPERATION_VV_COPY_PARENT_TOO_BIG, 38
 creating, resynchronizing, or stopping physical copy
 of volumes API error, 143
 INV_OPERATION_VV_COPY_TO_BASE, 38
 creating, resynchronizing, or stopping physical copy
 of volumes API error, 142
 INV_OPERATION_VV_COPY_TO_SELF, 38
 creating, resynchronizing, or stopping physical copy
 of volumes API error, 142
 INV_OPERATION_VV_CPG_ON_SNAPSHOT, 36
 volume modification API error, 79
 INV_OPERATION_VV_EXPORTED, 38
 creating, resynchronizing, or stopping physical copy
 of volumes API error, 142
 virtual-copy promotion API error, 145
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_VV_FAILED_ONLINE_COPY, 39
 creating, resynchronizing, or stopping physical copy
 of volumes API error, 143
 INV_OPERATION_VV_IN_REMOTE_COPY, 38
 creating, resynchronizing, or stopping physical copy
 of volumes API error, 141
 virtual-copy promotion API error, 145
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_VV_INTERNAL_VOLUME, 35
 creating, resynchronizing, or stopping physical copy
 of volumes API error, 142
 host-set or VV-set modification API error, 111
 volume growth API error, 81
 volume modification API error, 79
 volume tuning API error, 85
 VV-set creation API error, 110
 VV-set snapshot creation API error, 148
 INV_OPERATION_VV_IS_BUSY, 41
 virtual-copy promotion API error, 145
 volume growth API error, 81
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_VV_IS_PCOPY, 41
 volume growth API error, 82
 INV_OPERATION_VV_MODIFY_SNP_CPG_TPVV, 41
 INV_OPERATION_VV_MODIFY_USR_CPG_CPVV, 41
 INV_OPERATION_VV_MODIFY_USR_CPG_TDVV, 52, 84
 INV_OPERATION_VV_MODIFY_USR_CPG_TPVV, 35
 volume modification API error, 78
 INV_OPERATION_VV_NO_PARENT, 39
 creating, resynchronizing, or stopping physical copy
 of volumes API error, 143
 INV_OPERATION_VV_NO_SNAPSHOT_ALLOWED, 38

creating, resynchronizing, or stopping physical copy of volumes API error, 142
 INV_OPERATION_VV_NON_BASE_VOLUME, 38
 creating, resynchronizing, or stopping physical copy of volumes API error, 141
 volume tuning API error, 84
 INV_OPERATION_VV_NOT_IN_NORMAL_STATE, 39
 creating, resynchronizing, or stopping physical copy of volumes API error, 142
 volume growth API error, 82
 volume tuning API error, 85
 VV-set snapshot creation API error, 148
 INV_OPERATION_VV_ONLINE_COPY_IN_PROGRESS, 36
 creating, resynchronizing, or stopping physical copy of volumes API error, 142
 volume growth API error, 81
 VV-set snapshot creation API error, 147
 INV_OPERATION_VV_PARENT_OF_PCOPY, 41
 volume growth API error, 82
 INV_OPERATION_VV_PCOPY_IN_PROGRESS, 39
 creating, resynchronizing, or stopping physical copy of volumes API error, 142
 virtual-copy promotion API error, 145
 volume growth API error, 82
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_VV_PEER_VOLUME, 35
 creating, resynchronizing, or stopping physical copy of volumes API error, 142
 volume modification API error, 78
 volume tuning API error, 85
 VV-set snapshot creation API error, 147
 INV_OPERATION_VV_PROMOTE_IN_PROGRESS, 41
 remote-copy disaster recovery API error, 181
 INV_OPERATION_VV_PROMOTE_IS_NOT_IN_PROGRESS, 43
 INV_OPERATION_VV_READONLY_SNAPSHOT, 38
 creating, resynchronizing, or stopping physical copy of volumes API error, 142
 INV_OPERATION_VV_READONLY_TO_READONLY_SNAP, 39
 VV-set snapshot creation API error, 147
 INV_OPERATION_VV_SA_SD_SPACE_REMOVED, 41
 volume growth API error, 81
 INV_OPERATION_VV_SNAP_PARENT_SAME_BASE, 39
 VV-set snapshot creation API error, 147
 INV_OPERATION_VV_SNAPSPACE_NOT_MOVED_TO_CPG, 36
 INV_OPERATION_VV_SYS_VOLUME, 35
 creating, resynchronizing, or stopping physical copy of volumes API error, 141
 host-set or VV-set modification API error, 111
 volume modification API error, 79
 volume tuning API error, 84
 VV-set creation API error, 110
 INV_OPERATION_VV_TASK_CANCEL_IN_PROGRESS, 43
 volume tuning API error, 85
 INV_OPERATION_VV_TASK_VV_PROMOTE_IN_PROGRESS
 volume tuning API error, 85
 INV_OPERATION_VV_TUNE_IN_PROGRESS, 40
 virtual-copy promotion API error, 145
 volume growth API error, 81
 volume tuning API error, 85
 VV-set virtual-copy promotion API error, 152
 INV_OPERATION_VV_VOLUME_ACCOUNTING_IN_PROGRESS, 36
 volume modification API error, 79
 INV_OPERATION_VV_VOLUME_CONV_IN_PROGRESS, 36
 creating, resynchronizing, or stopping physical copy of volumes API error, 142
 volume growth API error, 81
 volume tuning API error, 85
 VV-set snapshot creation API error, 147
 INV_OPERATION_VV_VOLUME_NOT_DEFINED_ALL_NODES, 36
 volume modification API error, 79
 INV_OPERATION_VV_ZERO_DETECT_TPVV, 36
 volume modification API error, 79
 INV_POST_ACTION
 generic API error, 31
 INV_QUERY_STRING, 40
 volume query with WWN filtering API error, 92, 93, 136
 INV_REPORT_PARAM
 CPG creation and modification API error, 54
 INV_SESS_KEY
 generic API error, 29
 INV_SET_SIZE, 33
 CPG creation and modification API error, 66
 space query API error, 213
 INV_SSL
 generic API error, 29
 INV_URI
 generic API error, 31
 INV_URL_PERCENT_ENCODING
 generic API error, 30
 INV_USER_PASS
 generic API error, 29
 INV_UTF
 generic API error, 31
 INVALID
 enumeration for CPG operations, 64
 enumeration for remote-copy system status, 183
 enumeration for volume operations, 72
 INVALID_CURSOR_ID, 37
 INVALID_INPUT_VV_PATTERN, 39
 VV-set snapshot creation API error, 146
 INVALID_OPERATION_VV_ONLINE_COPY_IN_PROGRESS
 volume modification API error, 79
 INVALID_OPERATION_VV_SNAPSPACE_NOT_MOVED_TO_CPG
 volume modification API error, 79
 INVALID_OPERATION_VV_VOLUME_CONV_IN_PROGRESS
 volume modification API error, 79
 INVALID_TASK_ID, 43
 ioMaxLimit
 JSON object

- for QoS rule creation, 254
 - for QoS rule modification, 257
- JSON object member
 - for all-QoS rule query, 259
- ioMaxLimitOP
 - JSON object
 - for QoS rule creation, 254
 - for QoS rule modification, 257
- ioMinGoal
 - JSON object
 - for QoS rule creation, 254
 - for QoS rule modification, 257
 - JSON object member
 - for all-QoS rule query, 259
- ioMinGoalOP
 - JSON object
 - for QoS rule creation, 254
 - for QoS rule modification, 257
- IP
 - enumeration for port operations, 117
- IPAddr
 - JSON object member
 - for host query, 102, 103
 - for port query, 119
- ipAddr
 - iSCSI port property, 119
- IPOINT
 - enumeration for port operations, 116
- IPv4Addr
 - JSON object member
 - for storage-system query response, 196
- IPv6Addr
 - JSON object member
 - for storage-system query response, 196
- iSCSI
 - enumeration for port operations, 116
- iSCSI
 - enumeration for port operations, 117
 - names, 34, 94, 95, 96, 98, 99, 102, 130, 133
 - paths, 101
 - port, 116
 - port connection, 116, 117, 118, 119
- iSCSIName
 - iSCSI port property, 119
 - JSON object member
 - for port query, 119
- iSCSINames
 - JSON object member, 94
 - for host modification, 96
- iSCSIPaths
 - JSON object
 - for host query, 102, 103
 - JSON object member
 - for host query, 101
- iSCSIPortInfo
 - JSON object member
 - for port query, 119
- iSNSAddr
 - iSCSI port property, 119

- iSNSPort
 - iSCSI port property, 119
- ISO 8601
 - API type, 26

J

- JavaScript Object Notation *see* JSON
- JSON character encoding, 28
- JSON object
 - code, 28
 - defined, 20
 - desc, 54
 - null members, 25
 - optional members for input, 24
 - ref, 55
 - required members for input, 24
- JSON object members
 - AO config, 218
 - coordinated remote-copy group snapshot, 177
- JSON objects
 - for base-volume creation, 75
 - for CPG creation, 65
 - for CPG growth objects, 63
 - for CPG modification, 67
 - for CPG query, 69
 - for CPG space usage, 63
 - for creating a host, 94
 - for creating a QoS rule, 255
 - for LAYOUT in CPG operations, 60
 - for modifying a host, 96
 - for modifying a QoS rule, 257
 - for session key creation, 56, 57
 - for VLUN template request, 126
- JSON types, 26
- JSON_NOT_SUPPORTED
 - generic API error, 30
- JSON_SYNTAX_ERR
 - generic API error, 30

K

- KeepSnap
 - JSON object member
 - for dismissing a volume from a remote-copy group, 164
- keepVV
 - JSON object member
 - for tuning a volume, 83
- key, 56
 - see also* session key
 - JSON object member
 - for creating a session key, 57

L

- label
 - JSON object member
 - for port query, 118
- LAST
 - enumeration for CPG operations, 61
- latencyGoal

- JSON object
 - for QoS rule creation, 254
 - for QoS rule modification, 257
- JSON object member
 - for all-QoS rule query, 259
- latencyGoalSecs
 - JSON object member
 - for all-QoS rule query, 259
- LDLayout
 - JSON object
 - for CPG creation, 65
 - for CPG operations, 60
 - JSON object member
 - for CPG operations, 63
 - for CPG space query, 213
- LDLayout object
 - space query, 212
- LDLayout space query
 - error codes, 213
- LDLayoutCapacity
 - JSON object member
 - for CPG space query , 212
- LDS_NOT_STARTED
 - enumeration for volume operations, 71
- limitMiB
 - JSON object member
 - for CPG operations, 63
- links
 - AO configuration JSON object member, 218
 - AO configuration user collection, 218
 - distributing volumes, 86, 87
 - JSON object member
 - for admitting a volume into a remote-copy group, 161
 - for all-volumes query, 89
 - for host query, 101
 - for querying remote-copy groups, 184, 185, 188
 - for remote-copy disaster recovery, 181
 - for remote-copy information query response, 182, 184
 - for remote-copy modification response, 172
 - for remote-copy synchronization response, 175
 - for starting a remote-copy group, 166, 167
- linkState
 - JSON object member
 - for port query, 118
- localGroupsDirection
 - JSON object member
 - disaster recovery for remote-copy , 180
- localSnapCPG
 - JSON object member
 - for creating a remote-copy group, 154
 - for modifying a remote-copy group, 169
 - remote-copy group CPG parameter, 168
- localSnpCPG
 - JSON object member
 - for querying remote-copy groups, 184
- localUserCPG
 - JSON object member
 - for creating a remote-copy group, 154
 - for modifying a remote-copy group, 169
 - remote-copy group CPG parameter, 168
- localUsrCPG
 - JSON object member
 - for querying remote-copy groups, 184
- localVolumeName
 - JSON object member
 - for querying remote-copy groups, 185
- Location
 - server HTTP header, 24
- location
 - JSON object member
 - for host query, 101
 - for storage-system query response, 196
- LOGGING
 - enumeration for remote-copy group state, 188
 - enumeration for remote-copy synchronization status, 190
- logical unit number *see* LUN
- logicalName
 - JSON object member
 - for FC-switches query, 123
- LOGIN_WAIT
 - enumeration for port operations, 115
- loopId
 - JSON object member
 - for port-device query, 121
- LOSS_SYNC
 - enumeration for port operations, 115
- LOW
 - enumeration for creating physical copy of volume, 141
- LUN, 124
- lun
 - JSON object
 - for VLUN template creation, 125
 - JSON object member
 - for all-VLUNs query response, 130
 - for single-VLUN query response, 133
- LUN_HOSTPERSONA_CONFLICT, 36
 - host modification API error, 100
- LUN_ID_CONFLICT, 37
 - host-set or VV-set modification API error, 111
- M
- MAC
 - API type, 26
- MAG
 - enumeration for CPG operations, 61
- magList
 - JSON object member
 - for CPG operations, 62
- major
 - JSON object member
 - for storage-system version query response, 202
- management console *see* MC
- masterNode
 - JSON object member
 - for storage-system query response, 196

- MATCHED_SET
 - enumeration for VLUN operations, 124
- maxAutoLun
 - JSON object
 - for VLUN template creation, 126
- maximum number of WSAPI sessions, 57
- maximum WSAPI sessions, 57
- maxSpaceUtilizationMiB
 - AO configuration TierCPG object, 218
- MC, 18, 56
- MED
 - enumeration for creating physical copy of volume, 141
- memAdd
 - enumeration for adding a member to the physical copy of a VV set, 150
 - enumeration for removing member from the physical copy of a VV set, 150
- member
 - distributing volumes, 86
- MEMBER_IN_DOMAINSET, 37
 - host-set or VV-set creation API error, 109
 - host-set or VV-set modification API error, 111
- MEMBER_IN_SET, 37
 - host-set or VV-set creation API error, 109
 - host-set or VV-set modification API error, 111
- MEMBER_NOT_IN_SAME_DOMAIN, 37
 - host-set or VV-set creation API error, 109
 - host-set or VV-set modification API error, 111
- MEMBER_NOT_IN_SET, 37
 - host-set or VV-set modification API error, 111
- Members
 - JSON object member
 - for all-roles query, 216
 - for all-tasks status query, 204
 - for all-users status query, 215
 - for host query with WWN filtering, 105
 - for volume query with multiple-volumes filter, 93
 - for volume query with WWN filter, 92
- members
 - AO configuration user collection, 218
 - JSON object
 - for all remote-copy groups query, 183
 - for all-volumes query, 88
 - for port query, 118
 - for querying CPGs, 68
 - for single-VLUN query response, 133
 - for snapshot creation, 137
 - JSON object member
 - for all remote-copy groups query response, 184
 - for all-QoS rule query, 258
 - for all-VLUNs query response, 130
 - for FC-switches query, 123
 - for port-device query, 121
 - for querying all host sets or all VV sets, 113
 - for single-VLUN query response, 133, 135
- message body
 - adaptive optimization, 218
 - for modifying a host, 96
 - remote-copy group, 191
- method
 - HTTP, 22
- minor
 - JSON object member
 - for storage-system version query response, 202
- minSpaceUtilizationMiB
 - AO configuration TierCPG object, 218
- MISSING_VLUN_EXPORT_INFO, 34
 - VLUN creation API error, 127
- Mode
 - JSON object member
 - for creating a remote-copy group, 155
- mode
 - AO configuration JSON object member, 218
 - JSON object member
 - for flash cache, 193
 - for modifying a remote-copy group, 171
 - for port query, 118
 - for querying flash cache, 194
 - for querying remote-copy groups, 187
 - for remote-copy information query response, 182
 - parameter set for modifying a remote-copy group, 168
 - paramter for modifying an SLD remote-copy group, 168
- model
 - JSON object member
 - for host query, 102, 103
 - for storage-system query response, 196
- modification of remote-copy group
 - success response, 172
- modifying
 - a CPG, 66
 - a host, 96
 - a host set, 110
 - a QoS rule, 256
 - a remote-copy group, 168
 - a volume, 76
 - a VV set, 110
- modifyRemoteCopyTarget
 - JSON object
 - for modifying a remote-copy group, 169
- modules
 - for Perl client code samples, 20
- MOVE_REGIONS
 - enumeration for single-task status query, 205
- mtu
 - iSCSI port property, 119
- multipathing
 - enumeration for VLUN operations, 124
 - JSON object member
 - for all-VLUNs query response, 131
 - for single-VLUN query response, 134
- multiPathSoftware
 - JSON object member
 - for host query, 104
- multiPathSoftwareVersion
 - JSON object member
 - for host query, 104
- multiple session keys, 57

multiple-volumes filter for volume query
success response, 93

N

Name

JSON object member
for single-task status query, 204

name

AO configuration JSON object member, 218
AO configuration TierCPG object, 218
JSON object
for CPG creation, 64
for CPG query, 68
for QoS rule creation, 253
JSON object member, 94
for all-QoS rule query, 259
for all-volumes query, 89
for base-volume creation, 74
for creating a remote-copy group, 154
for FC-switches query, 123
for host query, 101, 102
for host-set or VV-set creation, 108
for querying all host sets or all VV sets, 113
for querying remote-copy groups, 184
for snapshot creation, 137
for storage-system query response, 196
remote-copy group snapshot, 177

Name16

API type, 26

name223

API type, 27

name27

API type, 26

name31

API type, 27

NEEDS_CHECK

enumeration for volume operations, 71

NEEDS_MAINT_CHECK

enumeration for volume operations, 71

netmask

iSCSI port property, 119

NEW

enumeration for remote-copy group state, 188
enumeration for remote-copy synchronization status,
189

new

distributing volumes, 87

newName

JSON object
for CPG creation, 64
JSON object member
for host modification, 96, 97
for host-set or VV-set creation, 110
for modifying CPGs, 67
for volume modification, 76

NEWPRESYNCD

enumeration for remote-copy synchronization status,
189

NEWSYNCDFROMSNAP

enumeration for remote-copy synchronization status,
189

NL

enumeration for CPG operations, 62

NLCapacity

JSON object member
for overall system capacity query response, 209

NO_DISK_PRESENT

CPG creation and modification API error, 53, 66

NO_HTTP_HDR

generic API error, 32

NO_INITIATOR_CHAP

host modification API error, 99

NO_SNAP_CPG

volume creation API error, 76
VV-set snapshot volume creation API error, 147

NO_SPACE

CPG creation and modification API error, 66
flash cache API error, 193
host creation API error, 95
space query API error, 214
volume creation API error, 76
volume growth API error, 82
volume tuning API error, 85

node

clusters, 57
JSON object member
for host query, 103
for VLUN operations, 124

NODE_DOWN

volume tuning API error, 85

nodeList

JSON object member
for CPG operations, 61

NODEUP

enumeration for remote-copy system status, 183

nodeWWN

JSON object member
for port query, 118
for port-device query, 122

NOLIMIT

enumeration for QoS rule creation or modification, 255

NON_ACTIVE_TASK

task modification API error, 207

NON_EXISTENT_AO

AO configuration error message, 219
CPG creation and modification API error, 54

NON_EXISTENT_CHAP

host modification API error, 100

NON_EXISTENT_CPG

CPG creation and modification API error, 66
CPG removal API error, 67
creating, resynchronizing, or stopping physical copy
of volumes API error, 141
remote-copy group creation API error, 157
remote-copy group modification API error, 173
single-CPG query API error, 69
space query API error, 214
volume tuning API error, 85

- NON_EXISTENT_DOMAIN
 - CPG creation and modification API error, 66
 - generic API error, 30
 - host-set or VV-set creation API error, 109
 - remote-copy group creation API error, 157
- NON_EXISTENT_FLASH_CACHE, 53
 - flash cache policy setting API error, 113
 - flash cache removal API error, 194
- NON_EXISTENT_HOST
 - generic API error, 29
 - host modification API error, 99
 - host query API error, 104
 - host removal API error, 100
 - single-VLUN query API error, 134
 - VLUN creation API error, 127
 - VLUN removal API error, 129
 - VV-set creation API error, 109
- NON_EXISTENT_LUN, 32
- NON_EXISTENT_PATH, 35
 - host modification API error, 100
- NON_EXISTENT_PERSONA
 - CPG creation and modification API error, 54
- NON_EXISTENT_PORT, 32
 - single-port query API error, 120
 - VLUN creation API error, 127
- NON_EXISTENT_QOS_RULE, 36
 - QoS rule modification API error, 255
 - QoS rules modification API error, 258
 - QoS rules query API error, 260
- NON_EXISTENT_RCOPY_GROUP, 43
 - remote-copy disaster recovery API error, 181
 - remote-copy group modification API error, 172
 - remote-copy group removal API error, 158
 - remote-copy group start API error, 166
 - remote-copy group stop API error, 168
 - remote-copy group synchronization API error, 176
 - single remote-copy group query API error, 190
 - volume admission into a remote-copy group API error, 161
 - volume dismissal from a remote-copy group API error, 164
- NON_EXISTENT_ROLE, 52
 - single-user query API error, 217
- NON_EXISTENT_SET, 37, 149
 - flash cache policy setting API error, 113
 - host-set or VV-set modification API error, 111
 - host-set or VV-set removal API error, 112
 - single-host-set or single-VV-set query error, 114
 - VV-set snapshot creation API error, 146
- NON_EXISTENT_SNAPSHOT, 44
 - volume admission into a remote-copy group API error, 161
- NON_EXISTENT_TASK, 40
 - all-tasks status query API error, 206
- NON_EXISTENT_TEMPLATE
 - CPG creation and modification API error, 53, 66
- NON_EXISTENT_USER, 52
 - single-user query API error, 216
- NON_EXISTENT_VLUN
 - single-VLUN query API error, 133, 134
 - VLUN removal API error, 129
- NON_EXISTENT_VOL, 32
 - creating, resynchronizing, or stopping physical copy of volumes API error, 141
 - host-set or VV-set modification API error, 111
 - single-VLUN query API error, 134
 - single-volume query API error, 92
 - VLUN creation API error, 127
 - volume admission into a remote-copy group API error, 161
 - volume dismissal from a remote-copy group API error, 164
 - volume growth API error, 80
 - volume removal API error, 88
 - volume tuning API error, 85
 - VV-set creation API error, 109
 - VV-set snapshot creation API error, 146
- NON_EXISTENT_VVCOPY, 39
 - creating, resynchronizing, or stopping physical copy of volumes API error, 143
- NON_LOCAL_USER, 52
 - single-user query API error, 216
- NON_UNIQUE_CHAP_SECRET, 34
 - host modification API error, 100
- nonCPGAdminMiB
 - JSON object member
 - overall system capacity query response, 210
- nonCPGsMiB
 - JSON object member
 - overall system capacity query response, 210
- nonCPGSnapshotMiB
 - JSON object member
 - overall system capacity query response, 210
- nonCPGUserMiB
 - JSON object member
 - overall system capacity query response, 210
- NONE
 - enumeration for port operations, 117
 - enumeration for remote-copy system mode, 183
- NONPARTICIPATE
 - enumeration for port operations, 115
- noResyncSnapshot
 - JSON object member
 - for synchronizing a remote-copy group, 175
- NORMAL
 - enumeration for CPG operations, 63
 - enumeration for remote-copy system status, 183
 - enumeration for volume operations, 71
- noSnapshot
 - JSON object member
 - disaster recovery for remote-copy , 180
 - for stopping a remote-copy group, 167
- NOT_STARTED
 - enumeration for volume operations, 71
- noVcn
 - JSON object
 - for VLUN template creation, 126
- null members

- JSON object, 25
- numFPVVs
 - JSON object
 - for CPG query, 68
- numTDVVs
 - JSON object
 - for CPG query, 68
- numTPVVs
 - JSON object
 - for CPG query, 68
- NV_OPERATION_SET_AUTO_CREATED
 - volume admission into a remote-copy group API error, 163
- O
- object members
 - AO configuration query, 218
- OFFLINE
 - enumeration for port operations, 116
- Online
 - JSON object
 - for promoting a virtual copy, 144
 - for promoting a VV-set virtual copy, 151
- online
 - JSON object member
 - for physical copy of volume creation, 140
- ONLINE_COPY
 - enumeration for single-task status query, 206
- onlineNodes
 - JSON object member
 - for storage-system query response, 196
- ONTAP_LEGACY
 - enumeration for host modification, 97
- OPENVMS
 - enumeration for host modification, 97
- os
 - JSON object member
 - for host query, 102, 103
- osPatch
 - JSON object member
 - for host query, 103
- osVersion
 - JSON object member
 - for host query, 103
- OTHER
 - generic API error, 29
 - WSAPI configuration query API error, 203
- overall available space query
 - error codes, 213
- overall capacity
 - querying, 209
- overall system capacity query
 - success response, 209
- overPeriodAlert
 - JSON object member
 - for modifying a remote-copy group, 171
 - for remote-copy group policy, 189
- OVERRIDE_GROUP
 - enumeration for remote-copy group operations, 160

- overrideLowerPriority
 - JSON object
 - for VLUN template creation, 126
- owner
 - JSON object member
 - for storage-system query response, 196
- P
- parameter
 - for unsetting CPG , 168
 - for unsetting snap CPG , 168
 - for unsetting user CPG , 168
- parameter sets
 - for modifying a remote-copy group, 168
- PARAMETER_ALREADY_SPECIFIED
 - CPG creation and modification API error, 54
- parameters
 - for modifying an SLD remote-copy group, 168
- JSON object
 - for creating a physical copy of a VV set, 148
 - for physical-copy of volume creation, 139
- parent
 - JSON object member
 - for resynchronizing physical copy to its VV set, 149
- parentId
 - JSON object member
 - for all-volumes query, 89
- PARTIAL_EXECUTION_SUCCESS
 - CPG creation and modification API error, 54
- partnerPos
 - JSON object member
 - for port query, 118
- password
 - creating for WSAPI access, 56
 - JSON object member
 - for creating credentials, 56
- pathManagement
 - JSON object member
 - for modifying a remote-copy group, 172
 - for remote-copy group policy, 189
- pathOperation
 - JSON object
 - for host modification, 97
 - JSON object member
 - for host modification, 96
- PEER
 - enumeration for port operations, 115, 116
 - enumeration for volume operations, 71
- PENDING_RESET
 - enumeration for port operations, 116
- performance reports
 - generating, 220
- PERIODIC
 - enumeration for remote-copy group mode, 155
- Perl client code samples, 20
- PERM_DENIED
 - generic API error, 29
- permissions
 - for creating a CPG, 64

- for creating a host, 94
- for creating a physical-copy volume, 73
- for creating a snapshot, 73
- for creating a VLUN, 125
- for creating a volume, 73
- for modifying a CPG, 66
- for modifying a host, 96, 100
- for removing a CPG, 67
- for removing a host set or VV set, 111
- for removing a remote-copy group, 157
- for removing a VLUN, 128
- persona
 - JSON object member, 94
 - for host query, 101
- pfcMask
 - JSON object member
 - for port query, 119
- PHYS_COPY_RESYNC
 - enumeration for single-task status query, 205
- physical copy of volume
 - creating, 139
 - resynchronizing, 143
 - stopping, 143
- physical copy of volume creation
 - success response, 141
- physical copy of VV set
 - creating, 148
 - resynchronizing, 149
 - stopping, 149, 150
- physical copy of VV set creation
 - error codes, 149
 - success response, 148
- physical-copy task status
 - error codes, 206
- PHYSICAL_COPY
 - enumeration for volume operations, 71
- physParentId
 - JSON object member
 - for all-volumes query, 89
- policies
 - JSON object
 - for modifying a remote-copy group, 171
 - for volume operations, 72
 - JSON object member
 - for all-volumes query, 89
 - for base-volume creation, 74
 - for modifying a remote-copy group, 171
 - for volume modification, 76
 - parameter set for modifying a remote-copy group, 168
- policy
 - JSON object member
 - for querying remote-copy groups, 187
- PORT
 - enumeration for CPG operations, 61
 - enumeration for VLUN operations, 124
- port device
 - querying, 121
- Port Property
 - API type for single-port query, 120
- port query
 - success response, 120
- port-device query
 - error codes, 122
 - success response, 121, 122
- portConnType
 - enumeration for port operations, 116
- portDevices
 - JSON object
 - port-device query, 121
- portFailOverState
 - enumeration for port operations, 117
- portId
 - JSON object member
 - for port-device query, 121
- portlinkState
 - enumeration for port operations, 115
- portList
 - JSON object member
 - for CPG operations, 61
- portMode
 - enumeration for port operations, 115
- portPos
 - JSON object
 - for host query, 103
 - for VLUN operations, 124
 - for VLUN template creation, 126
 - JSON object member
 - for all-VLUNs query response, 130
 - for host query, 102
 - for port query, 118
 - for single-VLUN query response, 134
- portProtocol
 - enumeration for port operations, 116
- ports
 - configuring, 115
 - enumeration objects for, 115
 - JSON object member
 - for FC-switches query, 123
 - querying, 117
- ports query
 - error codes, 120
 - success response, 117
- portWWN
 - JSON object member
 - for port query, 118
 - for port-device query, 122
- POST *see* HTTP POST
- Pragma
 - server HTTP header, 24
- PRESERVED
 - enumeration for volume operations, 71
- PRIMARY
 - enumeration for remote-copy group role, 188
- Print255
 - API type, 27
- print511
 - API type, 27
- Priority

- JSON object
 - for promoting a virtual copy, 144
- priority
 - JSON object
 - for promoting a VV-set virtual copy, 151
 - for QoS rule creation, 254
 - for QoS rule modification, 256
 - JSON object member
 - for all-QoS rule query, 259
 - for creating a physical copy of a VV set, 148
 - for host-set or VV-set creation, 110
 - for physical copy of volume creation, 140
 - for resynchronizing physical copy to its VV set, 149
 - for single-task status query, 205
- privileges
 - JSON object member
 - for all-users query, 215
- PROMOTE_SV
 - enumeration for single-task status query, 205
- PROMOTE_VIRTUAL_COPY
 - enumeration for promoting a virtual copy, 80
- promoteVirtualCopy
 - enumeration for promoting physical copy of VV set, 150
- PROMOTING
 - enumeration for volume operations, 72
- promoting
 - a virtual copy, 144
 - a VV-set virtual copy, 150
- promoting a virtual copy
 - error codes, 144
 - success response, 144
- promoting a VV-set virtual copy
 - error codes, 151
 - success response, 151
- properties
 - enumeration, 25
- protocol
 - format, 22
 - JSON object member
 - for port query, 118
- provisioningType
 - enumeration for volume operations, 70
 - JSON object member
 - for all-volumes query, 89
- PUT *see* HTTP PUT
- Q**
 - QoS rule
 - creating, 253
 - deletion, 258
 - modifying, 256
 - querying all, 258
 - querying, single, 260
 - QoS rule creation
 - errors, 255
 - success response, 255
 - QoS rule deletion
 - error codes, 258
 - success response, 258
 - QoS rule modification
 - error codes, 258
 - errors, 255
 - success response, 257
 - QoS rule query
 - success response, 258
 - qosEnabled
 - JSON object member
 - for querying all host sets or all VV sets, 114
 - quality of service rule *see* QoS rule
 - query
 - all AO configurations, 218
 - query expression parameters
 - system reporter, 221
 - querying
 - a single CPG, 69
 - a single host, 100
 - a single host set, 114
 - a single port, 120
 - a single QoS rule, 260
 - a single remote-copy group, 190
 - a single VLUN, 132
 - a single volume, 91
 - a single VV set, 114
 - all CPGs, 68
 - all host sets, 113
 - all hosts, 100
 - all ports, 117
 - all QoS rules, 258
 - all VLUNs, 130
 - all volumes, 88
 - all VV sets, 113
 - all-tasks status, 203
 - by iSCSI name, 104
 - by WWN, 104
 - CPG available space, 212
 - FC switches, 27
 - for VLUNs that have not remoteName assigned, 135
 - for volume information when volumes have no snapCPG assigned, 93
 - for volume information when volumes have no userCPG assigned, 93
 - host information, 104
 - host objects, 27
 - LDLayout object available space, 212
 - overall available space, 209
 - overall capacity, 209
 - overall remote-copy information, 182
 - port devices, 27
 - remote-copy groups, 183
 - single-task status, 204
 - storage system information, 196
 - version information, 201
 - VLUNs using filters, 135
 - VV objects, 27
 - VV-set physical copy status, 153
 - with filters, 27
 - querying overall capacity

error codes, 213

R

R0
enumeration for CPG operations, 60

R1
enumeration for CPG operations, 60

R5
enumeration for CPG operations, 60

R6
enumeration for CPG operations, 60

RAIDType
enumeration for CPG operations, 60
JSON object member
for CPG operations, 60

rate
iSCSI port property, 119

rawFreeMiB
JSON object member
for LDayout space query response, 213

rawReservedMiB
JSON object member
for volume space operations, 73

rawTotalMiB
JSON object member
for CPG operations, 63

rawUsedMiB
JSON object member
for CPG operations, 63

RCFC
enumeration for port operations, 116

RCIP
enumeration for port operations, 116
port connection, 118, 119

RCOPY_GROUP_ADD_VOL_FAILED, 47
volume admission into a remote-copy group API error, 163

RCOPY_GROUP_ADD_VOL_FAILED_PARTIAL, 47
volume admission into a remote-copy group API error, 163

RCOPY_GROUP_CREATED_MIRROR_CONFIG_OFF, 48
volume dismissal from a remote-copy group API error, 164

RCOPY_GROUP_EMPTY, 48
remote-copy disaster recovery API error, 181
remote-copy group start API error, 166

RCOPY_GROUP_EXISTENT_VOL, 44
volume admission into a remote-copy group API error, 161

RCOPY_GROUP_EXISTENT_VOL_ON_TARGET, 44
volume admission into a remote-copy group API error, 161

RCOPY_GROUP_EXISTENT_VOL_WWN_ON_TARGET, 51
remote-copy group start API error, 166

RCOPY_GROUP_HAS_NO_CPG, 44
remote-copy group creation API error, 157

volume admission into a remote-copy group API error, 161

RCOPY_GROUP_IN_FAILOVER_STATE, 50
remote-copy group removal API error, 158

RCOPY_GROUP_INCORRECT_SNAPSHOT_OR_VOLUME_SPECIFIED, 51, 166

RCOPY_GROUP_INV_OPERATION_ON_MULTIPLE_TARGETS, 53
remote-copy disaster recovery API error, 181
remote-copy group modification API error, 173

RCOPY_GROUP_INV_POLICY_FOR_GROUP_TARGET CPG creation and modification API error, 54

RCOPY_GROUP_INV_POLICY_FOR_PERIODIC_GROUP, 52
remote-copy group modification API error, 172

RCOPY_GROUP_INV_POLICY_FOR_SYNC_GROUP, 52
remote-copy group modification API error, 172

RCOPY_GROUP_INV_TARGET, 44
remote-copy disaster recovery API error, 181
remote-copy group creation API error, 156
remote-copy group modification API error, 173
remote-copy group start API error, 166
remote-copy group synchronization API error, 176
volume admission into a remote-copy group API error, 161, 162

RCOPY_GROUP_INV_TARGET_NUMBER, 46
remote-copy group modification API error, 173
volume admission into a remote-copy group API error, 162

RCOPY_GROUP_INVOLVED_IN_SYNCHRONIZATION, 52
remote-copy group modification API error, 176

RCOPY_GROUP_IS_BEING_REMOVED, 45

RCOPY_GROUP_IS_BUSY, 46
remote-copy disaster recovery API error, 181
remote-copy group removal API error, 158
volume admission into a remote-copy group API error, 162
volume dismissal from a remote-copy group API error, 164

RCOPY_GROUP_IS_NOT_ASYNC
remote-copy group modification API error, 173

RCOPY_GROUP_IS_NOT_PERIODIC
remote-copy group modification API error, 53, 172

RCOPY_GROUP_IS_SELF_MIRRORED, 47

RCOPY_GROUP_MAX_GROUP_REACHED_ASYNC, 49

RCOPY_GROUP_MAX_GROUP_REACHED_PERIODIC, 49
remote-copy group creation API error, 156

RCOPY_GROUP_MAX_GROUP_REACHED_SYNC, 49
remote-copy group creation API error, 156

RCOPY_GROUP_MAX_VOL_REACHED, 45
volume admission into a remote-copy group API error, 162

RCOPY_GROUP_MAX_VOL_REACHED_ASYNC, 45

RCOPY_GROUP_MAX_VOL_REACHED_PERIODIC, 45

volume admission into a remote-copy group API error, 161
 RCOPY_GROUP_MAX_VOL_REACHED_SYNC, 45
 volume admission into a remote-copy group API error, 161
 RCOPY_GROUP_MIXED_MODES_ON_ONE_TARGET, 48
 remote-copy group creation API error, 157
 RCOPY_GROUP_MODE_NOT_SUPPORTED, 49, 50
 remote-copy group creation API error, 156
 RCOPY_GROUP_MORE_THAN_ONE_PERIODIC_TARGET, 49
 remote-copy group creation API error, 156
 RCOPY_GROUP_MORE_THAN_ONE_SYNC_TARGET, 49
 remote-copy group creation API error, 156
 RCOPY_GROUP_MULTIPLE_RW_SNAPSHOT_IN_SAME_FAMILY, 47
 volume admission into a remote-copy group API error, 163
 RCOPY_GROUP_MULTIPLE_VOL_IN_SAME_FAMILY, 47
 volume admission into a remote-copy group API error, 163
 RCOPY_GROUP_NON_EXISTENT_VOL_ON_TARGET, 44
 volume admission into a remote-copy group API error, 161
 RCOPY_GROUP_NOT_ALL_VOLUMES_SPECIFIED, 48
 remote-copy group start API error, 166
 RCOPY_GROUP_NOT_STARTED, 49, 52
 remote-copy disaster recovery API error, 181
 RCOPY_GROUP_NOT_STOPPED, 53
 remote-copy disaster recovery API error, 181
 RCOPY_GROUP_NOT_SUPPORT_VOL_ID, 47
 RCOPY_GROUP_ONE_TO_ONE_CONFIG_FOR_MIXED_MODE
 remote-copy group creation API error, 156
 RCOPY_GROUP_ONE_TO_ONE_MIXED_MODE, 50
 RCOPY_GROUP_OPERATION_ONLY_ON_PRIMARY_SIDE, 47
 remote-copy disaster recovery API error, 181
 remote-copy group modification API error, 172
 remote-copy group removal API error, 158
 remote-copy group start API error, 166
 remote-copy group synchronization API error, 176
 volume admission into a remote-copy group API error, 163
 volume dismissal from a remote-copy group API error, 165
 RCOPY_GROUP_OPERATION_ONLY_ON_SECONDARY_SIDE, 53
 remote-copy disaster recovery API error, 181
 RCOPY_GROUP_RENAME_RESYNC_SNAPSHOT_FAILED, 48
 remote-copy group removal API error, 158
 volume dismissal from a remote-copy group API error, 164

RCOPY_GROUP_SECONDARY_DOES_NOT_MATCH_PRIMARY, 50
 volume admission into a remote-copy group API error, 163
 RCOPY_GROUP_SECONDARY_GROUP_MORE_THAN_ONE_BACKUP_TARGET, 49
 remote-copy group creation API error, 156
 RCOPY_GROUP_SNAPSHOT_IS_RW, 44
 volume admission into a remote-copy group API error, 161
 RCOPY_GROUP_SNAPSHOT_PARENT_MISMATCH, 50
 volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_STARTED, 46
 remote-copy disaster recovery API error, 181
 remote-copy group modification API error, 173, 176
 remote-copy group removal API error, 158
 remote-copy group start API error, 166
 volume admission into a remote-copy group API error, 162
 volume dismissal from a remote-copy group API error, 164
 RCOPY_GROUP_SYNC_SNAPSHOT_IN_MULTIPLE_TARGET, 47
 volume admission into a remote-copy group API error, 163
 RCOPY_GROUP_TARGET_NOT_IN_GROUP
 CPG creation and modification API error, 54
 RCOPY_GROUP_TARGET_NOT_UNIQUE, 49
 remote-copy group creation API error, 156
 remote-copy group modification API error, 173
 RCOPY_GROUP_TARGET_VOL_EXPORTED, 45
 volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_TARGET_VOL_IS_RO, 50
 volume admission into a remote-copy group API error, 163
 RCOPY_GROUP_TARGET_VOL_NO_SNAPSHOT_SPACE, 45
 volume admission into a remote-copy group API error, 161
 RCOPY_GROUP_TARGET_VOLUME_MISMATCH, 50
 remote-copy group removal API error, 158
 RCOPY_GROUP_TOO_MANY_TARGETS, 49
 remote-copy group creation API error, 156
 RCOPY_GROUP_VOL_, 46
 RCOPY_GROUP_VOL_CLEAN_UP, 46
 volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_VOL_IN_OTHER_GROUP, 46
 volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_VOL_INTERNAL_CONSISTENCY_ERR, 45
 volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_VOL_IS_BEING_REMOVED

volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_VOL_IS_INTERNAL, 46
 volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_VOL_IS_PEER_PROVISIONED, 46
 volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_VOL_IS_PHYSICAL_COPY, 45
 volume admission into a remote-copy group API error, 161
 RCOPY_GROUP_VOL_IS_RO, 44
 volume admission into a remote-copy group API error, 161
 RCOPY_GROUP_VOL_NO_SNAPSHOT_SPACE, 44
 volume admission into a remote-copy group API error, 161
 RCOPY_GROUP_VOL_NOT_IN_GROUP, 48
 RCOPY_GROUP_VOL_NOT_IN_SAME_DOMAIN
 volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_VOL_ONLINE_CONVERSION, 46
 volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_VOL_ONLINE_COPY, 46
 volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_VOL_ONLINE_PROMOTE, 46
 volume admission into a remote-copy group API error, 162
 RCOPY_GROUP_VOL_SIZE_NOT_MATCH, 44
 volume admission into a remote-copy group API error, 161
 RCOPY_GROUP_VOLUME_ALREADY_SYNCED, 51
 remote-copy group start API error, 166
 RCOPY_GROUP_VOLUME_NOT_IN_GROUP
 volume dismissal from a remote-copy group API error, 164
 RCOPY_GROUP_VOLUME_NOT_SYNCED
 CPG creation and modification API error, 54
 RCOPY_IS_NOT_READY, 45
 remote-copy group creation API error, 156
 volume admission into a remote-copy group API error, 162
 volume dismissal from a remote-copy group API error, 164
 RCOPY_MAX_ASYNC_TARGET_REACHED, 51
 RCOPY_MAX_PERIODIC_TARGET_REACHED, 51, 157
 RCOPY_MAX_SYNC_TARGET_REACHED, 51
 remote-copy group creation API error, 157
 RCOPY_REMOVE_REMOTE_VOLUME_FAILED, 48
 RCOPY_TARGET_IN_PEER_PERSISTENCE_SYNC_GROUP_ONLY, 50
 remote-copy group creation API error, 156
 RCOPY_TARGET_IS_NOT_READY, 47
 remote-copy group removal API error, 158
 remote-copy group stop API error, 168, 176
 volume admission into a remote-copy group API error, 163
 volume dismissal from a remote-copy group API error, 165
 RCOPY_TARGET_IS_SELF_MIRRORED
 volume admission into a remote-copy group API error, 162
 RCOPY_TARGET_MODE_NOT_SUPPORTED
 remote-copy group creation API error, 156
 RCOPY_TARGET_MULTI_TARGET_NOT_SUPPORTED, 50
 remote-copy group creation API error, 156
 RCOPY_TARGET_NOT_ASYNC
 CPG creation and modification API error, 54
 RCOPY_TARGET_NOT_SPECIFIED, 48
 remote-copy group start API error, 166
 RCOPY_TARGET_NOT_SUPPORT_VOL_ID
 volume admission into a remote-copy group API error, 162
 RCOPY_TARGET_VOL_AUTO_CREATION_NOT_SUPPORTED, 50
 remote-copy group creation API error, 157
 RCOPY_UNSUPPORTED_TARGET_VERSION, 47
 volume admission into a remote-copy group API error, 163
 rcopyGroupOperation
 enumeration for remote-copy group operations, 159
 rcopySysModeEnum
 enumeration for remote-copy information query, 182
 rcopySysStatusEnum
 enumeration for remote-copy information query, 183
 READ_SECTOR0
 enumeration for VLUN operations, 125
 readOnly
 JSON object member
 for all-volumes query, 89
 for snapshot creation, 137
 READY
 enumeration for port operations, 115
 RECOVER_GROUP
 enumeration for remote-copy group operations, 160
 recovery
 remote-copy disaster, 179
 recoveryPointObjmSecs
 JSON object member
 for querying remote-copy groups, 184
 ref
 JSON object member
 error codes, 55
 remote support, 262
 remote-copy disaster recovery, 179
 remote-copy group
 coordinated snapshot, 177
 coordinated snapshot error messages, 178
 creating, 154
 query subresource information, 190
 removing, 157
 subresource query target, 190
 successful snapshot, 177

- volume query, 191
- remote-copy group creation
 - error codes, 155
- remote-copy group modification
 - error codes, 172
- remote-copy group query
 - success response, 190
- remote-copy group removal
 - error codes, 158
 - success response, 157
- remote-copy group start
 - error codes, 166
 - success response, 165
- remote-copy group stop
 - error codes, 167
 - success response, 167
- remote-copy group synchronization
 - error codes, 176
- remote-copy groups
 - modifying , 168
 - querying a single group, 190
 - querying all, 183
 - starting, 165
 - stopping, 167
 - synchronizing , 174
- remote-copy groups query
 - success response, 183
- remote-copy information query, 182
 - error codes, 183
 - success response, 182
- REMOTE_COPY_FAILOVER
 - enumeration for single-task status query, 205
- REMOTE_COPY_RECOVER
 - enumeration for single-task status query, 205
- REMOTE_COPY_RESTORE
 - enumeration for single-task status query, 205
- REMOTE_COPY_REVERSE
 - enumeration for single-task status query, 205
- REMOTE_COPY_SYNC
 - enumeration for single-task status query, 205
- remoteGroupName
 - JSON object member
 - for querying remote-copy groups, 184
- remoteName
 - filter for VLUN query, 135
 - host WWN or iSCSI path name, 135
 - JSON object member
 - for all-VLUNs query response, 130
 - for single-VLUN query response, 133
- remoteSnapCPG
 - JSON object member
 - for modifying a remote-copy group, 170
 - remote-copy group CPG parameter, 168
- remoteSnpCPG
 - JSON object member
 - for querying remote-copy groups, 187
- remoteUserCPG
 - JSON object member
 - for modifying a remote-copy group, 170
- remote-copy group CPG parameter, 168
- remoteUsrCPG
 - JSON object member
 - for querying remote-copy groups, 187
- remoteVolumeID
 - JSON object member
 - for querying remote-copy groups, 185
- remoteVolumeName
 - JSON object member
 - for querying remote-copy groups, 185
- REMOVE
 - enumeration for host modification, 97
- removewsapisession
 - CLI command to start the WSAPI, 19
- REMOVING
 - enumeration for volume operations, 72
- removing
 - a CPG, 67
 - a host, 100
 - a host set, 112
 - a remote-copy group, 157
 - a storage volume, 87
 - a VLUN, 128
 - a VV set, 112
 - flash cache, 194
- REMOVING_RETRY
 - enumeration for volume operations, 72
- reportedName
 - JSON object member
 - for host query, 103
- reporting
 - HPE 3PAR System Reporter, 220
- reports
 - At Time, 220
 - requesting physical disk performance, 235
 - Versus Time, 220
- request input
 - null members, 25
 - required and optional members, 24
- reservedMiB
 - JSON object member
 - for volume space operations, 73
- RESTART
 - enumeration for remote-copy group state, 188
- RESTORE_GROUP
 - enumeration for remote-copy group operations, 160
- resyncIteration
 - JSON object member
 - for querying remote-copy groups, 186
- RESYNC_PHYSICAL_COPY
 - enumeration for resynchronizing a physical copy, 80
- RESYNC_TARGET
 - enumeration for volume operations, 72
- resynchronizing
 - physical copy to parent volume, 143
 - physical copy to parent VV set, 149
- resyncPhysicalCopy
 - enumeration for resynchronizing physical copy to VV set, 150

- resyncSnapshotName
 - JSON object member
 - for querying remote-copy groups, 185
- RETAINED, 33
 - volume removal API error, 88
- retaining
 - resynchronization snapshot during remote-copy group removal, 157
- retentionHours
 - JSON object member
 - for base-volume creation, 75
 - for snapshot creation, 138
 - for volume modification, 76
 - remote-copy group snapshot, 177
- retentionTime8601
 - JSON object member
 - for all-volumes query, 89
- retentionTimeSec
 - JSON object member
 - for all-volumes query, 90
- REVERSE_GROUP
 - enumeration for remote-copy group operations, 160
- right
 - JSON object member
 - for all-roles query, 217
- rightDescription
 - JSON object member
 - for all-roles query, 217
- rights
 - JSON object member
 - for all-roles query, 217
- rmExpTime
 - JSON object member
 - for volume modification, 77
- rmGrowthLimit
 - JSON object
 - for CPG creation, 65
 - JSON object member
 - for modifying CPGs, 67
- rmSnapFrequency
 - JSON object member
 - for modifying a remote-copy group, 171
- rmSsSpcAllocLimit
 - JSON object member
 - for volume modification, 77
- rmSsSpcAllocWarning
 - JSON object member
 - for volume modification, 77
- rmSyncPeriod
 - JSON object member
 - for modifying a remote-copy group, 170
 - paramter for modifying an SLD remote-copy group, 168
- rmUsrSpcAllocLimit
 - JSON object member
 - for volume modification, 77
- rmUsrSpcAllocWarning
 - JSON object member
 - for volume modification, 77
- rmWarningAlert
 - JSON object
 - for CPG creation, 65
 - JSON object member
 - for modifying CPGs, 67
- roChildId
 - JSON object member
 - for all-volumes query, 90
- role
 - Edit
 - for CPG creation, 64
 - for CPG modification, 66, 67
 - for host creation, 94
 - for host modification, 96, 100
 - for host-set or VV-set modification, 108
 - for host-set or VV-set removal, 111
 - for VLUN creation, 125
 - for VLUN removal, 128
 - for volume creation, 73
 - for VV-set snapshot creation, 146
 - JSON object member
 - for all-roles query, 217
 - for all-users query, 215
 - for querying remote-copy groups, 184
 - Service
 - for CPG modification, 66
 - Super
 - for CPG creation, 64
 - for CPG modification, 66
 - for CPG removal, 67
 - for host creation, 94
 - for host modification, 96, 100
 - for host-set or VV-set creation, 108, 146
 - for host-set or VV-set removal, 111
 - for remote-copy group removal, 157
 - for VLUN creation, 125
 - for VLUN removal, 128
 - for volume creation, 73
- roleReversed
 - JSON object member
 - for querying remote-copy groups, 187
- ROUND_ROBIN
 - enumeration for VLUN operations, 125
- RPM
 - JSON object member
 - for CPG operations, 62
- rwChildId
 - JSON object member
 - for all-volumes query, 90
- S
 - SA_GROW_FAILED
 - enumeration for CPG operations, 64
 - SA_LIMIT_REACHED
 - enumeration for CPG operations, 64
 - SA_WARN_REACHED
 - enumeration for CPG operations, 64
 - SAGrowth
 - JSON object

- for CPG operations, 63
 - for CPG query, 68
- SAS
 - enumeration for port operations, 117
- SAUsage
 - JSON object
 - for CPG operations, 63
 - for CPG query, 68
- saveSnapshot
 - JSON object member
 - for creating a physical copy of a VV set, 148
 - for physical copy of volume creation, 140
- SCHEDULED_TASK
 - enumeration for single-task status query, 205
- SCSI_TEST_UNIT_READY
 - enumeration for VLUN operations, 125
- SD_GROW_FAILED
 - enumeration for CPG operations, 64
- SD_LIMIT_REACHED
 - enumeration for CPG operations, 64
- SD_WARN_REACHED
 - enumeration for CPG operations, 64
- SDGrowth
 - JSON object
 - for CPG operations, 63
 - for CPG query, 68
- SDK *see* Client code samples
- SDUsage
 - JSON object
 - for CPG operations, 63
 - for CPG query, 68
- SECONDARY
 - enumeration for remote-copy group role, 188
- security
 - session key, 57
- secVolumeName
 - JSON object member
 - for admitting a volume into a remote-copy group, 159
- Serial-attached SCSI *see* SAS
- serialNumber
 - JSON object member
 - for storage-system query response, 196
- Server
 - server HTTP header, 24
- server
 - WSAPI
 - configuring, 19
 - starting, 19
- server HTTP header
 - Cache-Control, 24
 - Connection, 24
 - Content-Type, 24
 - Date, 24
 - format, 24
 - Location, 24
 - Pragma, 24
 - Server, 24
- serviceParams
 - JSON object member
 - for port-device query, 122
- session
 - timeout, 59
- session key
 - creating, 56
 - deleting, 59
 - multiple, 57
 - security, 57
 - timed expiration of, 59
 - WSAPI, 56
- session key creation
 - example, 56
 - example using cURL, 57
 - success response, 56
- session key deletion
 - error codes, 59
 - success response, 59
- sessions
 - WSAPI, maximum concurrent, 57
- sessionsInUse
 - JSON object member
 - for WSAPI configuration query, 203
- sessionTimeout
 - JSON object member
 - for WSAPI configuration query, 203
- SET_SIZE_NOT_SAME, 40, 149
- setmembers
 - JSON object member
 - for host-set or VV-set creation, 108, 110
 - for querying all host sets or all VV sets, 114
- setSize
 - JSON object member
 - for CPG operations, 60
- setting
 - system flash-cache policy, 207
- setwsapi
 - CLI command, 59
 - CLI command to configure the WSAPI server, 19
- showwsapi
 - CLI command to display server service configuration state, 19
- showwsapisession
 - CLI command to start the WSAPI, 19
- SHUTDOWN
 - enumeration for remote-copy system status, 183
- single CPG query, 69
- single host set
 - querying, 114
- single instance query
 - AO configuration, 219
- single QOS-rule query
 - success response, 260
- single QoS-rule query
 - error codes, 260
- single remote-copy group query
 - error codes, 190
 - success response, 190
- single task status

- querying, 204
- single user query
 - AO configuration, 219
- single volume query, 91
- single VV set query, 114
- single-CPG query
 - error codes, 69
 - success response, 69
- single-host query
 - a single host, 100
- single-port query
 - a single port, 120
 - error codes, 120
 - success response, 120
- single-task status query
 - success response, 204
- single-user query
 - error codes, 216, 217
- single-VLUN query, 132
 - error codes, 134
 - success response, 133, 135
- single-volume query
 - error codes, 91
 - success response, 91
- sizeGiB
 - JSON object member
 - for flash cache, 193
 - for querying flash cache, 194
- sizeMiB
 - JSON object member
 - for all-volumes query, 90
 - for base-volume creation, 74
- skipBlock
 - remote-copy group snapshot, 177
- skipInitialSync
 - JSON object member
 - for admitting a volume into a remote-copy group, 159
 - for starting a remote-copy group, 165
- skipPromote
 - JSON object member
 - disaster recovery for remote-copy , 180
- skipStart
 - JSON object member
 - disaster recovery for remote-copy , 179
- skipSync
 - JSON object member
 - disaster recovery for remote-copy , 180
- slot
 - JSON object member
 - for host query, 103
 - for VLUN operations, 124
- slotList
 - JSON object member
 - for CPG operations, 61
- snapCPG
 - JSON object member
 - for all-volumes query, 90
 - for base-volume creation, 74
 - for creating a remote-copy group, 155
 - for physical copy of volume creation, 140
 - for tuning a volume, 83
 - for volume modification, 76
- SNAPDATA_INVALID
 - enumeration for volume operations, 71
- snapFrequency
 - JSON object member
 - for modifying a remote-copy group, 171
 - for querying remote-copy groups, 187
- snapshot
 - retaining during remote-copy group removal, 157
- SNAPSHOT_ACCOUNTING
 - enumeration for single-task status query, 205
- SNAPSHOT_LIMIT_REACHED, 39
 - VV-set snapshot creation API error, 147
- snapshotName
 - JSON object member
 - for admitting a volume into a remote-copy group, 159
- snapshots
 - coordinated for remote-copy group, 177
 - creating, 137
 - creating for remote-copy group, 176
- snapshotSpace
 - JSON object
 - for volume operations, 73
 - JSON object member
 - for all-volumes query, 90
- snapshotSpaceMiB
 - distributing volumes, 87
- SNP
 - enumeration for volume operations, 71
- SNP_CPG
 - enumeration for changing the snap CPG of a volume, 83
- software development kit see Client code samples
- space available
 - querying, 209
- space JSON objects
 - for volume operations, 73
- space query
 - error codes, 213
 - success response, 212
- space reports
 - generating, 220
- spareMiB
 - JSON object member
 - overall system capacity query response, 212
- spareUnusedMiB
 - JSON object member
 - overall system capacity query response, 212
- spareUsedMiB
 - JSON object member
 - overall system capacity query response, 212
- SSD
 - enumeration for CPG operations, 62
- SSDCapacity
 - JSON object member

- for overall system capacity query response, 209
- SSL v3, 57
- ssSpcAllocLimitPct
 - JSON object member
 - for all-volumes query, 90
 - for base-volume creation, 74
 - for volume modification, 77
- ssSpcAllocWarningPct
 - JSON object member
 - for all-volumes query, 90
 - for base-volume creation, 74
 - for volume modification, 76
- STALE
 - enumeration for remote-copy synchronization status, 189
 - enumeration for volume operations, 72
- staleSS
 - JSON object
 - for volume operations, 72
- START_GROUP
 - enumeration for remote-copy group operations, 160
- STARTED
 - enumeration for remote-copy group state, 188
 - enumeration for remote-copy system mode, 183
- STARTING
 - enumeration for remote-copy group state, 188
- starting
 - a remote-copy group, 165
 - WSAPI server, 19
- startingSnapshots
 - JSON object member
 - for starting a remote-copy group, 165
- startTime
 - JSON object member
 - for copy task status query, 205
- STARTUP
 - enumeration for remote-copy system status, 183
- startwsapi
 - CLI command to stop the WSAPI server, 19
- State
 - JSON object
 - for CPG query, 68
- state
 - enumeration for CPG operations, 63
 - enumeration for creating physical copy of volumes, 140
 - enumeration for volume operations, 71
 - JSON object member
 - for all-volumes query, 90
 - for querying flash cache, 195
 - for querying remote-copy groups, 187
- Status
 - JSON object member
 - for single-task status query, 204
- status
 - JSON object member
 - for remote-copy information query response, 182
- stgt
 - iSCSI port property, 119
- STOP_GROUP
 - enumeration for remote-copy group operations, 160
- STOP_PHYSICAL_COPY
 - enumeration for stopping a physical copy, 80
- STOP_PROMOTE_VIRTUAL_COPY
 - enumeration for stopping the promotion of a virtual copy, 80
- stopGroups
 - JSON object member
 - disaster recovery for remote-copy , 180
- STOPPED
 - enumeration for remote-copy group state, 188
 - enumeration for remote-copy synchronization status, 189
 - enumeration for remote-copy system mode, 183
- stopPhysicalCopy
 - enumeration for stopping physical copy of VV SET, 150
- stopping
 - a remote-copy group, 167
 - physical copy of a VV set, 150
 - physical copy of volumes, 143
 - physical copy of VV set, 149
- stopPromoteVirtualCopy
 - enumeration for stopping promote virtual copy operations in a VV set, 150
- stopwsapi
 - CLI command to start the WSAPI, 19
- storage entity
 - Java client code samples classes, 20
- storage system
 - hostname, 22
- storage volume removal
 - error codes, 88
 - success response, 87
- storage-system query
 - error codes, 200
 - success response, 196
- storage-system version query
 - error codes, 202
 - success response, 201
- subresource query
 - remote-copy group, 190
- subresource target query
 - remote-copy group, 190
- success
 - flash-cache policy setting, 207
 - for querying a flash cache, 194
 - VV-set flash cache policy setting, 113
- success response
 - admission of volume into remote-copy group, 160
 - all remote-copy groups query, 183
 - all-roles query, 216
 - all-task status query, 204
 - all-users query, 215, 216, 217
 - all-VLUNs query, 130
 - CPG creation, 65
 - CPG modification, 67
 - CPG query, 69

- CPG removal, 67
- creation of remote-copy group, 155
- disaster recovery remote-copy, 180
- dismissal of volume from remote-copy group, 164
- distributing volume space, 86
- flash cache creation, 193
- flash cache removal, 194
- for creating a physical copy of a VV set, 148
- for creating physical copy of a volume, 141
- for port-device query, 121, 122
- for promoting a virtual copy, 144
- for promoting a VV-set virtual copy, 151
- for querying all host sets, 113
- for querying all VV sets, 113
- for resynchronizing a physical copy to its VV set, 150
- for resynchronizing the physical copy of a volume, 143
- for stopping physical copy of a VV set, 150
- for stopping the physical copy of a volume, 143
- growing volumes, 80
- host creation, 95
- host modification, 98
- host query, 100
- host query with WWN filtering, 105
- host removal, 100
- host set modification, 111
- host-set creation, 109
- host-set removal, 112
- modification of remote-copy group, 172
- multiple-volumes filter for volume query, 93
- QoS rule creation, 255
- QoS rule deletion, 258
- QoS rule modification, 257
- QoS rule query, 258
- remote-copy group removal, 157
- remote-copy group start, 165
- remote-copy group stop, 167
- remote-copy information query, 182
- session key deletion, 59
- session-key creation, 56
- single QoS-rule query, 260
- single remote-copy group query, 190
- single-CPG query, 69
- single-task status query, 204
- single-volume query, 91
- space query, 212
- synchronization of remote-copy group, 175
- task cancellation, 207
- tuning volumes, 83
- VLUN creation, 126
- VLUN removal, 129
- volume creation, 75
- volume query, 88
- volume removal, 87
- VV-set modification, 111
- VV-set removal, 112
- VV-set snapshot creation, 146
- WSAPI configuration query, 202
- WWN filter for volume query, 92
- support
 - Hewlett Packard Enterprise, 261
 - SUSPENDED
 - enumeration for port operations, 115
 - sv_create
 - permissions for, 73
 - SVC_UNAVAIL
 - generic API error, 30
 - SWITCH
 - enumeration for FC-switches query, 123
 - SWITCHOVER_GROUP
 - enumeration for remote-copy group operations, 160
 - syncIteration
 - JSON object member
 - for querying remote-copy groups, 186
 - SYNC
 - enumeration for remote-copy group mode, 155
 - SYNC_GROUP
 - enumeration for remote-copy group operations, 160
 - SYNCED
 - enumeration for remote-copy synchronization status, 189
 - synchronization of remote-copy group
 - success response, 175
 - synchronizing
 - a remote-copy group, 174
 - SYNCING
 - enumeration for remote-copy synchronization status, 189
 - syncPeriod
 - JSON object member
 - for modifying a remote-copy group, 170
 - for querying remote-copy groups, 187
 - parameter set for modifying a remote-copy group, 168
 - paramter for modifying an SLD remote-copy group, 168
 - syncSnapshotName
 - JSON object member
 - for querying remote-copy groups, 185
 - syncStatus
 - JSON object member
 - for querying remote-copy groups, 185
 - SYS_SVC_NOT_READY
 - generic API error, 31
 - SYS_TOO_BUSY
 - generic API error, 31
 - System
 - JSON object
 - for volume operations, 72
 - overall system capacity query response, 211
 - system
 - JSON object member
 - overall system capacity query response, 210
 - system reporter
 - common variables, 220
 - HPE 3PAR, 220
 - query expression parameters, 221
 - SYSTEM_ERR
 - generic API error, 31
 - SYSTEM_REPORTER_DATA_NOT_AVAILABLE

- CPG creation and modification API error, 54
- SYSTEM_TASK
 - enumeration for single-task status query, 205
- systemResourceUsage
 - JSON object member
 - for WSAPI configuration query, 203
- systemVersion
 - JSON object member
 - for storage-system query response, 196
- T
- t0CPG
 - AO configuration JSON object member, 218
- t1CPG
 - AO configuration JSON object member, 218
- t2CPG
 - AO configuration JSON object member, 218
- TARGET
 - enumeration for host modification, 97
 - enumeration for port operations, 115
- target
 - JSON object member
 - for querying remote-copy groups, 187
- targetChapEnabled
 - JSON object member
 - for host query, 101
- targetChapName
 - JSON object member
 - for host query, 101
- targetEncryptedChapSecret
 - JSON object member
 - for host query, 101
- targetName
 - JSON object member
 - disaster recovery for remote-copy , 179
 - for admitting a volume into a remote-copy group, 159
 - for creating a remote-copy group, 154
 - for modifying a remote-copy group, 169
 - for starting a remote-copy group, 165
 - for stopping a remote-copy group, 167
 - for synchronizing a remote-copy group, 175
 - for volume properties in a remote-copy group, 185, 187
- targets
 - JSON object member
 - for admitting a volume into a remote-copy group, 158, 159
 - for creating a remote-copy group, 154, 155
 - for modifying a remote-copy group, 169
 - for querying remote-copy groups, 184
- task cancellation
 - error codes, 207
 - success response, 207
- taskid
 - JSON object member
 - for resynchronizing physical copy to its VV set, 149
- taskPriorityEnum
 - enumeration for creating physical copy of volumes, 140
- tasks
 - canceling, 206
 - JSON object member
 - for remote-copy disaster recovery, 181
 - for remote-copy synchronization response, 176
 - for starting a remote-copy group, 166
 - WSAPI, 21
- tasktypeEnum
 - enumeration for single-task status query, 206
- TDVV
 - enumeration for changing the snap CPG of a volume, 83
 - enumeration for volume operations, 71
- tdvv
 - JSON object member
 - for base-volume creation, 74
 - for physical copy of volume creation, 140
- TDVV_COUNT_EXCEED_CPG_LIMIT, 52
- volume creation API error, 76
- template
 - JSON object
 - for CPG creation, 65
 - VLUN creation, 124
- thinly-provisioned virtual volume *see* TPVV
- tierCpg objects, 218
- TIMEOUT
 - generic API error, 29
- timeout
 - session, 59
- timeZone
 - JSON object member
 - for storage-system query response, 197
- TLS v1, 57
- TOO_LARGE
 - generic API error, 29
 - VLUN creation API error, 127
 - volume creation API error, 76
- Total
 - JSON object
 - for port query, 118
 - JSON object member
 - for all-roles query, 216
 - for all-tasks status query, 204
 - for all-users query, 215
 - for host query with WWN filtering, 105
 - for volume query with multiple-volumes filter, 93
 - for volume query with WWN filter, 92
- total
 - AO configuration user collection, 218
 - distributing volumes, 86
 - JSON object
 - for all remote-copy groups query, 183
 - for all-volumes query, 88
 - for querying CPGs, 68
 - JSON object member
 - for all remote-copy groups query response, 184
 - for all-QoS rule query, 258

- for all-VLUNs query response, 130
- for FC-switches query, 122
- for port-device query, 121
- for querying all host sets or all VV sets, 113
- for single-VLUN query response, 133, 135
- totalAllocatedMiB
 - JSON object member
 - overall system capacity query response, 210
- totalCapacityMB
 - JSON object member
 - for storage-system query response, 196
- totalChunkletsGreaterThanOrEqualTo
 - JSON object member
 - for CPG operations, 62
- totalChunkletsLessThan
 - JSON object member
 - for CPG operations, 62
- totalMiB
 - JSON object member
 - for CPG operations, 63
 - overall system capacity query response, 209
- totalNodes
 - JSON object member
 - for storage-system query response, 196
- totalPhases
 - JSON object member
 - for single-task status query, 204
- totalSteps
 - JSON object member
 - for single-task status query, 205
- totalSystemMiB
 - JSON object member
 - overall system capacity query response, 211
- totalVolumesMiB
 - JSON object member
 - overall system capacity query response, 210
- tpgt
 - iSCSI port property, 120
- TPVV, 60
 - enumeration for converting a volume to a TPVV, 83
 - enumeration for volume operations, 70
- tpvv
 - JSON object member
 - for base-volume creation, 74
 - for physical copy of volume creation, 140
- TUNE_VOLUME
 - enumeration for tuning a VV, 80
- tuneOperation
 - JSON object member
 - for tuning a volume, 82
- TUNING
 - enumeration for volume operations, 72
- tuning volumes
 - success response, 83
- TUPDATE_VIRTUAL_COPY
 - enumeration for tuning a VV, 80
- type
 - JSON object
 - for QoS rule creation, 253

- JSON object member
 - for all-QoS rule query, 259
 - for all-VLUNs query response, 131
 - for FC-switches query, 123
 - for port query, 118
 - for single-task status query, 204
 - for single-VLUN query response, 134

U

- uint32
 - API type, 27
- unavailableCapacityMiB
 - JSON object member
 - overall system capacity query response, 210
- uniform resource identifier *see* URI
- UNKNOWN
 - enumeration for FC-switches query, 123
 - enumeration for remote-copy group state, 188, 190
 - enumeration for VLUN operations, 125
 - enumeration for volume operations, 71
- UNLICENSED_FEATURE
 - generic API error, 31
 - QoS rule modification API error, 256
 - remote-copy disaster recovery API error, 181
 - remote-copy group synchronization API error, 176
 - single remote-copy group query API error, 190
 - volume modification API error, 78
- unmappedMiB
 - JSON object member
 - overall system capacity query response, 211
- unsetSnapCPG
 - JSON object member
 - for modifying a remote-copy group, 169
- unsetUserCPG
 - JSON object member
 - for modifying a remote-copy group, 169
- UNSUP_CONTENT
 - generic API error, 30
- UNSUP_HTTP
 - generic API error, 29
 - unsupported HTTP version error, 22
- UNSUP_LANGUAGE
 - generic API error, 30
- UNSUP_OP
 - generic API error, 29
- UNSUP_REPRESENTATION
 - generic API error, 30
- UNSYNC
 - enumeration for remote-copy synchronization status, 189
- updates
 - accessing, 261
- updating
 - a remote-copy group, 168
- UPGRADE
 - enumeration for remote-copy system status, 183
- URI
 - creating flash cache, 193
 - for admitting a volume into a remote-copy group, 158

- for canceling a task, 206
- for creating a CPG, 64
- for creating a host, 94
- for creating a host set, 108
- for creating a physical copy of a VV set, 148
- for creating a QoS rule , 253
- for creating a VLUN, 125
- for creating a VV set, 108, 146
- for creating base volumes, 73
- for creating physical copies of volumes, 139
- for creating remote-copy group, 154
- for creating snapshots, 137
- for deleting a session key, 59
- for dismissing a volume from a remote-copy group, 163
- for filtering WWNs during volume query, 92
- for growing volumes, 79
- for modifying a host, 96
- for modifying a host set, 110
- for modifying a QoS rule , 256
- for modifying a remote-copy group, 168
- for modifying a volume, 76
- for modifying a VV set, 110
- for promoting a virtual copy, 144
- for promoting a VV-set virtual copy, 150
- for QoS rule deletion, 258
- for querying a flash cache, 194
- for querying a single CPG, 69
- for querying a single host set, 114
- for querying a single port, 120
- for querying a single QoS, 260
- for querying a single remote-copy group, 190
- for querying a single role, 217
- for querying a single user, 216
- for querying a single VLUN, 132
- for querying a single volume, 91
- for querying a single VV set, 114
- for querying all CPGs, 68
- for querying all host sets, 113
- for querying all ports, 117
- for querying all QoS rules, 258
- for querying all remote-copy groups, 183
- for querying all volumes, 88
- for querying all VV sets, 113
- for querying all-tasks status, 203
- for querying CPG space, 212
- for querying FC switches, 122
- for querying hosts, 100
- for querying LDDisplay space, 212
- for querying overall remote-copy information, 182
- for querying overall system capacity, 209
- for querying port devices, 121
- for querying single-task status, 204
- for querying system information, 196
- for querying version information, 201
- for querying VLUNs using filters, 135
- for querying WSAPI configuration information, 202
- for querying WSAPI roles, 216
- for querying WSAPI users, 215
- for removing a CPG, 67
- for removing a host, 100
- for removing a remote-copy group, 157
- for removing a storage volume, 87
- for removing remote-copy group while retaining resynchronization snapshot, 157
- for resynchronizing a physical copy to parent volume, 143
- for resynchronizing a physical copy to parent VV set, 149
- for session key creation, 56
- for starting a remote-copy group, 165
- for stopping a physical copy of a volume, 143
- for stopping a physical copy of a VV set, 149
- for stopping a remote-copy group, 167
- for successful admission of volume into a remote-copy group using HTTP POST, 160
- for successful admission of volume into a remote-copy group using HTTP PUT, 160
- for successful CPG creation, 65
- for successful CPG modification, 67
- for successful creation of a physical copy of a VV set, 148
- for successful host creation, 95
- for successful host modification, 98
- for successful host-set creation, 109
- for successful host-set modification, 111
- for successful VLUN creation, 126
- for successful volume creation, 75
- for successful volume modification, 78
- for successful VV-set creation, 109, 146
- for successful VV-set modification, 111
- for synchronizing a remote-copy group, 174
- for tuning volumes, 82
- for volume information query with multiple volumes, 92
- format for WSAPI, 22
- HTTP methods, 22
- parameters for removing a VLUN
 - for VLUN removal, 128
- server HTTP headers, 24
- URI_RES_NOT_FOUND
 - generic API error, 29
- usableFreeMiB
 - JSON object member
 - for LDDisplay space query response, 213
- usedLDWarningAlertMiB
 - JSON object
 - for CPG creation, 64
- usedMiB
 - JSON object member
 - for CPG operations, 63
 - for volume space operations, 73
- usedSizeGiB
 - JSON object member
 - for querying flash cache, 195
- User
 - JSON object member
 - for single-task status query, 205
- user

- JSON object member
 - for creating credentials, 56
- userCPG
 - JSON object member
 - for all-volumes query, 90
 - for volume modification, 77
- username
 - creating for WSAPI access, 56
 - JSON object member
 - for all-users query, 215
- users collection
 - message body, 218
- userSpace
 - JSON object
 - for volume operations, 73
 - JSON object member
 - for all-volumes query, 90
- userSpaceMiB
 - distributing volumes, 87
- USR_CPG
 - enumeration for changing the user CPG of a volume, 83
- usrSpcAllocLimitPct
 - JSON object member
 - for all-volumes query, 90
 - for base-volume creation, 75
 - for volume modification, 77
- usrSpcAllocWarningPct
 - JSON object member
 - for all-volumes query, 90
 - for base-volume creation, 74
 - for volume modification, 77
- UsrUsage
 - JSON object
 - for CPG operations, 63
 - for CPG query, 68
- uuid
 - JSON object
 - for CPG query, 68
 - JSON object member
 - for all-volumes query, 90
- V
 - vendor
 - JSON object member
 - for FC-switches query, 123
 - for host query, 102, 103
 - version
 - JSON object member
 - for WSAPI configuration query, 203
 - version query
 - error codes, 202, 203
 - success response, 201
 - virtual copy
 - promoting, 144
 - virtual copy update
 - error codes, 153
 - virtual logical unit number *see* VLUN
 - virtual volume, 124
 - see also* VV
 - virtual-copy promotion
 - error codes, 144
 - VIRTUAL_COPY
 - enumeration for volume operations, 71
 - virtualportWWN
 - JSON object member
 - for port-device query, 122
 - vlands
 - iSCSI port property, 120
 - VLUN, 124
 - active, 124
 - configuring, 124
 - enumeration, 124
 - exporting, 124
 - query example, 131
 - removing, 128
 - VLUN creation, 125
 - error codes, 126
 - example, 127
 - success response, 126
 - VLUN query
 - success response, 133, 135
 - VLUN query filters, 135
 - VLUN query using filters
 - error codes, 135
 - VLUN removal
 - error codes, 129
 - example, 129
 - success response, 129
 - VLUN template
 - creating, 124
 - VLUN type
 - enumeration for VLUN operations, 124
 - vlun_create
 - permissions for, 125
 - vlun_remove
 - permissions for, 128
 - VLUNs
 - single-VLUN query error codes, 134
 - VMWARE
 - enumeration for host modification, 97
 - volume
 - admitting, 158
 - configuration objects for, 70
 - dismissing, 163
 - enumeration objects for, 70
 - modifying, 76
 - removing, 87
 - space JSON objects, 73
 - volume admission into remote-copy group
 - error codes, 161
 - volume creation, 73
 - error codes, 75
 - physical copy, 139
 - snapshot, 137
 - success response, 75
 - volume dismissal from remote-copy group
 - error codes, 164

- volume growth
 - error codes, 80
- volume modification
 - error codes, 78
 - message body JSON objects, 76
 - success response, 78
- volume properties
 - remote-copy group, 191
- volume query
 - error codes, 91
 - success response, 88, 91
- volume query with multiple-volumes filters
 - error codes, 93
- volume query with WWN filters
 - error codes, 92
- volume removal
 - error codes, 88
 - success response, 87
- volume tuning
 - error codes, 84
- volumeAutoCreation
 - JSON object member
 - for admitting a volume into a remote-copy group, 159
- volumelatteration
 - JSON object member
 - for querying remote-copy groups, 185
- volumeLastSnapTime
 - JSON object member
 - for volume properties in a remote-copy group, 186
- volumeLastSnapTimeSec
 - JSON object member
 - for volume properties in a remote-copy group, 186
- volumeLastSyncTime
 - JSON object member
 - for volume properties in a remote-copy group, 186
- volumeLastSyncTimeSec
 - JSON object member
 - for volume properties in a remote-copy group, 186
- volumeName
 - distributing volumes, 86
 - JSON object
 - for VLUN template creation, 125
 - JSON object member
 - for admitting a volume into a remote-copy group, 158
 - for all-VLUNs query response, 130
 - for dismissing a volume from a remote-copy group, 164
 - for single-VLUN query response, 133
 - for starting a remote-copy group, 165
- Volumes
 - JSON object
 - overall system capacity query response, 210
- volumes
 - growing, 79
 - JSON object member
 - for querying remote-copy groups, 184
 - overall system capacity query response, 210
 - querying all, 88
 - tuning, 82
- volumeSyncLength
 - JSON object member
 - for volume properties in a remote-copy group, 186
- volumeSyncOffset
 - JSON object member
 - for volume properties in a remote-copy group, 186
- volumeWWN
 - filter for VLUN query, 135
 - JSON object member
 - for all-VLUNs query response, 131
 - for single-VLUN query response, 134
 - WWN of exported volume, 135
- VV
 - modifying, 76
- VV set
 - creating, 108
 - creating physical copy, 148
 - error codes for creating physical copy, 149
 - modifying, 110
 - querying, 113
 - removing, 112
- VV set resynchronization
 - success response, 150
- VV space distribution
 - display, 86
- VV-set creation
 - error codes, 109
- VV-set flash-cache policy
 - success, 113
- VV-set modification
 - success response, 111
- VV-set query
 - error codes, 114
- VV-set removal
 - error codes, 112
 - success response, 112
- VV-set snapshot
 - creating, 146
- VV-set snapshot creation
 - success response, 146
- VV-set snapshot volume creation
 - error codes, 146
- VV-set virtual copy
 - promoting, 150
- VV-set virtual-copy promotion
 - error codes, 151
- VV_COPY
 - enumeration for single-task status query, 205
- vv_create
 - permissions for, 73
- VV_ID_LIMIT_REACHED, 39
 - VV-set snapshot creation API error, 147
- VV_IN_INCONSISTENT_STATE, 37
 - creating, resynchronizing, or stopping physical copy of volumes API error, 142
 - host-set or VV-set modification API error, 111
 - volume growth API error, 81

- volume tuning API error, 85
- VV-set creation API error, 109
- VV-set snapshot creation API error, 148
- VV_IN_STALE_STATE, 40
 - creating, resynchronizing, or stopping physical copy of volumes API error, 143
 - virtual-copy promotion API error, 145
 - VV-set snapshot creation API error, 147
 - VV-set virtual-copy promotion API error, 152
- VV_IS_BEING_REMOVED, 37
 - creating, resynchronizing, or stopping physical copy of volumes API error, 142
 - host-set or VV-set modification API error, 111
 - virtual-copy promotion API error, 145
 - volume growth API error, 81
 - volume tuning API error, 85
 - VV-set creation API error, 109
 - VV-set snapshot creation API error, 147
 - VV-set virtual-copy promotion API error, 151
- VV_LIMIT_REACHED, 39
 - VV-set snapshot creation API error, 146
- VV_NEEDS_TO_BE_CHECKED, 43
 - volume tuning API error, 85
- VV_NEW_SIZE_EXCEED_CPG_LIMIT, 40
 - volume growth API error, 81
- VV_NEW_SIZE_EXCEED_LIMIT, 41
 - volume growth API error, 81
- VV_NEW_SIZE_IS_SMALLER, 40
- VV_NOT_IN_SAME_DOMAIN, 38
 - creating, resynchronizing, or stopping physical copy of volumes API error, 141
 - volume growth API error, 80
- VV_NOT_STARTED, 40
 - virtual-copy promotion API error, 144
 - volume growth API error, 81
 - volume tuning API error, 85
 - VV-set snapshot creation API error, 147
 - VV-set virtual-copy promotion API error, 151
- VV_SIZE_CANNOT_REDUCE
 - volume growth API error, 81
- VV_UNAVAILABLE, 40
 - VV-set snapshot creation API error, 147
- VVSET_QOS_TARGET, 37
 - VV set removal API error, 112
- vvset_set
 - permissions for, 108

W

- warningMiB
 - JSON object member
 - for CPG operations, 63
- warningPct
 - JSON object
 - for CPG query, 68
- Web Services application program interface *see* WSAPI
- websites, 261
 - customer self repair, 262
- WindowsServer
 - enumeration for host modification, 98

World Wide Name *see* WWN

WSAPI

- accessing, 21
- description, 18
- hostname, 22
- overview, 21
- request input, 24
- session key, 56
- system access, 55
- tasks, 21
- WSAPI configuration information query
 - error codes, 203
- WSAPI configuration query
 - success response, 202
- WSAPI credentials
 - creating, 56
- WSAPI sessions
 - maximum, 57
- WWN
 - API type, 27
 - JSON object member
 - for host query, 102
 - name, 34, 95, 96
 - names, 96, 98, 99
- wwn
 - JSON object member
 - for all-volumes query, 90
- WWN filter for volume query
 - success response, 92

X

- X-HP3PAR-WSAPI-SessionKey
 - client HTTP header, 23
 - using, 57

XXX

- enumeration for port operations, 115

Z

ZERO

- enumeration for QoS rule creation or modification, 255

zeroDetect

- JSON object
 - for volume operations, 72