HCP SDK Documentation

Release 0.9.0-3

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CHAPTER

ONE

PREFACE

1.1 About HCP

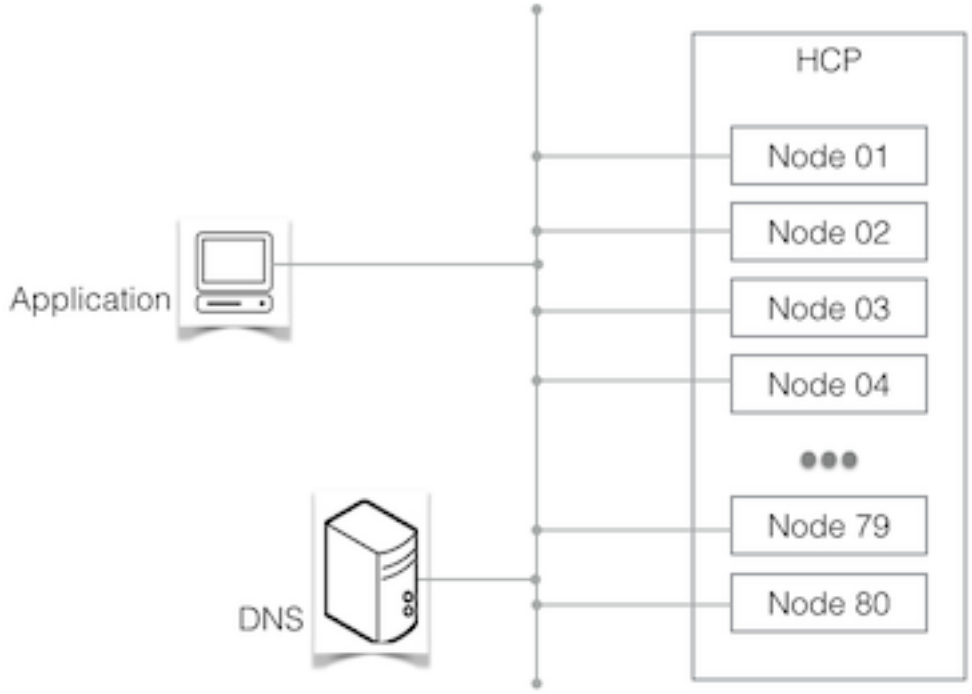

Figure 1.1: A simple HCP environment

Hitachi Content Platform (HCP) is a distributed storage system designed to support large, growing repositories of fixed-content data. An HCP system consists of both hardware (physical or virtual) and software.

HCP stores objects that include both data and metadata that describes that data. HCP distributes these objects across the storage space. HCP represents objects either as URLs or as files in a standard file system. An HCP repository is partitioned into namespaces. Each namespace consists of a distinct logical grouping of objects with its own directory structure. Namespaces are owned and managed by tenants.

HCP provides access to objects through a variety of industry-standard protocols, as well as through various HCP-specific interfaces.

1.2 Coding for HCP

Even as HCP might behave like a web server at first glance, it has some very different characteristics when it comes to coding against it, using one of the http/REST based interfaces (native http/REST, HS3 and HSwift). This isn't really relevant for an application doing a single Request from time to time, but it is critical for an application designated for high load / high performance HCP access.

To create an application optimized for optimal HCP access for the latter case:

1. Use threading or multiprocessing to access HCP using multiple connections in parallel
2. Use all available nodes, in conjunction with (1.)
3. Keep connections persistent, as Connection setup is an expensive operation, especially when using https. Nevertheless, release Connection if unused for some time, as one should not block an HCP Connection slot permanently without using it.
4. If there's no urgent need for an human-readable structure, use a structure optimized for HCP, as demonstrated with the *hcpsdk.pathbuilder — unique object names* (page 19) subpackage

There are some additional suggestions not aiming at performance, but for reliability:

5. If there is no load balancer in the data path to HCP, cache HCPs IP addresses in the application and use them to access all nodes in a round-robin fashion. Refresh the cached address pool from time to time and on a failed Connection, too. *Depending on how HCP has been integrated with the corporate DNS, this can lower network traffic overhead significantly.*
6. If there is a replication Target HCP, make the application replica-aware - at least, allow the application to read from the replica.
7. As a last resort, make sure the application can survive some time of not being able to connect to HCP by caching content locally to a certain degree (this is not covered by this SDK).

CHAPTER

TWO

INTENTION

There are several needs that led to the creation of the HCP SDK:

- Blueprint implementation of a connector module to access HCPs authenticated namespaces in a language that is easy enough to understand for any developers, whatever language she/he normally uses, to provide a base for own development.
- Showcase for coding guidelines outlined in the *Preface* (page 1).
- Demonstration material for developer trainings.
- And last, but not least, a replacement for the various modules the author used in the past for his own coding projects.

CHAPTER

THREE

STATE OF IMPLEMENTATION

Release 0.9.0-3

- Handle HCP as a *Target* object, responsible for IP address resolution (by-passing the local DNS cache, per default) and assigning IP addresses out of a cached pool to *Connection* objects. As of today, it handles the native http/REST interface, only. Support for HS3 and HSwift are planned.

  Support for automated usage of a replicated HCP will be implemented soon, with various usage strategies available.

- Provide *Connection* objects related to *Target* objects, responsible for traffic handling, service time measurement as well as handling of errors and timeouts. Connections are persistent for a configurable idle time, and are automatically re-connected on next use, if they timed out on idle.

- Easy access to Namespace information and statistics.

- The *pathbuilder* subpackage builds a path/name combination to be used to store an object into HCP, keeping the number of needed folders low.

- Provide access to to the Management API (MAPI). This is very restricted today, but will be extended on the authors personal needs. Available today:

  – Replication link information, link failover/failback.

CHAPTER

FOUR

HCPSDK — OBJECT ACCESS

hcpsdk provides functionality for access to HCP, where *Target()* acts as a central object per HCP Target (and its replica, eventually) and *Connection()* provides methods for REST access.

4.1 Methods

hcpsdk.**version**()
Returns the full version of the HCPsdk (0.9.0-3).

4.2 Classes

class hcpsdk.**NativeAuthorization**(*user*, *password*)
Authorization for native http/REST access to HCP.

Parameters

- **user** – the data access user
- **password** – his password

class hcpsdk.**Target**(*fqdn*, *authorization*, *port=443*, *interface='native'*, *replica_fqdn=None*, *replica_strategy=None*)
This is the a central access point to an HCP Target (and its replica, evntually). It caches the FQDN, the port, the authentication header (both variants - the legacy one for HCP up to version 5 and the new style header for HCP version 6 and better. Several REST-based interface to HCP are provided (**actually, just I_NATIVE (the native http/REST interface) has been implemented**).

Parameters

- **fqdn** – ([namespace.]tenant.hcp.loc)
- **authorization** – an instance of one of BaseAuthorization's subclasses
- **port** – port number (443, 8000 and 9090 are seen as ports using ssl)
- **interface** – the HCP interface to use (I_NATIVE, I_HS3 or I_HSWIFT)
- **replica_fqdn** – the replica HCP's FQDN
- **replica_strategy** – or'd combination of the RS_* modes

Raises HcpsdkError

Class constants:

I_NATIVE
HCP's http/REST dialect for access to HCPs authenticated namespaces.

I_HS3
The Amazon S3 compatible HS3 REST dialect. *-not yet implemented-*

I_HSWIFT
The OpnStack Swift compatible HSWIFT dialect. *-not yet implemented-*

RS_READ_ALLOWED
Allow to read from replica (always)

RS_READ_ON_FAILOVER
Automatically read from replica when failed over

RS_WRITE_ALLOWED
Allow write to replica (always, **A/A links only**)

RS_WRITE_ON_FAILOVER
Allow write to replica when failed over

Read-only class attributes:

fqdn
The FQDN for which the Target was initialized (string).

port
The port used by the Target (int).

ssl
Target initialized for SSL (bool).

addresses
The IP addresses used by this Target (list).

headers
The http headers prepared for this Target (dictionary).

replica
The replica Target, if available (an *hcpsdk.Target* object or None).

Class methods:

getaddr()
Convenience method to get an IP address out of the pool.

Returns an IP address (as string)

class hcpsdk.**Connection**(*target*, *timeout=30*, *idletime=30*, *debuglevel=0*, *retries=3*)
This class represents a Connection to HCP, caching the related parameters.

Parameters

- **target** – an initialized Target object
- **timeout** – the timeout for this Connection (secs)
- **idletime** – the time the Connection shall stay persistence when idle (secs)
- **debuglevel** – 0..9 -see-> http.client.HTTP[S]connetion
- **retries** – the number of retries until giving up on a Request **-not yet implemented-**

Read-only class attributes:

address
The IP address used for this Connection.

Response
Exposition of the http.client.Response object for the last Request.

response_status
The HTTP status code of the last Request.

response_reason
The corresponding HTTP status message.

connect_time
The time the last connect took.

service_time1
The time the last action on a Request took. This can be the initial part of PUT/GET/etc. or a single (possibly incomplete) read from a Response.

service_time2
Duration of the complete Request up to now. Sum of all `service_time1` during handling a Request.

Class methods:

request(*method*, *url*, *body=None*, *params=None*, *headers=None*)
Wraps the *http.client.HTTP[s]Connection.Request()* method to be able to catch any exception that might happen plus to be able to trigger hcpsdk.Target to do a new DNS query.

Url and *params* will be urlencoded, by default.

Beside of *method*, all arguments are valid for the convenience methods, too.

Parameters

- **method** – any valid http method (GET,HEAD,PUT,POST,DELETE)
- **url** – the url to access w/o the server part (i.e: /rest/path/object)
- **body** – the payload to send (see *http.client* documentation for details)
- **params** – a dictionary with parameters to be added to the Request:

  `{'verbose': 'true', 'retention': 'A+10y', ...}`

  or a list of 2-tuples:

  `[('verbose', 'true'), ('retention', 'A+10y'), ...]`

- **headers** – a dictionary holding additional key/value pairs to add to the auto-prepared header

Returns the original Response object received from *http.client.HTTP[s]Connection.requests()*.

getheader(**args*, ***kwargs*)
Used to get a single Response header. Wraps *http.client.Response.getheader()*. Arguments are simply passed through.

getheaders()
Used to get a the Response headers. Wraps *http.client.Response.getheaders()*.

PUT(*url*, *body=None*, *params=None*, *headers=None*)
Convenience method for Request() - PUT an object. Cleans up and leaves the Connection ready for the next Request. For parameter description see *Request()*.

GET(*url*, *params=None*, *headers=None*)
Convenience method for Request() - GET an object. You need to fully *.read()* the requested content from the Connection before it can be used for another Request. For parameter description see *Request()*.

HEAD(*url*, *params=None*, *headers=None*)
Convenience method for Request() - HEAD - get metadata of an object. Cleans up and leaves the Connection ready for the next Request. For parameter description see *Request()*.

POST(*url*, *params=None*, *headers=None*)
Convenience method for Request() - POST metadata. Cleans up and leaves the Connection ready for the next Request. For parameter description see *Request()*.

DELETE(*url*, *params=None*, *headers=None*)
Convenience method for Request() - DELETE an object. Cleans up and leaves the Connection ready for the next Request. For parameter description see *Request()*.

read(*amt=None*)
Read amt # of bytes (or all, if amt isn't given) from a Response.

Parameters **amt** – number of bytes to read

Returns the requested number of bytes; fewer (or zero) bytes signal end of transfer, which means that the Connection is ready for another Request.

close()
Close the Connection. **It is essential to close the Connection**, as open connections might keep the program from terminating for at max *timeout* seconds, due to the fact that the timer used to keep the Connection persistent runs in a separate thread, which will be canceled on *close()*.

4.3 Exceptions

exception hcpsdk.**HcpsdkError**(*reason*)
Used to signal a generic error in **hcpsdk**.

reason
An error description.

exception hcpsdk.**HcpsdkTimeoutError**(*reason*)
Used to signal a Connection timeout.

reason
An error description.

exception hcpsdk.**HcpsdkReplicaInitError**(*reason*)
Used to signal that the Target for a replica HCP couldn't be initialized (typically, this is a name resolution problem). **If this exception is raised, the primary Target's init failed, too.** You'll need to retry!

reason
An error description.

4.4 Example

```
>>> import hcpsdk
>>> hcpsdk.version()
'0.9.0-2'
>>> auth = hcpsdk.NativeAuthorization('n', 'n01')
>>> t = hcpsdk.Target('n1.m.hcp1.snomis.local', auth, port=443)
>>> c = hcpsdk.Connection(t)
>>> c.connect_time
'0.000000000010'
>>>
>>> r = c.PUT('/rest/hcpsdk/test1.txt', body='This is an example', params={'index': 'tru
>>> c.response_status, c.response_reason
(201, 'Created')
>>>
>>> r = c.HEAD('/rest/hcpsdk/test1.txt')
>>> c.response_status, c.response_reason
(200, 'OK')
>>> c.getheaders()
[('Date', 'Sat, 31 Jan 2015 20:34:53 GMT'),
 ('Server', 'HCP V7.1.0.10'),
 ('X-RequestId', '38AD86EF250DEB35'),
 ('X-HCP-ServicedBySystem', 'hcp1.snomis.local'),
 ('X-HCP-Time', '1422736493'),
 ('X-HCP-SoftwareVersion', '7.1.0.10'),
 ('ETag', '"68791e1b03badd5e4eb9287660f67745"'),
 ('Cache-Control', 'no-cache,no-store'),
 ('Pragma', 'no-cache'),
 ('Expires', 'Thu, 01 Jan 1970 00:00:00 GMT'),
 ('Content-Type', 'text/plain'),
 ('Content-Length', '18'),
 ('X-HCP-Type', 'object'),
 ('X-HCP-Size', '18'),
 ('X-HCP-Hash', 'SHA-256 47FB563CC8F86DC37C86D08BC542968F7986ACD81C97BF76DB7AD744407FE11
 ('X-HCP-VersionId', '91055133849537'),
 ('X-HCP-IngestTime', '1422736466'),
 ('X-HCP-RetentionClass', ''),
 ('X-HCP-RetentionString', 'Deletion Allowed'),
 ('X-HCP-Retention', '0'),
 ('X-HCP-IngestProtocol', 'HTTP'),
 ('X-HCP-RetentionHold', 'false'),
 ('X-HCP-Shred', 'false'),
 ('X-HCP-DPL', '2'),
 ('X-HCP-Index', 'true'),
 ('X-HCP-Custom-Metadata', 'false'),
 ('X-HCP-ACL', 'false'),
 ('X-HCP-Owner', 'n'),
 ('X-HCP-Domain', ''),
 ('X-HCP-UID', ''),
 ('X-HCP-GID', ''),
 ('X-HCP-CustomMetadataAnnotations', ''),
 ('X-HCP-Replicated', 'false'),
 ('X-HCP-ReplicationCollision', 'false'),
 ('X-HCP-ChangeTimeMilliseconds', '1422736466446.00'),
 ('X-HCP-ChangeTimeString', '2015-01-31T21:34:26+0100'),
 ('Last-Modified', 'Sat, 31 Jan 2015 20:34:26 GMT')
]
```

```
>>>
>>> r = c.GET('/rest/hcpsdk/test1.txt')
>>> c.response_status, c.response_reason
(200, 'OK')
>>> c.read()
b'This is an example'
>>> c.service_time2
0.0005471706390380859
>>>
>>> r = c.DELETE('/rest/hcpsdk/test1.txt')
>>> c.response_status, c.response_reason
(200, 'OK')
>>> c.service_time2
0.0002570152282714844
>>>
>>> c.close()
>>>
```

CHAPTER

FIVE

HCPSDK.IPS — NAME RESOLUTION

hcpsdk.ips provides name resolution service and IP address caching. Typically used by *hcpsdk*'s internally, only.

5.1 Classes

class hcpsdk.ips.**Circle**(*fqdn*, *port=443*)

Resolve an FQDN (through **query()**), cache the acquired IP addresses and yield them round-robin.

Parameters

- **fqdn** – the FQDN to be resolved
- **port** – the port to be used by the **hcpsdk.Target** object

Read-only class attributes:

_addresses
List of the cached IP addresses

Class methods:

refresh()
Force a fresh DNS query and rebuild the cached list of IP addresses

class hcpsdk.ips.**Response**(*fqdn*, *cache*)

DNS query Response object, returned by the **query()** function.

Parameters

- **fqdn** – the FQDN for the Response
- **cache** – Response from a query by-passing the local DNS cache (False) or using the system resolver (True)

Read-only class attributes:

ips
List of resolved IP addresses (as strings)

fqdn
The FQDN for which the resolve happened.

cache
False if the local DNS cache has been by-passed, True if the system-default resolver was used.

raised
Empty string when no Exception were raised, otherwise the Exception's error message.

5.2 Functions

hcpsdk.ips.**query**(*fqdn*, *cache=False*)
Submit a DNS query, using *socket.getaddrinfo()* if cache=True, or *dns.resolver.query()* if cache=False.

Parameters

- **fqdn** – a FQDN to query DNS -or- a *Request* object
- **cache** – if True, use the system resolver (which might do local caching), else use an internal resolver, bypassing any cache available

Returns an **hcpsdk.ips.Response** object

Raises should never raise, as Exceptions are signaled through the **Response.raised** attribute

5.3 Exceptions

exception hcpsdk.ips.**IpsError**(*reason*)
Signal an error in 'ips' - typically a name resolution problem.

reason
An error description.

CHAPTER

SIX

HCPSDK.NAMESPACE — NAMESPACE INFORMATION

hcpsdk.namespace provides access to the actual Namespace's parameters and statistics. The **hcpsdk.Target** object must have been instantiated with a **Namespace FQDN**.

6.1 Classes

class hcpsdk.namespace.**Info**(*target*, *debuglevel=0*)

Class to access namespaces metadata information

Parameters

- **target** – an **hcpsdk.Target** object
- **debuglevel** – 0..9 (propagated to *http.client*)

nsstatistics()

Query for namespace statistic information

Returns a dict holding the stats

Raises hcpsdk.HcpsdkError()

returned dictionary (example):

```
{'customMetadataObjectBytes': 13542405,
 'customMetadataObjectCount': 380107,
 'namespaceName': 'n1',
 'objectCount': 402403,
 'shredObjectBytes': 0,
 'shredObjectCount': 0,
 'softQuotaPercent': 85,
 'totalCapacityBytes': 53687091200,
 'usedCapacityBytes': 13792362496}
```

listaccessiblens(*all=False*)

List the settings of the actual (or all accessible namespace(s).

Parameters **all** – list all accessible namespaces if True, else list the actual one, only.

Returns a dict holding a dict per namespace

returned dictionary (example):

```
{'n2': {'defaultIndexValue': True,
        'defaultRetentionValue': 0,
        'defaultShredValue': False,
        'description': ['replicated', 'search', 'versioning'],
        'dpl': 2,
        'hashScheme': 'SHA-256',
        'name': 'n2',
        'nameIDNA': 'n2',
        'retentionMode': 'enterprise',
        'searchEnabled': True,
        'versioningEnabled': True},
 'n1': {'defaultIndexValue': True,
        'defaultRetentionValue': 0,
        'defaultShredValue': False,
        'description': ['replicated', 'search', 'no versioning'],
        'dpl': 2,
        'hashScheme': 'SHA-256',
        'name': 'n1',
        'nameIDNA': 'n1',
        'retentionMode': 'enterprise',
        'searchEnabled': True,
        'versioningEnabled': False}}
```

listretentionclasses()

List the Retention Classes available for the actual namespace.

Returns a dict holding a dict per Retention Class

returned dictionary (example):

```
{'initial_unspecified': {'autoDelete': False,
                         'description': 'Retention Class with an initial '
                                        'unspecified value.',
                         'name': 'initial_unspecified',
                         'value': -2},
 'deletion_prohibited': {'autoDelete': False,
                         'description': 'Class which prohibits deletion.',
                         'name': 'deletion_prohibited',
                         'value': -1},
 'TAX_DATA': {'autoDelete': True,
              'description': 'Class for tax data - actually 10 years.',
              'name': 'TAX_DATA',
              'value': 'A+10y'}}
```

listpermissions()

List the namespace and user permissions for the actual namespace.

Returns a dict holding a dict per permission domain

returned dictionary (example):

```
{'namespacePermissions': {'browse': True,
                          'changeOwner': True,
                          'delete': True,
                          'privileged': True,
```

```
                                    'purge': True,
                                    'read': True,
                                    'readAcl': True,
                                    'search': True,
                                    'write': True,
                                    'writeAcl': True},
             'namespaceEffectivePermissions': {'browse': True,
                                               'changeOwner': True,
                                               'delete': True,
                                               'privileged': True,
                                               'purge': True,
                                               'read': True,
                                               'readAcl': True,
                                               'search': True,
                                               'write': True,
                                               'writeAcl': True},
             'userPermissions': {'browse': True,
                                 'changeOwner': True,
                                 'delete': True,
                                 'privileged': True,
                                 'purge': True,
                                 'read': True,
                                 'readAcl': True,
                                 'search': True,
                                 'write': True,
                                 'writeAcl': True},
             'userEffectivePermissions': {'browse': True,
                                          'changeOwner': True,
                                          'delete': True,
                                          'privileged': True,
                                          'purge': True,
                                          'read': True,
                                          'readAcl': True,
                                          'search': True,
                                          'write': True,
                                          'writeAcl': True}}
```

6.2 Example

```
>>> import hcpsdk.namespace
>>> from pprint import pprint
>>> auth = hcpsdk.NativeAuthorization('n', 'n01')
>>> t = hcpsdk.Target('n1.m.hcp1.snomis.local', auth, port=443)
>>> n = hcpsdk.namespace.Info(t)
>>> pprint(n.nsstatistics())
{'customMetadataObjectBytes': 0,
 'customMetadataObjectCount': 0,
 'namespaceName': 'n1',
 'objectCount': 0,
 'shredObjectBytes': 0,
 'shredObjectCount': 0,
 'softQuotaPercent': 85,
 'totalCapacityBytes': 53687091200,
 'usedCapacityBytes': 0}
>>>
```

CHAPTER

SEVEN

HCPSDK.PATHBUILDER — UNIQUE OBJECT NAMES

Due to its internals, bulk ingest activity into HCP delivers best possible performance if multiple parallel writes are directed to different folders take place.

This subpackage offers functionality to create an unique object name along with a pseudo-random path to a folder to store the object in.

The object name generated is an UUID version 1, as defined in RFC 4122[1]. The algorithm uses (one of) the servers MAC addresses, along with the system time to create the UUID.

7.1 Classes

class hcpsdk.pathbuilder.**PathBuilder**(*initialpath='/rest/hcpsdk'*, *annotation=False*)

Conversion of a filename into a unique object name and a proper path for HCPs needs. Reconversion of a unique object name to the path where the object can be found in HCP.

Parameters

- **initialpath** – the leading part of the path
- **annotation** – if True, create an XML structure to be used as custom metadata annotation containing a tag with the original filename of the object.

getunique(*filename*)

Build a unique path / object name scheme.

The path is build from **initialpath** given during class instantiation plus byte 4 and 3 of the UUID in hexadecimal.

If **annotation** is True during class instantiation, there will be a third element in the returned tuple, containing an XML structure that can be used as custom metadata annotation for the object.

Parameters **filename** – the filename to be transformed

Returns a tuple consisting of path, unique object name and -eventually- an annotation string.

Raises hcpsdk.pathbuilder.pathbuilderError

Example:

[1] http://tools.ietf.org/pdf/rfc4122.pdf

```
>>> from hcpsdk.pathbuilder import PathBuilder
>>> p = PathBuilder(initialpath='/rest/mypath', annotation=True)
>>> o = p.getunique('testfile.txt')
>>> o
('/rest/mypath/b4/ec', '8ac8ecb4-9f1e-11e4-a524-98fe94437d8c',
 '<?xml version='1.0' encoding='utf-8'?>
    <hcpsdk_fileobject
        filename="testfile.txt"
        path="/rest/mypath/b4/ec"
        uuid="8ac8ecb4-9f1e-11e4-a524-98fe94437d8c"
 />')
>>>
```

getpath(*objectname*)

From a unique object name, retrieve the path in which the object was stored.

Parameters **objectname** – an unique object name

Returns the full path to the object (including its name)

Raises hcpsdk.pathbuilder.pathbuilderError

Example:

```
>>> p.getpath('8ac8ecb4-9f1e-11e4-a524-98fe94437d8c')
'/rest/mypath/b4/ec/8ac8ecb4-9f1e-11e4-a524-98fe94437d8c'
>>>
```

7.2 Exceptions

exception hcpsdk.pathbuilder.**PathBuilderError**(*reason*)

Used to signal an error during unique object name generation or object name to path mapping.

reason

An error description.

CHAPTER

EIGHT

HCPSDK.MAPI — MAPI ACCESS

hcpsdk.mapi provides access to selected MAPI functions.

8.1 Classes

class hcpsdk.mapi.**Replication**(*target*, *debuglevel=0*)

Access replication link information, modify the replication link state.

Parameters

- **target** – an hcpsdk.Target object
- **debuglevel** – 0..9 (used in *http.client*)

Class constants:

Link types:

R_ACTIVE_ACTIVE
Active/Active link

R_OUTBOUND
Outbound link (active/passive)

R_INBOUND
Inbound link (active/passive)

Link activities:

R_SUSPEND
Suspend a link (all link types)

R_RESUME
Resume a suspended link (all link types)

R_RESTORE
Restore a link (all link types)

R_FAILOVER
Initiate a failover (all link types)

R_FAILBACK = 'failBack'
Initiate a failback (ACTIVE/ACTIVE links only)

R_BEGINRECOVERY = 'beginRecovery'
Begin recovery (INBOUND links only)

R_COMPLETERECOVERY = 'completeRecovery'
Complete recovery (INBOUND links only)

Class methodes:

getreplicationsettings()
Query MAPI for the general settings of the replication service.
Returns a dict containing the settings
Raises HcpsdkError

returned dictionary (example):

```
{'allowTenantsToMonitorNamespaces': 'true',
 'enableDNSFailover': 'true',
 'enableDomainAndCertificateSynchronization': 'true',
 'network': '[hcp_system]'}
```

getlinklist()
Query MAPI for a list of replication links.
Returns a list with the names of replication links
Raises HcpsdkError

returned list (example):

```
['hcp1-a-a-hcp2']
```

getlinkdetails(*link*)
Query MAPI for the details of a replication link.
Parameters **link** – the name of the link as retrieved by **getlinklist()**
Returns a dict holding the details
Raises HcpsdkError

the returned dictionary (example):

```
{'compression': 'false',
 'Connection': {'localHost': '192.168.0.52, 192.168.0.53, 192.168.0.54, '
                             '192.168.0.55',
                'localPort': '5748',
                'remoteHost': '192.168.0.56, 192.168.0.57, 192.168.0.58,
                              '192.168.0.59',
                'remotePort': '5748'},
 'description': 'active/active link between HCP1 and HCP2',
 'encryption': 'false',
 'failoverSettings': {'local': {'autoFailover': 'false',
                                'autoFailoverMinutes': '120'},
                      'remote': {'autoFailover': 'false',
                                 'autoFailoverMinutes': '120'}},
 'id': 'b9c488db-f641-486e-a8b4-56810faf23cd',
 'name': 'hcp1-a-a-hcp2',
 'priority': 'OLDEST_FIRST',
 'statistics': {'bytesPending': '0',
                'bytesPendingRemote': '0',
                'bytesPerSecond': '0.0',
```

```
                            'bytesReplicated': '0',
                            'errors': '0',
                            'errorsPerSecond': '0.0',
                            'objectsPending': '0',
                            'objectsPendingRemote': '0',
                            'objectsReplicated': '0',
                            'operationsPerSecond': '0.0',
                            'upToDateAsOfMillis': '1419975449113',
                            'upToDateAsOfString': '2014-12-30T22:37:29+0100'},
                'status': 'GOOD',
                'statusMessage': 'Synchronizing data',
                'suspended': 'false',
                'type': 'ACTIVE_ACTIVE'}
```

setreplicationlinkstate(*linkname*, *action*, *linktype=None*)

Failover and failback a replication link.

Parameters

- **linkname** – name of the link to change the state
- **linktype** – one of [R_ACTIVE_ACTIVE, R_OUTBOUND, R_INBOUND]; not required for [R_SUSPEND, R_RESUME, R_RESTORE]
- **action** – one of [R_SUSPEND, R_RESUME, R_RESTORE, R_FAILOVER, R_FAILBACK, R_BEGINRECOVERY, R_COMPLETERECOVERY]

Raises HcpsdkError

8.2 Exceptions

exception hcpsdk.mapi.**ReplicationSettingsError**(*reason*)

Indicate an invalid action for the given link type (R_BEGINRECOVERY or R_COMPLETERECOVERY on a R_ACTIVE_ACTIVE link, R_FAILBACK on an R_OUTBOUND or R_INBOUND link).

reason

An error description.

8.3 Example

```
>>> import hcpsdk.mapi
>>> from pprint import pprint
>>>
>>> auth = hcpsdk.NativeAuthorization('service', 'service01')
>>> t = hcpsdk.Target('admin.hcp1.snomis.local', auth, port=9090)
>>> r = hcpsdk.mapi.Replication(t)
>>> l = r.getlinklist()
>>> l
['hcp1--<-->--hcp2']
>>> d = r.getlinkdetails(l[0])
>>> pprint(d)
{'compression': 'false',
 'connection': {'localHost': '192.168.0.52, 192.168.0.53, 192.168.0.54, '
                             '192.168.0.55',
```

```
                'localPort': '5748',
                'remoteHost': '192.168.0.56, 192.168.0.57, 192.168.0.58, '
                              '192.168.0.59',
                'remotePort': '5748'},
 'description': 'active/active replication between HCP1 and HCP2',
 'encryption': 'false',
 'failoverSettings': {'local': {'autoFailover': 'false',
                                'autoFailoverMinutes': '120'},
                      'remote': {'autoFailover': 'false',
                                 'autoFailoverMinutes': '120'}},
 'id': '81b6df01-2bda-4094-aed8-0c47e68bd820',
 'name': 'hcp1--<-->--hcp2',
 'priority': 'OLDEST_FIRST',
 'statistics': {'bytesPending': '0',
                'bytesPendingRemote': '0',
                'bytesPerSecond': '0.0',
                'bytesReplicated': '0',
                'errors': '0',
                'errorsPerSecond': '0.0',
                'objectsPending': '0',
                'objectsPendingRemote': '0',
                'objectsReplicated': '0',
                'operationsPerSecond': '0.0',
                'upToDateAsOfMillis': '1422701963994',
                'upToDateAsOfString': '2015-01-31T11:59:23+0100'},
 'status': 'GOOD',
 'statusMessage': 'Synchronizing data',
 'suspended': 'false',
 'type': 'ACTIVE_ACTIVE'}
>>>
```

CHAPTER

NINE

CODE SAMPLES

9.1 Simple object I/O without replica

9.1.1 Code sample

This code sample shows basic usage of the SDK - ingest an object, retrieve its metadata, read and delete it. It also shows how to retrieve request timers and how to enable debug logging.

First, we import the needed packages and setup a few constants with the parameters needed to access HCP. We also make sure that this program only runs if called as such:

```
import sys
from os.path import normpath
from pprint import pprint
import hcpsdk

# HCP Connection details - you'll need to adopt this to your environment!
# -- primary HCP
P_FQDN = 'n1.m.hcp1.snomis.local'
P_USER = 'n'
P_PASS = 'n01'
P_PORT = 443
# -- file to be used for the test (read-only)
P_FILE = normpath('../testfiles/128kbfile')
# -- debug mode
P_DEBUG = True

if __name__ == '__main__':
```

We need to create an authorization object, which converts the user credentials into the authorization token needed for HCP access.

```
    # Setup an authorization object:
    auth = hcpsdk.NativeAuthorization(P_USER, P_PASS)
    print('*I_NATIVE* authorization initialized')
    print('')
```

Now, we initialize a **Target** object with the parameters and the authorization object created in the steps before. Notice that we do this within a try/except clause, as we need to be able to react on errors that might happen during initialization.

```
    # Setup an HCP Target object:
    try:
        t = hcpsdk.Target(P_FQDN, auth, port=P_PORT)
```

```
except hcpsdk.HcpsdkError as e:
    sys.exit('init of *Target* failed - {}'.format(e))
else:
    print('Target *t* was initialized with IP addresses: {}'.format(t.addresses
```

At next, we initialize a **Connection** object, using the **Target** created before. Notice that there is no IP address assigned to the Connection at this time! This is because a connection will acquire an IP address not earlier than needed.

```
# Setup a Connection object:
try:
    c = hcpsdk.Connection(t)
except hcpsdk.HcpsdkError as e:
    sys.exit('init of *Target* failed - {}'.format(e))
else:
    print('Connection *c* uses IP address: {}'.format(c.address))
    print('')
```

Now that we have a **Connection** and its corresponding **Target**, let's write an object (the 128kb file); we'll also set some policies for it, using the *params* argument. Again, notice the exception handling! Now, we have an IP address assigned. If all's well, print the hash value HCP calculated for our object:

```
# Ingest an object:
try:
    with open(P_FILE, 'r') as infile:
        r = c.PUT('/rest/hcpsdk/sample_primary_only.txt',
                  body=infile,
                  params={'index': 'true', 'shred': 'true'})
except hcpsdk.HcpsdkTimeoutError as e:
    sys.exit('PUT timed out - {}'.format(e))
except hcpsdk.HcpsdkError as e:
    sys.exit('PUT failed - {}'.format(e))
except OSError as e:
    sys.exit('failure on {} - {}'.format(P_FILE, e))
else:
    if c.response_status == 201:
        print('PUT Request was successful')
        print('used IP address: {}'.format(c.address))
        print('hash = {}'.format(c.getheader('X-HCP-Hash')))
        print('connect time:     {:0.12f} seconds'.format(c.connect_time))
        print('Request duration: {:0.12f} seconds'.format(c.service_time2))
        print('')
    else:
        sys.exit('PUT failed - {}-{}'.format(c.response_status,
                                             c.response_reason))
```

OK, as all was well so far, let's see if our object is really there - we'll do an *HEAD* Request and if successful, print the returned headers, as they contain the objects metadata:

```
# Check an object for existence and get its metadata:
try:
    r = c.HEAD('/rest/hcpsdk/sample_primary_only.txt')
except hcpsdk.HcpsdkTimeoutError as e:
    sys.exit('HEAD timed out - {}'.format(e))
except hcpsdk.HcpsdkError as e:
    sys.exit('HEAD failed - {}'.format(e))
else:
```

```
    if c.response_status == 200:
        print('HEAD Request was successful - headers:')
        pprint(c.getheaders())
        print('used IP address: {}'.format(c.address))
        print('Request duration: {:0.12f} seconds'.format(c.service_time2))
        print('')
    else:
        sys.exit('HEAD failed - {}-{}'.format(c.response_status,
                                              c.response_reason))
```

We'll read the object back and print the first few bytes of its content:

```
# Read an object:
try:
    r = c.GET('/rest/hcpsdk/sample_primary_only.txt')
except hcpsdk.HcpsdkTimeoutError as e:
    sys.exit('GET timed out - {}'.format(e))
except hcpsdk.HcpsdkError as e:
    sys.exit('GET failed - {}'.format(e))
else:
    if c.response_status == 200:

        print('GET Request was successful - here\'s the content:')
        print('{}...'.format(c.read()[:40]))
        print('used IP address: {}'.format(c.address))
        print('Request duration: {:0.12f} seconds'.format(c.service_time2))
        print('')
    else:
        sys.exit('GET failed - {}-{}'.format(c.response_status,
                                             c.response_reason))
```

Clean up by deleting the object again:

```
# Delete the object:
try:
    r = c.DELETE('/rest/hcpsdk/sample_primary_only.txt')
except hcpsdk.HcpsdkTimeoutError as e:
    sys.exit('DELETE timed out - {}'.format(e))
except hcpsdk.HcpsdkError as e:
    sys.exit('DELETE failed - {}'.format(e))
else:
    if c.response_status == 200:
        print('DELETE Request was successful')
        print('used IP address: {}'.format(c.address))
        print('Request duration: {:0.12f} seconds'.format(c.service_time2))
        print('')
    else:
        sys.exit('DELETE failed - {}-{}'.format(c.response_status,
                                                c.response_reason))
```

And finally, don't forget to close the **Connection**! This will cleanly cancel the timer thread that keeps an idle connection open (persistent). Not doing so will lead to the program not finishing until the timer expires!

```
# Close the Connection:
finally:
    # noinspection PyUnboundLocalVariable
    c.close()
```

As the SDK is pre-configured for DEBUG logging using Pythons native logging facility, you simply enable it by activating a logger, set to level DEBUG. In this example, we simply set P_DEBUG to True, which will enable the logging facility:

```
if P_DEBUG:
    import logging
    logging.basicConfig(level=logging.DEBUG, style='{', format='{levelname:>5s}
    # noinspection PyShadowingBuiltins
    print = pprint = logging.info
```

9.1.2 Sample code output

Without debug messages:

```
running *simple_primary_only.py*
*I_NATIVE* authorization initialized

Target *t* was initialized with IP addresses: ['192.168.0.54', '192.168.0.55', '192.168.
Connection *c* uses IP address: None

PUT Request was successful
used IP address: 192.168.0.55
hash = SHA-256 A2706A20394E48179A86C71E82C360C2960D3652340F9B9FDB355A42E3AC7691
connect time:     0.001457214355 seconds
Request duration: 0.042128801346 seconds

HEAD Request was successful - headers:
[('Date', 'Sat, 31 Jan 2015 18:53:16 GMT'),
 ('Server', 'HCP V7.1.0.10'),
 ('X-RequestId', '2D7DF390A7714581'),
 ('X-HCP-ServicedBySystem', 'hcp1.snomis.local'),
 ('X-HCP-Time', '1422730396'),
 ('X-HCP-SoftwareVersion', '7.1.0.10'),
 ('ETag', '"ced877c812a6b561fa8c28b99fda69f2"'),
 ('Cache-Control', 'no-cache,no-store'),
 ('Pragma', 'no-cache'),
 ('Expires', 'Thu, 01 Jan 1970 00:00:00 GMT'),
 ('Content-Type', 'text/plain'),
 ('Content-Length', '131072'),
 ('X-HCP-Type', 'object'),
 ('X-HCP-Size', '131072'),
 ('X-HCP-Hash',
  'SHA-256 A2706A20394E48179A86C71E82C360C2960D3652340F9B9FDB355A42E3AC7691'),
 ('X-HCP-VersionId', '91054745358209'),
 ('X-HCP-IngestTime', '1422730396'),
 ('X-HCP-RetentionClass', ''),
 ('X-HCP-RetentionString', 'Deletion Allowed'),
 ('X-HCP-Retention', '0'),
 ('X-HCP-IngestProtocol', 'HTTP'),
 ('X-HCP-RetentionHold', 'false'),
 ('X-HCP-Shred', 'false'),
 ('X-HCP-DPL', '2'),
 ('X-HCP-Index', 'true'),
 ('X-HCP-Custom-Metadata', 'false'),
 ('X-HCP-ACL', 'false'),
 ('X-HCP-Owner', 'n'),
```

```
 ('X-HCP-Domain', ''),
 ('X-HCP-UID', ''),
 ('X-HCP-GID', ''),
 ('X-HCP-CustomMetadataAnnotations', ''),
 ('X-HCP-Replicated', 'false'),
 ('X-HCP-ReplicationCollision', 'false'),
 ('X-HCP-ChangeTimeMilliseconds', '1422730396251.00'),
 ('X-HCP-ChangeTimeString', '2015-01-31T19:53:16+0100'),
 ('Last-Modified', 'Sat, 31 Jan 2015 18:53:16 GMT')]
used IP address: 192.168.0.55
Request duration: 0.000173091888 seconds

GET Request was successful - here's the content:
b'0123456789abcdef0123456789abcdef01234567'...
used IP address: 192.168.0.55
Request duration: 0.047782897949 seconds

DELETE Request was successful
used IP address: 192.168.0.55
Request duration: 0.000145196915 seconds
```

With debug messages:

```
 INFO running *simple_primary_only.py*
DEBUG *I_NATIVE* authorization initialized for user: n
DEBUG pre version 6:     Cookie: hcp-ns-auth=bg==:1dc7fed37e11b35093d311ef66928ad9
DEBUG version 6+: Authorization: HCP bg==:1dc7fed37e11b35093d311ef66928ad9
 INFO *I_NATIVE* authorization initialized
 INFO
DEBUG Target initialized: n1.m.hcp1.snomis.local:443 - SSL = True - IPs = ['192.168.0.55
 INFO Target *t* was initialized with IP addresses: ['192.168.0.55', '192.168.0.52', '19
DEBUG Connection object initialized: IP None (n1.m.hcp1.snomis.local) - timeout: 30 - id
 INFO Connection *c* uses IP address: None
 INFO
DEBUG tried to cancel a non-existing idletimer (pretty OK)
DEBUG URL = /rest/hcpsdk/sample_primary_only.txt
DEBUG Connection needs to be opened
DEBUG Connection open: IP 192.168.0.52 (n1.m.hcp1.snomis.local) - connect_time: 0.001263
DEBUG PUT Request for /rest/hcpsdk/sample_primary_only.txt - service_time1 = 0.08711385
DEBUG tried to cancel a non-existing idletimer (pretty OK)
DEBUG idletimer started: <Timer(Thread-1, started 4350545920)>
 INFO PUT Request was successful
 INFO used IP address: 192.168.0.52
 INFO hash = SHA-256 A2706A20394E48179A86C71E82C360C2960D3652340F9B9FDB355A42E3AC7691
 INFO connect time:     0.001263856888 seconds
 INFO Request duration: 0.087113857269 seconds
 INFO
DEBUG idletimer canceled: <Timer(Thread-1, started 4350545920)>
DEBUG URL = /rest/hcpsdk/sample_primary_only.txt
DEBUG HEAD Request for /rest/hcpsdk/sample_primary_only.txt - service_time1 = 0.0003759
DEBUG tried to cancel a non-existing idletimer (pretty OK)
DEBUG idletimer started: <Timer(Thread-2, started 4350545920)>
 INFO HEAD Request was successful - headers:
 INFO [('Date', 'Sat, 31 Jan 2015 19:32:17 GMT'), ('Server', 'HCP V7.1.0.10'), ('X-Reque
 INFO used IP address: 192.168.0.52
 INFO Request duration: 0.000375986099 seconds
```

```
 INFO
DEBUG idletimer canceled: <Timer(Thread-2, started 4350545920)>
DEBUG URL = /rest/hcpsdk/sample_primary_only.txt
DEBUG GET Request for /rest/hcpsdk/sample_primary_only.txt - service_time1 = 0.000219821
DEBUG tried to cancel a non-existing idletimer (pretty OK)
DEBUG idletimer started: <Timer(Thread-3, started 4350545920)>
 INFO GET Request was successful - here's the content:
DEBUG (partial?) read: service_time1 = 0.020802974700927734 secs
 INFO b'0123456789abcdef0123456789abcdef01234567'...
 INFO used IP address: 192.168.0.52
 INFO Request duration: 0.021022796631 seconds
 INFO
DEBUG idletimer canceled: <Timer(Thread-3, started 4350545920)>
DEBUG URL = /rest/hcpsdk/sample_primary_only.txt
DEBUG DELETE Request for /rest/hcpsdk/sample_primary_only.txt - service_time1 = 0.000174
DEBUG tried to cancel a non-existing idletimer (pretty OK)
DEBUG idletimer started: <Timer(Thread-4, started 4350545920)>
 INFO DELETE Request was successful
 INFO used IP address: 192.168.0.52
 INFO Request duration: 0.000174045563 seconds
 INFO
DEBUG idletimer canceled: <Timer(Thread-4, started 4350545920)>
DEBUG Connection object closed: IP 192.168.0.52 (n1.m.hcp1.snomis.local)
```

CHAPTER

TEN

LICENSE

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CHAPTER

ELEVEN

ABOUT

About the Developer

The developer serves for Hitachi Data Systems since 2007, with a main focus on **Hitachi Content Platform** and its surrounding products. Being a presales consultant with HDS Germany for more than six years, he actually works for HCP engineering as an HCP Technologist for the EMEA region.

Prior to HDS, he served for eight years as a presales manager for a major storage vendor in Germany. Before that, he worked for ten years as a software developer, system programmer, project manager and technical architect for a major German manufacturing company.

In his spare time, he develops tools around HCP that make his own (and hopefully) others life easier.

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