vCloud SDK for PHP Developer's Guide

vCloud Director 8.10

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Contents

vCloud SDK for PHP Developer's Guide

The *vCloud SDK for PHP Developer's Guide* provides information about the PHP SDK for version 20.0 of the vCloud API.

VMware provides APIs and SDKs for various applications and goals. This guide provides information about the vCloud API for developers who are interested in creating RESTful clients of VMware vCloud Director.

Revision History

The *vCloud SDK for PHP Developer's Guide* is revised with each release of the product or when necessary. A revised version can contain minor or major changes.

Table 1. Revision History

Revision Date	Description
26MAY16	API version 20.0
10SEP15	API version 9.0
7OCT14	API Version 5.6
19SEP13	API Version 5.5
10SEP12	API Version 5.1
01SEP11	API Version 1.5
30AUG10	API Version 1.0

Intended Audience

This guide is intended for software developers who are building VMware Ready Cloud Services, including interactive clients of VMware vCloud Director. You should be familiar with the PHP programming language, representational State Transfer (REST) and RESTful programming conventions, the Open Virtualization Format Specification, and VMware Virtual machine technology. You should also be familiar with other widely deployed technologies such as XML, HTTP, and the Windows or Linux operating system.

About the VMware vCloud API

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The VMware vCloud API provides support for developers who are building interactive clients of VMware vCloud Director using a RESTful application development style.

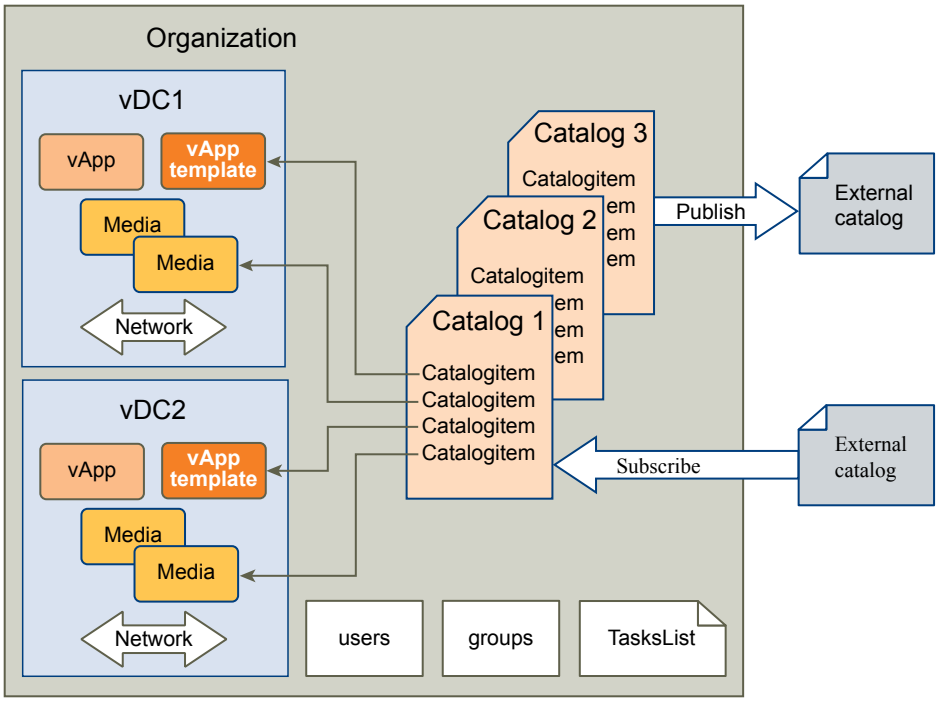
vCloud API clients communicate with servers over HTTP, exchanging representations of vCloud objects. These representations take the form of XML elements. You use HTTP GET requests to retrieve the current representation of an object, HTTP POST and PUT requests to create or modify an object, and HTTP DELETE requests to delete an object.

This chapter includes the following topics:

Object Taxonomy

The vCloud API defines a set of objects common to cloud computing environments. An understanding of these objects, their properties, and their relationships is essential to using the vCloud API.

Figure 1-1. vCloud API Object Taxonomy



vCloud API objects have the following high-level properties:

Organizations

A cloud can contain one or more organizations. Each organization is a unit of administration for a collection of users, groups, and computing resources. Users authenticate at the organization level, supplying credentials established when the user was created or imported. User credentials are authenticated by the organization's identity provider. vCloud Director includes an integrated identity provider. It also supports several standards-based external identity providers.

Users and Groups

An organization can contain an arbitrary number of users and groups. Users can be created locally or managed by an external identity provider. Groups must be managed by an external identity provider. Permissions within an organization are controlled through the assignment of rights and roles to users and groups.

Catalogs

Catalogs contain references to vApp templates and media images. You can configure a catalog in several different ways:

- as a repository for local content that can remain private to the catalog owner or can be shared with other users, groups, or organizations in your cloud
- as a source of published content, to which other clouds can subscribe.

- as a local repository for content published by another cloud or any Web site that hosts a VMware Content Subscription Protocol (VCSP) endpoint.

An organization administrator or catalog owner controls catalog sharing. Organization administrators in organizations that have permission to publish catalogs control publication and subscription options for catalogs in their organization. A system administrator can enable background synchronization of catalogs with external sources and set background synchronization schedules to regulate consumption of network bandwidth by this activity.

Organization VDCs

An organization virtual datacenter (organization VDC) is a deployment environment for virtual systems owned by the containing organization, and an allocation mechanism for resources such as networks, storage, CPU, and memory. In an organization VDC, computing resources are fully virtualized, and can be allocated based on demand, service level requirements, or a combination of the two.

Organization VDC Networks

An organization VDC can be provisioned with zero or more networks. These organization VDC networks can be configured to provide direct or routed connections to external networks, or can be isolated from external networks and other organization VDC networks. Routed connections require an Edge Gateway and network pool in the VDC. The Edge Gateway provides firewall, network address translation, static routing, VPN, and load balancing services.

Virtual Systems and Media Images

Virtual systems and ISO-format media images are stored in a catalog and represented as catalog item objects. Virtual systems are stored as templates, using an open standard format (OVF 1.0). These templates can be retrieved from catalogs and transformed into virtual systems, called vApps, through a process called instantiation, which binds a template's abstract resource requirements to resources available in a VDC. A vApp contains one or more individual virtual machines (`Vm` elements), along with parameters that define operational details, including:

- How the contained virtual machines are connected to each other and to external networks.
- The order in which individual virtual machines are powered on or off.
- End-user license agreement terms for each virtual machine.
- Deployment lease terms, typically inherited from the containing organization, that constrain the consumption of VDC resources by the vApp.
- Access control information specifying which users and groups can perform operations such as deploy, power on, modify, and suspend on the vApp and the virtual machines that it contains.

Tasks

Asynchronous operations are tracked by task objects. Running and recently completed tasks initiated by members of an organization are kept on the organization's tasks list.

Objects, References, and Representations

The vCloud API represents objects as XML documents in which object properties appear as elements and attributes with typed values. The object hierarchy is defined by an XML schema.

XML representations of first-class vCloud API objects, such as the objects in Figure 1-1, include these attributes.

id The object identifier, expressed in URN format. The value of the `id` attribute uniquely identifies the object, persists for the life of the object, and is never reused. The `id` attribute value is intended to provide a context-free identifier that can be used with the vCloud API `entityResolver` .

type The object type, specified as a MIME content type.

href An object reference, expressed in URL format. This reference includes the object identifier portion of the `id` attribute value, and supplies additional information, including the current location of the object when accessed in a specific view. Although URLs have a well-known syntax and a well-understood interpretation, a client should treat each `href` as an opaque string. The rules that govern how the server constructs `href` strings might change in future releases.

Views

The vCloud API defines several contexts, or views, in which you can access objects in a cloud. These views are expressed in the URL returned as the `href` of an object, and have the following forms, where *API-URL* is a URL of the form `https://vcloud.example.com/api` and *object-type* is a string indicating the type of the object.

user view A URL of the form *`API-URL/object-type/id`* indicates that any user can access the object.

admin view A URL of the form *`API-URL`*`/admin/`*`object-type/id`* indicates that organization administrators and system administrators can access the object. Organization administrators do not have rights to modify some objects in the admin view.

extension view A URL of the form *`API-URL`*`/admin/extension/`*`object-type/id`* indicates that system administrators can access the object.

A given object retrieved in one view may have a different representation and media type from the same object retrieved in a different view. Not all objects are presented in every view.

Example: Object id, type, and href Attributes

These abbreviated request and response examples show the `id`, `type`, and `href` attributes in the user and admin views of an organization.

Request:

```
GET https://vcloud.example.com/api/org/72fe715c-5f6a-407f-bbb2-bf465915b5f4
```

Response:

```
<Org
   ...
   id="urn:vcloud:org:72fe715c-5f6a-407f-bbb2-bf465915b5f4"
   type="application/vnd.vmware.vcloud.org+xml"
```

```
   href="https://vcloud.example.com/api/org/72fe715c-5f6a-407f-bbb2-bf465915b5f4"
   ...>
   ...
</Org>
```

The `id` value is the same in both cases, but the `type` and `href` attributes have values specific to the view.

Request:

```
GET https://vcloud.example.com/api/admin/org/72fe715c-5f6a-407f-bbb2-bf465915b5f4
```

Response:

```
<AdminOrg
   ...
   id="urn:vcloud:org:72fe715c-5f6a-407f-bbb2-bf465915b5f4"
   type="application/vnd.vmware.admin.organization+xml"
   href="https://vcloud.example.com/api/admin/org/72fe715c-5f6a-407f-bbb2-bf465915b5f4"
   ...>
   ...
</AdminOrg>
```

The value of the `id` attribute is a permanent, unique object identifier. The value of the `href` attribute is an object locator that refers to a specific view of the object in its current location. Unlike the value of the `id` attribute, object location and view context can change during the life of an object.

When a client application must keep a persistent reference to an object, the best practice is to keep a reference to the `id` and the `href` (URL) that was most recently used to access the object. When the application needs to access the object in the future, it should first try using the saved `href`. If that fails, use the `id` with the entity resolver to obtain a valid reference to the object, then replace the saved `href` with that valid reference.

Links and Link Relations

The vCloud API makes extensive use of `Link` elements to provide references to objects and the actions that they support. These elements are the primary mechanism by which a server tells a client how to access and operate on an object.

The server creates `Link` elements in a response body. They are read-only at the client. If a request body includes a `Link` element, the server ignores it.

Attributes of a Link Element

In the XML representation of a vCloud object, each `Link` element has the following form:

```
<Link rel="relationship"
   type="application/vnd.vmware.vcloud.object_type+xml"
   href="URL"
   name="string"/>
```

Attribute values in a `Link` element supply the following information:

rel — Defines the relationship of the link to the object that contains it. A relationship can be the name of an operation on the object, a reference to a contained or containing object, or a reference to an alternate representation of the object. The relationship value implies the HTTP verb to use when you use the link's `href` value as a request URL.

type — The object type, specified as a MIME content type, of the object that the link references. This attribute is present only for links to objects. It is not present for links to actions.

href An object reference, expressed in URL format. This reference includes the object identifier portion of the `id` attribute value, and supplies additional information, including the current location of the object when accessed in a specific view. Although URLs have a well-known syntax and a well-understood interpretation, a client should treat each `href` as an opaque string. The rules that govern how the server constructs `href` strings might change in future releases.

name The name of the referenced object, taken from the value of that object's `name` attribute. Action links do not include a `name` attribute.

Table 1-1. Link Relationships and HTTP Request Types

rel Attribute Value	Action or Relationship Description	Implied HTTP Verb
abort	Abort this blocking task.	POST
add	Add an item to this container.	POST
alternate	References an alternate representation of this object.	GET
answer	Provide user input requested by a virtual machine.	POST
authorization:check	Check whether an extension service operation is authorized for an entity.	POST
blockingTask	A list of pending blocking task requests in this cloud.	GET
bundle:upload	Upload an extension service localization bundle.	PUT
bundles:cleanup	Remove unused extension service localization bundles.	POST
catalogItem	References the CatalogItem object that refers to this object.	GET
certificate:reset	Removes the SSL certificate used by this service.	POST
certificate:update	Updates the SSL certificate used by this service.	POST
checkCompliance	Check that this virtual machine is using a storage profile of the intended type.	POST
consolidate	Consolidate this virtual machine.	POST
controlAccess	Apply access controls to this object.	POST
copy	Reserved	N/A
customizeAtNextPowerOn	Force guest customization to be applied the next time this virtual machine is powered on.	POST
deploy	Deploy this vApp.	POST
disable	Disable this object.	POST
discardState	Discard the suspended state of this virtual machine.	POST
disk:attach	Attach an independent disk to this virtual machine.	POST
disk:detach	Detach an independent disk from this virtual machine.	POST
down	References an object contained by this object.	GET
down:aclRules	Retrieve the ACL rules for this resource class action.	GET
down:apiDefinitions	Retrieve the API definitions for this extension service.	GET
down:apiFilters	Retrieve the API filters for this extension service.	GET
down:extensibility	Add an extension service to the system.	POST
down:fileDescriptors	Retrieve file descriptors for extension services APIs	GET
down:files	Retrieve files for extension services APIs	GET

Table 1-1. Link Relationships and HTTP Request Types (Continued)

rel Attribute Value	Action or Relationship Description	Implied HTTP Verb
down:resourceClassActions	Retrieve the actions defined for this extension service resource class.	GET
down:resourceClasses	Retrieve the resource classes defined by this extension service.	GET
down:serviceLinks	Retrieve the service links defined by this extension service.	GET
down:serviceResources	Retrieve the list of extension service resources of this class.	
down:services	Retrieve the list of registered extension services.	GET
download:alternate	Reserved	N/A
download:default	References the default location from which this file can be downloaded.	GET
download:identity	References the extended OVF descriptor of this vApp template. The extended OVF descriptor contains additional information such as MAC address, BIOS UUID, and NetworkConfigSection	GET
edgeGateway:configureServices	Update the network services offered by this Edge Gateway.	POST
edgeGateway:reapplyServices	Reapply (after an update) the network services offered by this Edge Gateway.	POST
edgeGateway:redeploy	Redeploy the vShield Edge supporting this Edge Gateway.	POST
edgeGateway:syncSyslogSettings	Synchronize syslog server addresses used by this Edge Gateway with system defaults.	POST
edgeGateway:upgrade	Upgrade the backing configuration of this Edge Gateway from compact to full.	POST
edgeGateways	List the Edge Gateway objects in this organization VDC.	GET
edit	Modify this object, typically by replacing its current representation with the one in the request body.	PUT
enable	Enable this object.	POST
enterMaintenanceMode	Put this virtual machine into maintenance mode.	POST
entity	Retrieve a representation of the object on which an operation triggered this notification.	GET
entityResolver	Retrieve an object id as a context-free Entity element.	GET
event:create	Create an event in an this organization's event stream.	POST
exitMaintenanceMode	Take this virtual machine out of maintenance mode.	POST
fail	Fail this blocking task.	POST
firstPage	Reference to the first page of a paginated response.	GET
installVmwareTools	Install VMware Tools on this virtual machine.	POST
keystore:reset	Removes the keystore used by this service.	POST
keystore:update	Updates the keystore used by this service.	POST
keytab:reset	Removes the keytab used by this service.	POST
keytab:update	Updates the keytab used by this service.	POST
lastPage	Reference to the last page of a paginated response.	GET

Table 1-1. Link Relationships and HTTP Request Types (Continued)

rel Attribute Value	Action or Relationship Description	Implied HTTP Verb
media:ejectMedia	Eject virtual media from a virtual device.	POST
media:insertMedia	Insert virtual media into a virtual device.	POST
metrics	Retrieve a subset of current or historic metrics from a virtual machine	POST
merge	Merge one or more Provider VDCs with this Provider VDC.	POST
migrateVms	Migrate virtual machines from this resource pool to a different one.	POST
move	Reserved	N/A
nextPage	Reference to the next page of a paginated response.	GET
orgVdcNetworks	List the organization VDC networks supported by this Edge Gateway.	GET
ova	Reserved	N/A
ovf	References the OVF descriptor of this vApp template.	GET
power:powerOff	Power off this vApp or virtual machine.	POST
power:powerOn	Power on this vApp or virtual machine.	POST
power:reboot	Reboot this vApp or virtual machine.	POST
power:reset	Reset this vApp or virtual machine.	POST
power:shutdown	Shut down this vApp or virtual machine.	POST
power:suspend	Suspend this vApp or virtual machine.	POST
previousPage	Reference to the previous page of a paginated response.	GET
publish	Share this catalog.	POST
publishToExternalOrganizations	Publish this catalog externally	POST
recompose	Recompose this vApp to add, remove, or reconfigure virtual machines.	POST
reconfigureVm	Update multiple sections of a virtual machine.	POST
reconnect	Reconnect this vCenter Server to the system.	POST
refreshStorageProfiles	Refresh the list of storage profiles that exist on the vCenter service backing this Provider VDC.	POST
refreshVirtualCenter	Refresh the representation of this vCenter server	POST
register	Register a VCenter Server with the system.	POST
reloadFromVc	Reload certain properties of this virtual machine from the vCenter database.	POST
relocate	Relocate this virtual machine.	POST
remove	Remove this object.	DELETE
remove:force	Force removal of this object.	DELETE
repair	Repair this host or network.	POST
resourcePoolVmList	List the virtual machines using this resource pool.	GET
resume	Resume this blocking task.	POST
rights	List the service-specific rights created by this extension service.	GET

Table 1-1. Link Relationships and HTTP Request Types (Continued)

rel Attribute Value	Action or Relationship Description	Implied HTTP Verb
rights:cleanup	Remove service-specific rights no longer used by any extension service.	POST
screen:acquireTicket	Retrieve a screen ticket for this virtual machine.	GET
screen:thumbnail	Retrieve a thumbnail view of the screen of this virtual machine.	GET
shadowVms	List shadow virtual machines associated with the virtual machines in this vApp template.	GET
snapshot:create	Create a snapshot of the virtual machines in this vApp.	POST
snapshot:removeAll	Remove all snapshots created for the virtual machines in this vApp.	POST
snapshot:revertToCurrent	Revert all virtual machines in this vApp to their current snapshot.	POST
storageProfile	References the storage profile for this object.	GET
subscribeToExternalCatalog	Add an external subscription to this catalog.	POST
sync	Synchronize this catalog or catalog item with its external source.	POST
syncSyslogSettings	Synchronize syslog server addresses used by this vApp network with system defaults.	POST
takeOwnership	Take ownership of this user's vApps, media, and catalogs.	POST
task	Retrieve the blocking task that triggered this notification.	GET
task:cancel	Cancel this task.	POST
task:create	Create a task object.	POST
task:owner	Reference to the owner of a task.	GET
truststore:reset	Remove the truststore used by this service.	POST
truststore:update	Update the truststore used by this service.	PUT
undeploy	Undeploy this vApp.	POST
unlock	Unlock this user account.	POST
unregister	Unregister this vCenter Server.	POST
up	References an object that contains this object.	GET
update:resourcePools	Update the resource pools of this Provider VDC	POST
updateProgress	Request an update of this task's progress.	POST
upgrade	Upgrade this host.	POST
upload:alternate	Reserved	N/A
upload:default	References the default location to which this object can be uploaded.	PUT
vSphereWebClientUrl	A URL that you can use to view this object with the vSphere Web Client	GET

Client Workflow Overview

vCloud API clients implement a RESTful workflow, making HTTP requests to the server and retrieving the information they need from the server's responses.

About RESTful Workflows

REST, an acronym for Representational State Transfer, describes an architectural style characteristic of programs that use the Hypertext Transfer Protocol (HTTP) to exchange serialized representations of objects between a client and a server. In the vCloud API, these representations are XML documents.

In a RESTful workflow, representations of objects are passed back and forth between a client and a server with the explicit assumption that neither party need know anything about an object other than what is presented in a single request or response. The URLs at which these documents are available often persist beyond the lifetime of the request or response that includes them. The other content of the documents is nominally valid until the expiration date noted in the HTTP `Expires` header.

vCloud REST API Workflows

Application programs written to a REST API use HTTP requests that are often executed by a script or other higher-level language to make remote procedure calls that create, retrieve, update, or delete objects that the API defines. In the vCloud REST API, these objects are defined by a collection of XML schemas. The operations themselves are HTTP requests, and so are generic to all HTTP clients.

To write a RESTful client application, you must understand only the HTTP protocol and the semantics of XML, the transfer format that the vCloud API uses. To use the vCloud API effectively in such a client, you need to know only a few things:

- The set of objects that the API supports, and what they represent; for example, what is a VDC and how does it relate to an organization or catalog?
- How the API represents these objects; for example, what does the XML schema for an `Org` look like? What do the individual elements and attributes represent?
- How a client refers to an object on which it wants to operate; for example, where are the links to objects in a VDC? How does a client obtain and use them?

You can find that information in this Guide, and in the *vCloud API Schema Reference*. See "About the Schema Reference," on page 25.

RESTful Workflow Patterns

All RESTful workflows follow a common pattern.

1. Make an HTTP request, typically GET, PUT, POST, or DELETE. The target of this request is either a well-known URL such as the vCloud API `versions` URL, or a URL obtained from the response to a previous request. For example, a GET request to an organization URL returns links to catalog and VDC objects that the organization contains.
2. Examine the response, which always includes an HTTP response code and usually includes a body. In the vCloud API, a response body is an XML document that can contain any of the following items.
   - XML elements and attributes that represent object properties
   - `Link` elements that implement operations on the object or its contents
   - If the object is being created or modified, an embedded `Task` object that tracks the progress of the creation or modification

These operations can repeat, in this order, for as long as necessary.

vCloud API REST Requests

To retrieve object representations, clients make HTTP requests to object references. The server supplies these references as `href` attribute values in responses to GET requests.

Every cloud has a well-known URL from which an unauthenticated user can retrieve a `SupportedVersions` document, which lists each version of the vCloud API that the server supports. For each version, the response lists the names and MIME types of the complex types defined in the version's XML namespace, and the version login URL. A system administrator can use that URL to authenticate to the cloud by logging in to the `System` organization. An authenticated user can discover other vCloud API URLs by making GET requests to URLs retrieved from the login response, and the URLs contained in responses to those requests.

Requests are typically categorized by the type of requested operation: create, retrieve, update, and delete. This sequence of verbs is often abbreviated with the acronym CRUD. Each type of request is characterized by the use of specific HTTP verb to access a URL found in a `Link` element that has an operation-specific value for its `rel` (relation) attribute.

Table 1-2. CRUD Operations Summary

Operation Type	HTTP Verb	Link Relation	Operation Summary
Create	POST	add	Creates a new object.
Retrieve	GET	down	Retrieves the representation of an existing object in its current state.
Update	PUT	edit	Modifies an existing object.
Delete	DELETE	remove	Deletes an existing object. If the object is a container, you must remove all of its contents before you can delete it.

For example, this `Link` element indicates that you can use the URL https://vcloud.example.com/api/admin/org/26 to update the `Org` object that contains it.

```
<Link
   rel="edit"
   type="application/vnd.vmware.admin.organization+xml"
   href="https://vcloud.example.com/api/admin/org/26" />
```

The implied HTTP verb is PUT.

Important Request bodies must contain all required elements and attributes, even if you are not changing their values. Because optional elements and attributes typically revert to default values if they are omitted or empty, it is a best practice to include optional elements in request bodies that modify existing objects. `Link` elements and `href` attributes from responses do not need to be included in modified sections. Some elements and attributes are read-only and cannot be modified. See the schema reference for details.

Request Limits

To guard against denial-of-service attacks, vCloud Director imposes the following limits on vCloud API requests:

- Requests cannot exceed 512 KB.
- Requests cannot contain more than 4096 XML elements.
- Requests cannot have a depth greater than 100.

vCloud API REST Responses

All responses include an HTTP status code and, unless the status code is 204 (No Content), a Content-Type header. Response content depends on the request. Some responses include a document body, some include only a URL, and some are empty.

Response Content

Response content depends on the requested operation. The response to a GET request is typically the complete representation of an existing object. The response to a PUT or POST request always contains values for the `href`, `name`, and `id` attributes of the object being created or updated. It also contains at most one `Task` element that you can retrieve to track the progress of the operation. When the `Task` completes with a status of `success`, a GET request to the object's `href` returns all properties of the object. If the `Task` completion status is not success, the object is in an indeterminate state, and should be deleted.

HTTP Response Codes

A vCloud API client can expect a subset of HTTP status codes in a response.

Table 1-3. HTTP Status Codes that the vCloud API Returns

Status Code	Status Description
200 OK	The request is valid and was completed. The response includes a document body.
201 Created	The request is valid. The requested object was created and can be found at the URL specified in the Location header.
202 Accepted	The request is valid and a task was created to handle it. This response is usually accompanied by a `Task` element.
204 No Content	The request is valid and was completed. The response does not include a body.
400 Bad Request	The request body is malformed, incomplete, or otherwise invalid.
401 Unauthorized	Login failed or authentication token has expired.
403 Forbidden	Any of: ■ One or more objects specified in the request could not be found in the specified container. ■ The user is not authenticated or does not have adequate privileges to access one or more objects specified in the request. ■ The user 's session has expired.
404 Not Found	Usually indicates a malformed request URL or request body.
405 Method Not Allowed	The HTTP method specified in the request is not supported for this object.
406 Not Acceptable	The resource identified by the request is not capable of generating a response of the type specified in the request's `Accept` header.
409 Conflict	The object state is not compatible with the requested operation.
415 Unsupported Media Type	The resource identified by the request does not support a request of the specified `Content-Type` and HTTP method.
500 Internal Server Error	The request was received but could not be completed because of an internal error at the server.

Table 1-3. HTTP Status Codes that the vCloud API Returns (Continued)

Status Code	Status Description
503 Service Unavailable	The server is currently unable to handle the request due to a temporary condition such as resource exhaustion or server maintenance.
504 Gateway Timeout	The server, while acting as a gateway or proxy, did not receive a timely response from the upstream server specified by the request URL.

XML Representations in the vCloud API

The vCloud API represents objects in a cloud as XML documents in which object properties are contained in elements and attributes that have typed values and an explicit object hierarchy defined by an XML schema.

Client programs of RESTful Web services must be able to request object representations from the server, parse the server's responses to extract the information they contain, and compose requests that, in many cases, are based on the information extracted from a response. Developers of such clients must understand the structure of each representation that might be part of a request or response, and any requirements that the network protocol (HTTP) places on client-server interaction.

XML Schemas

Each vCloud API object is defined in an XML schema document. Schema files and reference information about all elements, types, operations, and queries is included in the *vCloud API Schema Reference*. See "About the Schema Reference," on page 25.

vCloud Director uses a validating XML parser that requires elements in XML documents to agree in order and number with the schema. Required elements must appear in request bodies. All elements that appear in request bodies must appear in the order established by the schema, and with content that conforms to the type constraint specified in the schema. Default values, where defined, are supplied for elements that are empty. See "XML Namespace Identifiers," on page 21.

All vCloud API requests are processed in the `http://www.vmware.com/vcloud/v1.5` XML namespace. vCloud API XML namespace information appears in the values of the `xsi:schemaLocation` and `xmlns` attributes in a response document.

```
xmlns="http://www.vmware.com/vcloud/v1.5"
xsi:schemaLocation="https://vcloud.example.com/api/v1.5/schema/master.xsd"
```

Other XML namespace identifiers may also be required in request bodies. See "XML Namespace Identifiers," on page 21.

API Versions

The vCloud XML namespace (`http://www.vmware.com/vcloud/v1.5`) defines elements and attributes for all supported versions of the vCloud API. Treatment of version-specific elements and attributes in requests is controlled by the value of the `version` attribute in the `Accept` header. For example, this `Accept` header specifies that the request body is presumed to be valid for vCloud API version 20.0 and a version 20.0 response is expected:

```
Accept: application/*;version=20.0
```

Requests are validated against the elements and attributes defined in the specified version. Responses are filtered to remove elements and attributes that are not defined in the specified version. In general, client requests can access objects defined by any version of the vCloud API that is less than or equal to the version specified in the `Accept` header. Exceptions to this rule are mentioned in the vCloud Director *Release Notes*. The *vCloud API Schema Reference* indicates the deprecation status of elements and attributes, and also indicates when each element or attribute was added to the API. See "About the Schema Reference," on page 25.

To discover the API versions that a server supports, a client can make an unauthenticated GET request to a well-known URL on the server.

Date and Time Values

Values of type `xs:dateTime` are always interpreted as UTC if a timezone has not been explicitly specified.

Length Limits on Element and Attribute String Values

String values for the `name` attribute and the `Description` and `ComputerName` elements have length limitations that depend on the object to which they are attached.

Table 1-4. Length Limits on Element and Attribute String Values

Object	Element or Attribute Name	Maximum Length in Characters
`Catalog`	`name`	128
`Catalog`	`Description`	256
`EdgeGateway`	`name`	35
`Media`	`name`	128
`Media`	`Description`	256
`VApp`	`name`	128
`VApp`	`Description`	256
`VAppTemplate`	`name`	128
`VAppTemplate`	`Description`	256
`Vdc`	`name`	256
`Vdc`	`Description`	256
`Vm`	`name`	128
`Vm`	`ComputerName`	15 on Windows, 63 on all other platforms

Extensibility

The vCloud API provides complete programmatic access to the vCloud Director Extension Services facility. See the *vCloud API Programming Guide*.

In addition, there is a more general extensibility mechanism, `VCloudExtension`, that clients are free to use. `VCloudExtensibleType` is an abstract type that all complex types defined in the vCloud API namespace extend. It can contain an arbitrary number of elements and attributes, and provides a way for you to add custom attributes and elements to any type.

The `VCloudExtension` element has an attribute named `required` that specifies how clients and servers proceed when they see an unknown extension. All `VCloudExtension` elements are assumed to require a server that understands them. The `required` attribute is optional, but if omitted is assumed to be present with a value of `true`. This extensibility mechanism allows new servers to extend the XML representations native to the vCloud API without requiring existing clients to understand those extensions.

A client might encounter a `VCloudExtension` element in any response. If the element declares `required="true"` and the client does not know how to interpret the contents of the element, the client can ignore it, but it must include the `VCloudExtension` in any request to modify the element that contains it. A server must return a failure when a request includes a `VCloudExtension` element that declares `required="true"` but the server does not understand the extension. For more information about `VCloudExtension`, see the schema reference.

XML Namespace Identifiers

Elements used as request or response bodies contain a set of attributes that enable XML validation. The body of a PUT or POST request must contain all XML namespace identifiers required to validate the elements it contains. A response body typically includes all the XML namespace identifiers that the server used to validate it, in addition to other attributes that specify the schema locations searched during validation.

The vCloud API uses these XML namespace identifier attributes and prefixes.

Table 1-5. XML Namespace Identifiers in the vCloud API

Name	Value	Requirement
xmlns	http://www.vmware.com/vcloud/v1.5	Required in all request bodies.
xmlns:vmext	http://www.vmware.com/vcloud/extension/v1.5	Required in request bodies that include elements from the vSphere platform extensions.
xmlns:ve	http://www.vmware.com/schema/ovfenv	Required in request bodies that include an `ovf:Environment`element.
xmlns:ovf	http://schemas.dmtf.org/ovf/envelope/1	Required in request bodies that include elements defined in OVF schema http://schemas.dmtf.org/ovf/envelope/1/dsp8023.xsd.
xmlns:rasd	http://schemas.dmtf.org/wbem/wscim/1/cim-schema/2/CIM_ResourceAllocationSettingData	Required in request bodies that include elements defined in OVF schema CIM_ResourceAllocationSettingData.xsd.
xmlns:oe	http://schemas.dmtf.org/ovf/environment/1	Required in request bodies that include elements defined in OVF schema dsp8027_1.1.0.xsd.
xmlns:vssd	http://schemas.dmtf.org/wbem/wscim/1/cim-schema/2/CIM_VirtualSystemSettingData	Not required in request bodies.
xsi:schemaLocation	An installation-dependent schema location search path. See http://www.w3.org/TR/xmlschema-0/.	Not required in request bodies.
xmlns:xsi	http://www.w3.org/2001/XMLSchema-instance	Not required in request bodies.

XML Namespace Prefixes in Request and Response Bodies

When a request or response includes elements from multiple XML namespaces, each element name is prefixed with a namespace identifier. Unless all elements in a request or response originate in the same XML namespace, these prefixes are required in request bodies, and are always included in response bodies.

The examples omit XML namespace identifiers from most responses. The following fragment shows how some of them appear in a typical response body.

```
<VApp
   xmlns="http://www.vmware.com/vcloud/v1.5"
   ...
   xmlns:ovf="http://schemas.dmtf.org/ovf/envelope/1"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

```
   xsi:schemaLocation="http://www.vmware.com/vcloud/v1.5
https://vcloud.example.com/api/schema/v1.5/master.xsd">
   ...>
   ...
</VApp>
```

Common vCloud API Attributes

Most vCloud API objects have a number of common attributes. With the exception of `name`, none of these attributes are required in request bodies, and are ignored if included. All of them are included in response bodies.

Object Name

Every object requires a `name` attribute. The string value of this attribute is included in all object references, and can be used as the display name for the object. The value of `name` must be unique within a given scope.

Table 1-6. Requirements for Unique Object Names

Object Type	Name Scope
ProviderVdc	Cloud
Org	Cloud
Vdc	Organization
Catalog	Organization
CatalogItem	Catalog
vAppTemplate	None
vApp	Organization
Vm	vApp
Media	Catalog
Disk	None
Network	Container (Organization VDC, vApp, or cloud)

Object Identifier, Type, and Reference

These attributes are common to all object representations.

id The object identifier, expressed in URN format. The value of the `id` attribute uniquely identifies the object, persists for the life of the object, and is never reused. The `id` attribute value is intended to provide a context-free identifier that can be used with the vCloud API `entityResolver` .

type The object type, specified as a MIME content type.

href An object reference, expressed in URL format. This reference includes the object identifier portion of the `id` attribute value, and supplies additional information, including the current location of the object when accessed in a specific view. Although URLs have a well-known syntax and a well-understood interpretation, a client should treat each `href` as an opaque string. The rules that govern how the server constructs `href` strings might change in future releases.

Object Creation Status

Objects such as `VAppTemplate`, `VApp`, and `Vm`, that extend the `ResourceEntity` type have a `status` attribute whose value indicates the state of the object. In this table, YES indicates that a status value is allowed for the object listed in the column header. The `status` value for a `VAppTemplate` or `VApp`, which contain `Vm` objects that each have a `status` attribute of their own, is computed from the status of the contained objects. When returned in an XML representation, `status` has a numeric value. When returned by the query service, it has a string value.

Table 1-7. `status` Attribute Values for VAppTemplate, VApp, Vm, and Media Objects

Numeric Value	String Value	Description	vAppTemplate	vApp	Vm	Media
-1	FAILED_CREATION	The object could not be created.	YES	YES	YES	YES
0	UNRESOLVED	The object is unresolved.	YES	YES	YES	YES
1	RESOLVED	The object is resolved.	YES	YES	YES	YES
2	DEPLOYED	The object is deployed.	No	No	No	No
3	SUSPENDED	The object is suspended.	No	YES	YES	No
4	POWERED_ON	The object is powered on.	No	YES	YES	No
5	WAITING_FOR_INPUT	The object is waiting for user input.	No	YES	YES	No
6	UNKNOWN	The object is in an unknown state.	YES	YES	YES	No
7	UNRECOGNIZED	The object is in an unrecognized state.	YES	YES	YES	No
8	POWERED_OFF	The object is resolved and powered off.	YES	YES	YES	No
9	INCONSISTENT_STATE	The object is in an inconsistent state.	No	YES	YES	No
10	MIXED	Children do not all have the same status.	YES	YES	No	No
11	DESCRIPTOR_PENDING	Upload initiated, OVF descriptor pending.	YES	No	No	No
12	COPYING_CONTENTS	Upload initiated, copying contents.	YES	No	No	No
13	DISK_CONTENTS_PENDING	Upload initiated , disk contents pending.	YES	No	No	No
14	QUARANTINED	Upload has been quarantined.	YES	No	No	No
15	QUARANTINE_EXPIRED	Upload quarantine period has expired.	YES	No	No	No
16	REJECTED	Upload has been rejected.	YES	No	No	No
17	TRANSFER_TIMEOUT	Upload transfer session timed out.	YES	No	No	YES
18	VAPP_UNDEPLOYED	The vApp is resolved and undeployed.	YES	No	No	No
19	VAPP_PARTIALLY_DEPLOYED	The vApp is resolved and partially deployed.	YES	No	No	No

VDC objects have their own set of `status` values and mappings.

Table 1-8. `status` Attribute Values for VDC Objects

Numeric Value	String Value	Description
-1	FAILED_CREATION	The VDC could not be created.
0	NOT_READY	The VDC is not ready for use
1	READY	The VDC Is ready for use
2	UNKNOWN	The VDC status could not be retrieved
3	UNRECOGNIZED	The VDC status cannot be mapped to a known state.

Retrieve an Object as an Entity

You can use the vCloud API entity resolver with an object's `id` attribute value to retrieve a context-free reference to the object.

Every first-class object that the vCloud API defines includes an `id` attribute whose value is the object identifier expressed in URN format. The value of the `id` attribute uniquely identifies the object, persists for the life of the object, and is never reused.

You can append the value of the `id` attribute to the vCloud API `entityResolver` URL to retrieve a context-free representation of the underlying object as an `Entity` element. The `Entity` includes a `Link` element for each currently valid reference to the object identified by the `id` specified in the request.

Prerequisites

Verify that you are logged in to the vCloud API.

Procedure

1 Retrieve the current `Session` object to get the `entityResolver` URL.

Use a request like this one:

```
GET https://vcloud.example.com/api/session
```

The response is a `Session` element, which includes a link to the `entityResolver`.

```
<Session ... >
  ...
    <Link
      rel="entityResolver"
      type="application/vnd.vmware.vcloud.entity+xml"
      href="https://vcloud.example.com/api/entity/" />
</Session>
```

2 Retrieve the object whose `id` you want to resolve and find the value of its `id` attribute.

See the request portion of "Example: Using the entityResolver URL," on page 24.

3 Append the value of the object's `id` attribute to the `entityResolver` URL.

4 Make a GET request to the URL you created in Step 3

See the request portion of "Example: Using the entityResolver URL," on page 24.

Example: Using the entityResolver URL

This example retrieves the organization object shown in "Example: Object id, type, and href Attributes," on page 10 as an `Entity`.

Request:

```
GET https://vcloud.example.com/api/entity/urn:vcloud:org:72fe715c-5f6a-407f-bbb2-bf465915b5f4
```

This response includes two `Link` elements, each of which provides a valid `href` to the object identified by the `id` specified in the request.

Response:

```
<Entity
   xmlns="http://www.vmware.com/vcloud/v1.5"
   id="urn:vcloud:org:72fe715c-5f6a-407f-bbb2-bf465915b5f4"
   name="urn:vcloud:org:72fe715c-5f6a-407f-bbb2-bf465915b5f4"
   type="application/vnd.vmware.vcloud.entity+xml"
   href="https://vcloud.example.com/api/entity/urn:vcloud:org:72fe715c-5f6a-407f-bbb2-
bf465915b5f4"
   ...>
   <Link
      rel="alternate"
      type="application/vnd.vmware.vcloud.organization+xml"
      href="https://vcloud.example.com/api/org/72fe715c-5f6a-407f-bbb2-bf465915b5f4"/>
   <Link
      rel="alternate"
      type="application/vnd.vmware.vcloud.admin.organization+xml"
      href="https://vcloud.example.com/api/admin/org/72fe715c-5f6a-407f-bbb2-bf465915b5f4"/>
</Entity>
```

About the Schema Reference

The *vCloud API Schema Reference* includes reference material for all elements, types, queries, and operations in the vCloud API. It also includes a downloadable set of the schema definition files.

The *vCloud API Schema Reference* is available in HTML format in the vCloud Director documentation center.

Important The schema reference includes reference topics for the entire vCloud API, including topics that apply to objects and operations that are accessible only to vCloud Air tenants.

Setting Up for PHP Development 2

To use the vCloud SDK for PHP, you need PHP 5.3.2 or later and the PEAR HTTP_Request2 package, or a similar HTTP client for PHP.

Prerequisites for Using the vCloud SDK for PHP

To use the vCloud SDK for PHP, you should be familiar with the PHP programming language and have access to an installation of VMware vCloud Director.

In addition, consider the following items:

- The vCloud SDK for PHP reference documentation provides information about the vCloud API XML schemas, which define the objects and operations that the SDK supports. Familiarity with the details of the underlying objects and operations, as described in the *vCloud API Programming Guide*, can help you understand the structure of vCloud API objects, and how the methods in this SDK operate on those objects.
- Before you can run the samples, you must use the vCloud Director Web console or the vCloud API to create an organization, catalog, and VDC that the samples can use. The organization must have a user account with rights to run the samples. The predefined `CatalogAuthor` role should provide all of the necessary rights. For more information about roles and rights, see the *VMware vCloud Director Administrator's Guide*.
- Several of the sample programs, including `vapplifecycle.php`, require you to have an OVF package available on the client host. This package must be uncompressed. For more information about OVF, see the *vCloud API Programming Guide*.

This chapter includes the following topics:

Download the vCloud SDK for PHP Package

The vCloud SDK for PHP is distributed in two compressed archive formats. Uncompressed, either archive requires about 32MB of disk space.

Procedure

1. Go to http://www.vmware.com/go/vcloudsdkforphp.
2. In the Resources area of the vCloud SDK for PHP Community page, click **Download**.
3. On the Download page, log in with your VMware customer credentials.

4 Review the license agreement.

   Click **Yes** to accept it and continue with the download, or click **No** to exit without downloading.

5 On the Download page, choose a download option and click the file format to download.

Option	Description
VMware-vCloudDirector-PHPSDK-8.10.*build*.zip	A compressed archive in `tar` format, where *build* is a build number.
VMware-vCloudDirector-PHPSDK-8.10.*build*.tar.gz	A compressed archive in `zip` format.

6 When the download is complete, uncompress the download package to a convenient folder on your computer.

The package includes the following folders:

docs Reference documentation in HTML format.

library A collection of class libraries and functions that encapsulate vCloud API objects and operations.

samples Example code demonstrating common use cases associated with programmatically managing virtual infrastructure.

Using the HTML Reference Material

The reference documentation in the `docs` folder of the vCloud SDK for PHP downloaded files provides detailed information about classes and functions in the SDK.

Procedure

1 Open the `docs` folder in the downloaded files and open the `index.html` file in a browser.

2 Select **VMware_VCloud_API** from the **Packages** drop-down menu.

3 Select a class in the left-hand pane.

4 In the **Method Summary** section of the right-hand pane, click the link for the `__construct()` method.

   The method summary lists the constructors for required and optional attributes, and elements of the class, sorted by type. You can click the name of any element, then click its method summary to view information about its constructors. For example, `VMware_VCloud_API_AdminOrgType` requires a `VMware_VCloud_API_OrgSettingsType` element. You can click the element name to see its method summary, and click its `__construct()` method to see how to construct it.

Working with the vCloud SDK for PHP

3

The vCloud SDK for PHP provides a PHP class library and a set of example applications. The classes and functions in the library encapsulate the interfaces, objects, and operations that the vCloud API supports, while preserving its RESTful approach and compatibility with the HTTP protocol family.

Packages Included in the vCloud SDK for PHP

The vCloud SDK for PHP includes the following packages:

API packages

API packages contain classes that represent complex types defined in vCloud API, vCloud administrative API, and vCloud vSphere platform API extensions. Classes in the API package are generated from the vCloud API XML schema files. Each class maps to a complex type defined in those files. Objects of these classes are referred to as vCloud data objects.

Table 3-1. VMware_VCloud_API Packages

Package Name	Package Contents
VMware_VCloud_API	Classes representing objects defined in the vCloud user API and administrative API
VMware_VCloud_API_OVF, VMware_VCloud_API_OVFENV	Classes representing objects defined in the OVF specification
VMware_VCloud_API_Extension	Classes representing objects defined in the vCloud API extensions
VMware_VCloud_API_Version	Classes representing objects that contain vCloud API version information

SDK packages

These packages contain classes that implement vCloud API operations. Each of the classes maps to a vCloud resource entity. Classes manage the resource entity life cycle of create, retrieve, update, and delete. This sequence of verbs is often abbreviated with the acronym CRUD. This package also implements utility functions associated with connecting to a vCloud instance, marshalling requests, unmarshalling responses, and so on. Objects of these classes are referred to as vCloud SDK objects.

Table 3-2. VMware_VCloud_SDK Packages

Package Name	Package Contents
VMware_VCloud_SDK	Classes that implement operations defined in the vCloud user API and administrative API
VMware_VCloud_SDK_Extension	Classes that implement operations defined in the vCloud API vSphere Platform Extensions
VMware_VCloud_SDK_HTTP	Classes that support HTTP client operations.

This chapter includes the following topics:

Summary of SDK Objects, Containers, and Methods

Every SDK object is associated with a container type and an object reference creation method.

To create an SDK object, you use an SDK object creation method to retrieve an object reference from an object container. For each SDK each object, there is a corresponding container and the method for retrieving an object reference from the container. Some methods return a read-only object, such as a `RightReference`, that you might need when you create other objects. For these methods, the word None appears in the SDK Object column. The table omits the `VMware_VCloud_SDK_` part of the package names in the SDK Object and Container columns.

Table 3-3. Summary of SDK Objects, Containers, and Methods

SDK Object	Container	Method
None	Admin	getRightRefs()
ProviderVdc	Admin	getProviderVdcRefs()
None	Extension_VMWProviderVdc	getNetworkPoolRefs()
None	Extension_VimServer	getResourcePoolRefs()
Admin	None	See "Create a Root Object," on page 33
AdminCatalog	AdminOrg	getAdminCatalogRefs()
AdminNetwork	AdminOrg	getAdminNetworkRefs()
AdminOrg	Admin	getAdminOrgRefs() , getSystemOrgRef()
AdminVdc	AdminOrg	getAdminVdcsRefs()
AuditEvent	Admin	getAuditEventRefs()
Catalog	Org	getCatalogRefs()
Task	Org	getTasks()

Table 3-3. Summary of SDK Objects, Containers, and Methods (Continued)

SDK Object	Container	Method
CatalogItem	Catalog	getCatalogItemRefs()
CatalogItem	AdminCatalog	getCatalogItemRefs()
Extension	None	See "Create a Root Object," on page 33
Extension_Host	Extension	getHostRefs()
Extension_VimServer	Extension	getVimServerRefs()
Extension_VMWExternalNetwork	Extension	getVMWExternalNetworkRefs()
Extension_VMWNetworkPool	Extension	getVMWNetworkPoolRefs()
Extension_VMWProviderVdc	Extension	getVMWProviderVdcRefs()
Extension_BlockingTask	Extension	getBlockingTaskRefs()
Group	AdminOrg	getGroupRefs()
Media	Vdc	getMediaRefs()
Org	Service	getOrgRefs()
Role	Admin	getRoleRefs()
Service	None	See "Create a Root Object," on page 33
User	AdminOrg	getUserRefs()
VApp	Vdc	getVAppRefs()
VApp	VApp	getContainedVAppRefs()
VAppTemplate	Vdc	getVAppTemplateRefs()
Vdc	Org	getVdcRefs()
Vm	VApp	getContainedVmRefs()
Extension_Datastore	Extension	getDatastoreRefs()
Disk	Vdc	getDiskRefs()
VdcStorageProfile	Vdc	getVdcStorageProfileRefs()
Right	Admin	getRightRefs()
AdminVdcStorageProfile	AdminVdc	getAdminVdcStorageProfileRefs()
ProviderVdcStorageProfile	AdminVdcStorageProfile	getProviderVdcStorageProfileRefs()
Extension_StrandedItem	Extension	getStrandedItems()
UserService	Service	getUserServiceRefs()
APIDefinition	UserService	getAPIDefinitionRefs()
TasksList	Org	getTasksListRef()
EdgeGateway	AdminVdc	getEdgeGatewayRefs()
Extension_VMWProviderVdcStorageProfile	Extension_VMWProviderVdc	getStorageProfileRefs()
Extension_VMWProviderVdcResourcePool	Extension_VMWProviderVdc	getResourcePoolRefs()
Extension_Service	Extension	getExtensionService()
Extension_ApiFilter	Extension_Service	getApiFilterRefs()
Extension_ServiceLink	Extension_Service	getServiceLinks()

Table 3-3. Summary of SDK Objects, Containers, and Methods (Continued)

SDK Object	Container	Method
Extension_APIDefinition	Extension_Service	getAPIDefinitions()
Extension_File	Extension_Service	getFileDescriptor()
Extension_ResourceClass	Extension_Service	getResourceClass()
Extension_ResourceClassAction	Extension_Service	getResourceClassAction()
Extension_AclRule	Extension_Service	getAclRule()
Extension_ServiceResource	Extension_Service	getServiceResources()
Extension_VMWVdcTemplate	Extension	getVMWVdcTemplateRefs()
VdcTemplate	Service	getVdcTemplateRefs()

Create an SDK Object

To create an SDK object, retrieve an array of object references, and use the createSDKObj method to create an object from a reference.

You can create an SDK object when you need to run a life cycle operation such as create or modify on a vCloud API object. Most class constructors for SDK objects require two parameters:

- A `VMware_VCloud_SDK_Service` object, which contains HTTP connection information.
- A `ReferenceType` data object, which contains the request URL. For more information about request URLs, see "vCloud API REST Requests," on page 17.

For example, you can use code similar to the fragment shown in "Example: Creating an SDK Object," on page 32 to create a `VMware_VCloud_SDK_Org` object to use as an entry point for client operations. This procedure uses the data in Table 3-3 as a guide to creating SDK objects.

Prerequisites

Familiarize yourself with the set of SDK objects, container objects, and constructor methods listed in Table 3-3. Examples in this procedure refer to column names in that table.

Procedure

1 Retrieve an array of object references by specifying a container object and creation method.

```
$references=Container->Method
```

2 For any reference in the array, create an SDK object using the selected reference, as the following example shows.

```
SDK_Object=$service->createSDKObj($reference)
```

Example: Creating an SDK Object

```
// get the list of all organizations in the vCloud
$orgRefs = $service->getOrgRefs($orgName);
// create an object that represents the first organization in the list
$sdkOrg = $service->createSDKObj($orgRefs[0]);
// create a task object
$sdkTask = $service->createSDKObj($task);
```

Note Several new SDK objects have specialized creation methods. The following example creates a QueryService SDK object:

```
$sdkQuery= VMware_VCloud_SDK_Query::getInstance($service);
```

Create a Data Object

To create a data object, you can either invoke an empty constructor and then call the setters for the object or invoke the constructor with parameters.

Each data object class includes a constructor method whose parameters represent attributes of the class and all of its ancestors. Attributes are marked as protected to restrict their visibility. All classes contain setter and getter methods for XML elements and attributes.

The general form of setter and getter method names is *operation_attribute-name* for attributes and *operationElementName* for elements, where *operation* is one of `set` or `get`. For example, the `VMware_VCloud_API_ReferenceType` class supports `set_name()` and `get_name()` methods that get or set the value of its `name` attribute. The `VMware_VCloud_API_UserType` class supports `setFullName()` and `getFullName()` methods that set or get the value of the `FullName` element in a `User` object.

Procedure

- Create a data object by invoking an empty constructor and calling the setters for the object.

```
$ref = new VMware_VCloud_API_ReferenceType();
   $ref->set_href($href);
   $ref->set_type($type);
   $ref->set_name($name);
```

- Create a data object by invoking the constructor with parameters.

```
$ref = new VMware_VCloud_API_ReferenceType ($href=$href, $type=$type, $name=$name);
```

Create a Root Object

In the vCloud API, root objects such as `VCloud` and `VMWExtension` do not have containers. The vCloud SDK for PHP provides dedicated constructors for these objects.

Procedure

- To create a `VMware_VCloud_SDK_Service` object to use as an entry point for user API operations, use `VMware_VCloud_SDK_Service::getService`, as this example shows:

```
$service = VMware_VCloud_SDK_Service::getService();
```

- To create a VMware_VCloud_SDK_Admin object to use as an entry point for administrative operations, use `createSDKAdminObj`, as this example shows:

```
$sdkAdminObj = $service->createSDKAdminObj();
```

- To create a `VMware_VCloud_SDK_Extension` object to use as an entry point for vSphere Platform Extensions operations, use `createSDKExtensionObj`, as this example shows:

```
$sdkExtObj = $service->createSDKExtensionObj();
```

Use a Different HTTP Library

Example programs included in the vCloud SDK for PHP require the PEAR HTTP_Request2 package. You can use a different HTTP library.

Procedure

1 Create an HTTP client object that implements the `VMware_VCloud_SDK_Http_Client_Interface` interface.

2 Call the `VMware_VCloud_SDK_Service::getService()` method that specifies the client that you created.

For example,

```
$service = VMware_VCloud_SDK_Service::getService($myHTTPClient);
```

About SSL Access

Even though HTTP communications between a vCloud API clients and server are secured with SSL, all SDK samples can run with or without SSL.

All of the SDK samples provide the following options:

- If SSL certificates are imported into a keystore, and the keystore details are provided to the sample program, the sample uses the keystore for the communications.
- If no keystore details are provided to the sample program, the sample ignores SSL for the communication with the server.

Client applications built with this SDK can enable the use of SSL communications by importing SSL certificates into a keystore or by implementing a custom socket factory that accepts certificates from the server.

About the Example Programs

4

The vCloud SDK for PHP includes example programs that demonstrate how to use the SDK to develop client applications. The examples are in the `samples` folder of the SDK downloadable files.

Comments in the examples provide detailed information about how they use the features of the vCloud SDK for PHP.

Required Permissions

vCloud Director uses roles, and their associated rights, to determine which users and groups can perform which operations. vCloud Director includes several predefined roles, each of which has a default set of rights. Some SDK example programs can be run by any user with the rights to create and operate a vApp. For example, a user with the vApp Author role. Other samples require those rights belonging to the System Administrator role.

Table 4-1. Summary of Example Programs and their Required Permissions for a Predefined Role

Example Name	Description	Required Permissions/Predefined Role
`login.php`	Authenticates a user.	Requires credentials for a system administrator or user with the vApp Author role.
`ssologin.php`	Authenticates a user using a SAML identity provider, including the vSphere SSO server.	Requires the SAML token provided by the system's SSO server or SAML identity provider.
`hokssologin.php`	Authenticates a user using a SAML identity provider and HOK (holder of key) token, including the vSphere SSO server.	Requires the SAML token provided by the system's SSO server or SAML identity provider.
`createcatalogitem.php`	Adds an item to a catalog.	vApp Author.
`createcatalog.php`	Creates a catalog.	vApp Author.
`deployvapp.php`	Deploys and powers on a vApp.	vApp Author.
`vapplifecycle.php`	A structured workflow example that uses command-line parameters.	vApp Author.
`instantiatevapptemplate.php`	Instantiates a vApp template using organization defaults.	vApp Author.
`updatevm.php`	Edits the memory required by a virtual machine and reduces the existing value by half.	vApp Author.
`uploadvapptemplate.php`	Uploads an OVF package to create a vApp template.	vApp Author.

Table 4-1. Summary of Example Programs and their Required Permissions for a Predefined Role (Continued)

Example Name	Description	Required Permissions/Predefined Role
`createorg.php`	Creates an organization.	System Administrator.
`createvdc.php`	Creates a VDC.	System Administrator.
`createextnet.php`	Creates an external network from vSphere resources.	System Administrator.
`createnetpool.php`	Creates a network pool from vSphere resources.	System Administrator.
`createprovidervdc.php`	Creates a provider VDC from vSphere resources.	System Administrator.
`importvm.php`	Imports a virtual machine from vCenter to create a vApp in the specified VDC.	System Administrator.
`host.php`	Prepares an ESXi host for use with vCloud Director.	System Administrator.
`vimserver.php`	Register, unregister, enable, or disable a vCenter server for use withvCloud Director.	System Administrator.
`recomposevapp.php`	Add a virtual machine from a vAppTemplate to an existing vApp.	System Administrator.
`query.php`	Use the query service.	System Administrator.
`queryadminauditevents.php`	Query administrator audit events using the query service.	System Administrator.
`queryvmmetrics.php`	List current metrics information for a virtual machine.	vApp User.
`callout.php`	Use notifications and blocking tasks.	System Administrator.
`enableblockingtasks.php`	Enable or disable blocking tasks.	System Administrator.
`edgegateway.php`	Create, retrieve, update, or delete an edge gateway.	System Administrator.
`externalnetworkcrud.php`	Create, retrieve, update, or delete an external network.	System Administrator.
`networkpoolcrud.php`	Create, retrieve, update, or delete a network pool.	System Administrator.
`providervdccrud.php`	Create, retrieve, update, or delete a provider VDC.	System Administrator.
`correlation.php`	Shows which cloud resources are correlated to which vCenter server.	System Administrator.
`inventory.php`	Lists organization and provider resources.	The vApp Author role provides the minimum rights required to list organization resources. The rights associated with the System Administrator credentials are required to list provider resources.

Table 4-1. Summary of Example Programs and their Required Permissions for a Predefined Role (Continued)

Example Name	Description	Required Permissions/Predefined Role
`sessionmanagement.php`	Illustrates the session management capabilities available for vCloud API clients.	System Administrator.
`vmdiskworkflow.php`	Add a disk-level storage profile. In this example, a new disk is added to the virtual machine, and the disk is assigned a storage profile different from the virtual machine's default storage profile.	vApp User.

This chapter includes the following topics:

Running theVappLifeCycle Example

The `vapplifecycle.php` example program, included in the `samples` folder of the SDK, demonstrates a number of the operations that the vCloud SDK for PHP supports.

The `vapplifecycle.php` example demonstrates the following operations:

- Logging in to the cloud and getting an organization list
- Finding a VDC and a catalog
- Uploading an OVF package to create a vApp template in the catalog
- Instantiating the vApp template to create a vApp
- Operating the vApp

Like all of the example programs in this SDK, `vapplifecycle.php` is liberally commented. Read the comments for more information about how this example uses the features of the SDK to implement a structured workflow through the lifecycle of a vApp.

Procedure

1 Open a console or shell in the `samples` folder.

2 Run `php vapplifecycle.php`, as show in "Example: Running VappLifeCycle," on page 37.

Example: Running VappLifeCycle

You must supply runtime options on the command line. To see a summary of `vapplifecycle.php` options, use the following command:

```
php vapplifecycle.php –-help
```

To run the `vapplifecycle.php` example, use the following command:

```
php vapplifecycle.php –s vCloudURL –u user@vcloud–organization –p password –v 20.0 –o=orgName –
d=vdcName –f=ovfFileLocation –g=catalogName –n=vAppTemplateName
```

Values for the runtime options provide user credentials, object names, and file names.

Table 4-2. vapplifecycle runtime options

Value	Description
vCloudURL	The vCloud Director URL.
user	The name of a user account that can run the sample. This user must have rights to create and operate vApps.
vcloud-organization	The name of the organization in which the user account exists.
password	The user's password.
SDK version	The SDK version level. Specify 20.0 for version 8.10 of the SDK. Allowable values are 1.5, 5.1, 5.5, 5.6, 9.0, or 20.0.
orgName	The name of the organization in which the user account exists, and to which the user is authenticating.
vdcName	The name of a VDC in that organization where the user can upload the OVF and deploy the vApp.
ovfFileLocation	The full pathname to the OVF descriptor on the local disk.
catalogName	The name of the catalog into which the OVF package is uploaded, and in which the resulting vApp template is catalogued.
vAppTemplateName	The name of the vAppTemplate to be created from the OVF package.

All options but `–s`, `–u`, `–p`, and `–v` must be separated from their arguments by an equals sign, as the following example shows:

```
php vapplifecycle.php –s https://vcloud.example.com –u user@SampleOrg –p Pa55w0rd –v 20.0 –
o=SampleOrg –d=SampleVDC –f=C:\descriptor.ovf –g SampleCatalog –n=SamplevAppTemplate
```

You can use the vCloud Director Web Console or the vCloud REST API to find appropriate values in your vCloud for *orgName*, *vdcName*, and *catalogName*. See the *vCloud Director User's Guide* or the *vCloud API Programming Guide*.

Understanding the VappLifeCycle Example

The `vapplifecycle.php` example performs a sequence of operations that are typical of the workflow for provisioning and operating a vApp.

Included in the example are comment blocks that explain how the steps in the example use the SDK libraries. For additional information about vCloud API requests, see the *vCloud API Programming Guide*.

Logging In and Getting an Organization List

Most vCloud API requests must be authenticated by a login request that supplies user credentials in the form that Basic HTTP authentication requires. This form is MIME Base64 encoding of a string having the form *user@vcloud-organization*:*password*. The `VMware_VCloud_SDK_Service` class implements a login method that takes the following parameters:

`userName` Supplied in the form *user@vcloud-organization*.

`password` The user's password.

`vapplifecycle.php` encapsulates this authentication protocol in its `login()` method, which returns a list of organizations to which the specified user has access. In the typical case, this list has a single member, the organization that was supplied in the `userName` parameter.

Getting References to the VDC and Catalog

To instantiate a vApp template and operate the resulting vApp, you need the object references, the `href` values, for the catalog in which the vApp template will be entered and the VDC in which the vApp will be deployed. The `VMware_VCloud_SDK_Org` class implements `getVdcRefs()` and `getCatalogRefs()` methods that return references to VDCs and catalogs.

Creating a vApp Template in the Catalog by Uploading an OVF Package

The `vapplifecycle.php` command requires you to supply the name of an OVF descriptor file. This information is used in the `uploadOVFAsVappTemplate ()` method to upload the OVF descriptor file and create a vApp template.

Creating a vApp by Instantiating the vApp Template

After the template is added to a catalog, you can create a vApp by instantiating the template. `vapplifecycle.php` implements an `instantiateVAppTemplateDefault()` method that constructs a simple `InstantiateVAppTemplateParams` request body, makes the request to the `action/instantiateVAppTemplate` URL of the VDC, and returns a helper object that contains a reference to the vApp.

Operating the vApp

The `VMware_VCloud_SDK_VApp` class includes methods that perform operations on the vApp. Most of these operations return a `Task` object that tracks the progress of the operation. `vapplifecycle.php` uses these methods to cycle the vApp through the following states:

1 `$sdkVApp->deploy()`, which deploys and powers on the vApp

2 `$sdkVApp->undeploy()`, which powers off and undeploys the vApp

3 `$sdkVApp->delete()`, which deletes the vApp

Run the Other vCloud SDK PHP Example Programs

The example programs included with the SDK display a usage message when you run them with no parameters.

Each of the example programs in the `samples` folder requires that you specify parameters at the command line. Common parameters, such as the credentials that the examples use for logging in, are read from a file named `config.php`. Running an example program with no command-line parameters causes the program to display a usage summary. You can use the summary to help construct a command line that runs the example with parameters that are appropriate for your installation.

Procedure

1 (Optional) Edit the `config.php` file to provide common parameter values.

When you run an example program, you can override its use of these values by supplying them at the command line.

2 Run the example in a shell window using a command of the following form, where *example* is the name of the example program:

`php` *`example`*`.php`

When you run an example program with no parameters, a usage message appears and the program exits.

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