

7: Resources

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1

Info

>

2

Properties

>

3

Authentication

>

4

Config & Parameters

>

5

Hooks

>

6

Events

>

After you set up your connector, you can add resources to start making requests. As you create new resources, keep the API documentation of the API provider close. You will refer to it often.

Certain resources automatically appear based on the hub. For example, if you create a connector in the CRM hub, SAP Cloud Platform Open Connectors creates endpoints resources like accounts, contacts, leads, and opportunities. The resources created differ from hub to hub, but we will always create the following resources:

- /ping
- /objects
- /objectName

Note: Throughout this section, we provide several examples. To keep them consistent, we are using the use case of adding a `/deals` resource to a CRM connector.

Define New Resources

Defining a resource is a multi-step process, but you do not need to complete each step. For example, you need to add hooks only for advanced or complex use cases. You need to configure bulk for only the resources that you plan to download or upload bulk changes.

When defining resources, begin by adding a resource and providing basic information about the resource as a whole. For each endpoint, provide a description and add any endpoint-level configuration. If needed, add parameters to pass along with each request to each endpoint. For more complex use cases, write hooks needed to perform complex tasks. If the method requires models (POST, PUT, PATCH), define the models for each request and response. Lastly, if you want to be able to upload or download bulk CSV or JSON files, configure bulk for the endpoint.

Before you begin, review the [Connector Conventions](#) so your connector will align with others in the Connectors Catalog.

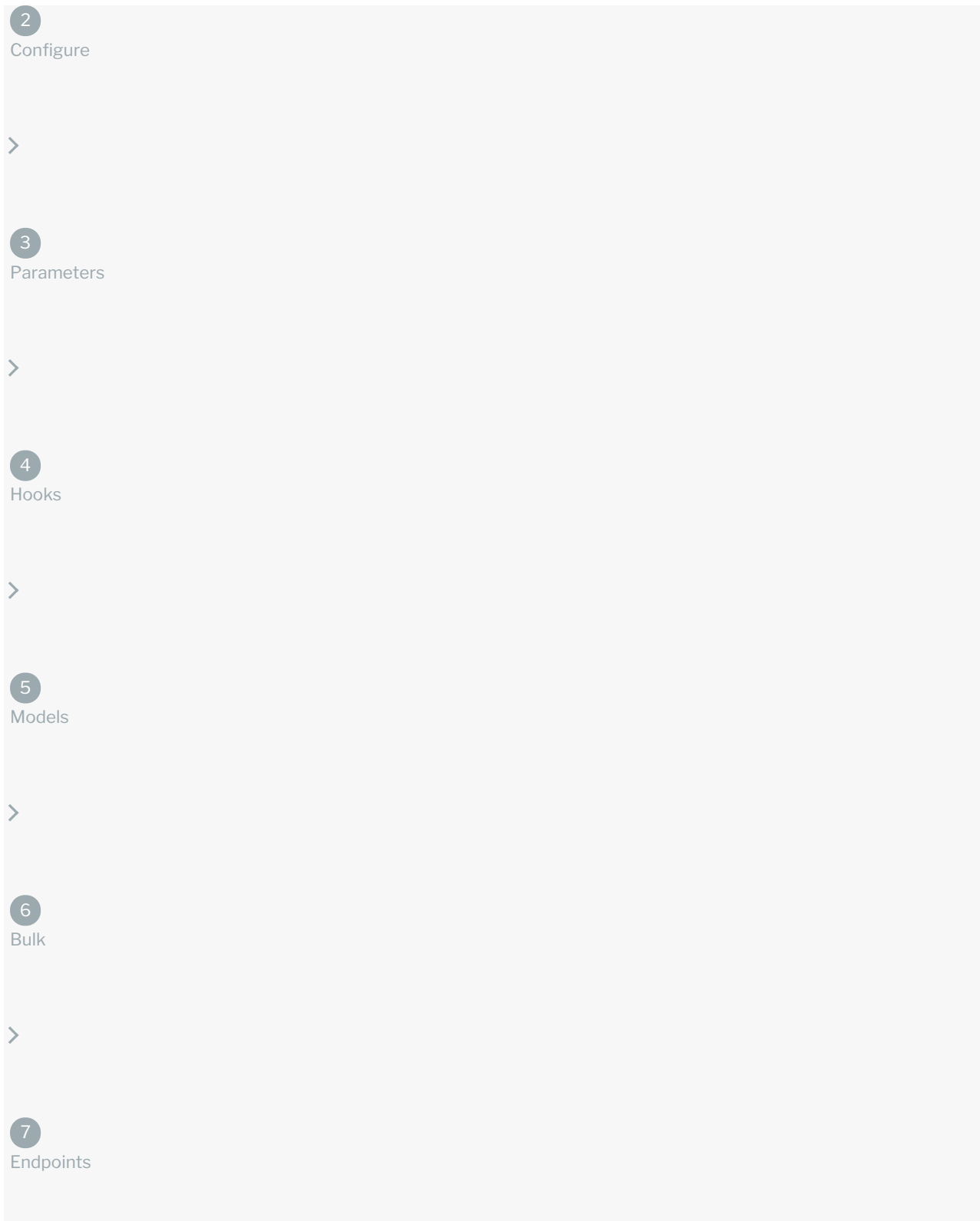
Add a Resource with a Different API Type

You can now create a new resource with a different API type at the resource level by overriding the API type at the connector level.

For example, the Adwords connector is a SOAP API for all its resources except the `/reports` resource. The API type of the connector was overridden at the resource level, making `/reports` a REST API resource.

Here's a [use case](#) for the same.

Add a Resource



Adding a resource enables you to create multiple endpoints for a single resource at one time. You can also add individual endpoints one at a time. SAP Cloud Platform Open Connectors automatically groups individual endpoints by resource name when they match.

To add a resource:

1. Click **Add a new resource** at the top of the page.
2. Identify if the resource is a child resource, such as `/users/{id}/tasks` or `/contacts/{id}/tasks`.
3. In **SAP Cloud Platform Open Connectors Resource Name** add the name of the resource as you want to see it in SAP

Cloud Platform Open Connectors. For example, enter `deals` to add a `/deals` resource to a CRM connector. The name you choose is what appears in the API documentation and also creates an endpoint in the hub. For example, the new `GET /deals` endpoint appears as **GET /deals** in the docs and is accessible via the `hubs/crm/deals` endpoint.

Note: To remain consistent with SAP Cloud Platform Open Connectors naming conventions, we recommend that you name the resources in the plural form. For example, `/deals`` not `/deal``.

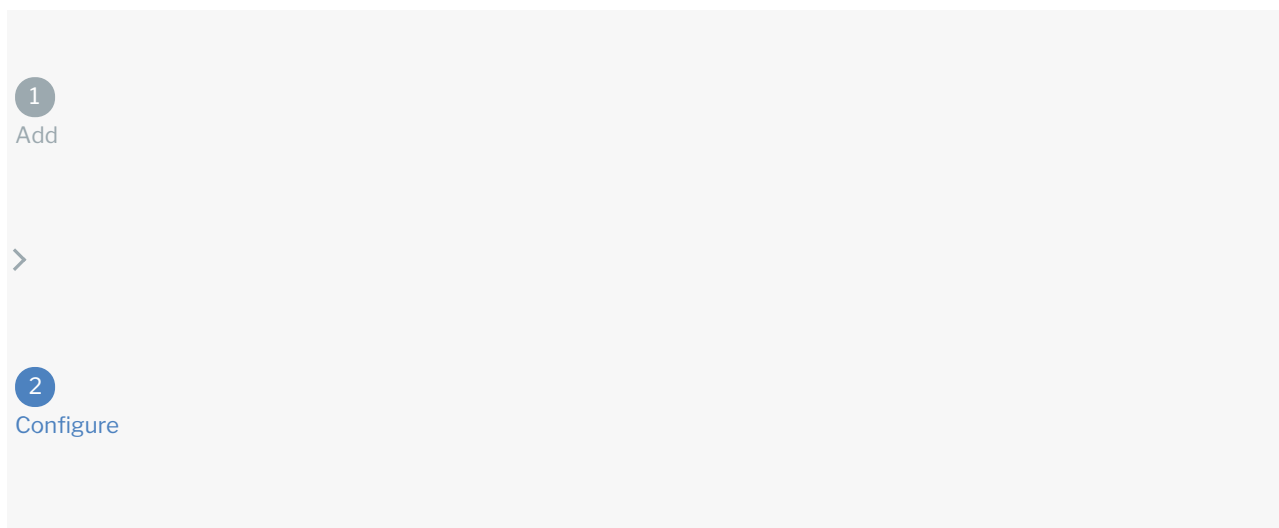
4. In **Vendor Resource Name** add the path to the resource at the API provider. The value that you enter is appended directly to the Base URL. If your Base URL ends with a slash `/` then do not enter a slash before the resource name. If your Base URL does not end in a slash `/`, then add one before the resource name.
5. In **Primary Key** enter the property that uniquely identifies the resource. Primary keys are typically ID fields associated with the resource. In this example, a primary key could be `id`.
6. In **Created Date Key** and **Updated Date Key** enter the properties that identify the created and updated dates. Created and updated date keys vary widely, but can be `created`, `createdate`, or `timecreated` and `updated`, `lastModified`, or `dateModified`.
7. Select the methods to add. You will define the methods that you select when you [set up the endpoints](#). Make sure that the methods that you select are supported by the API provider.

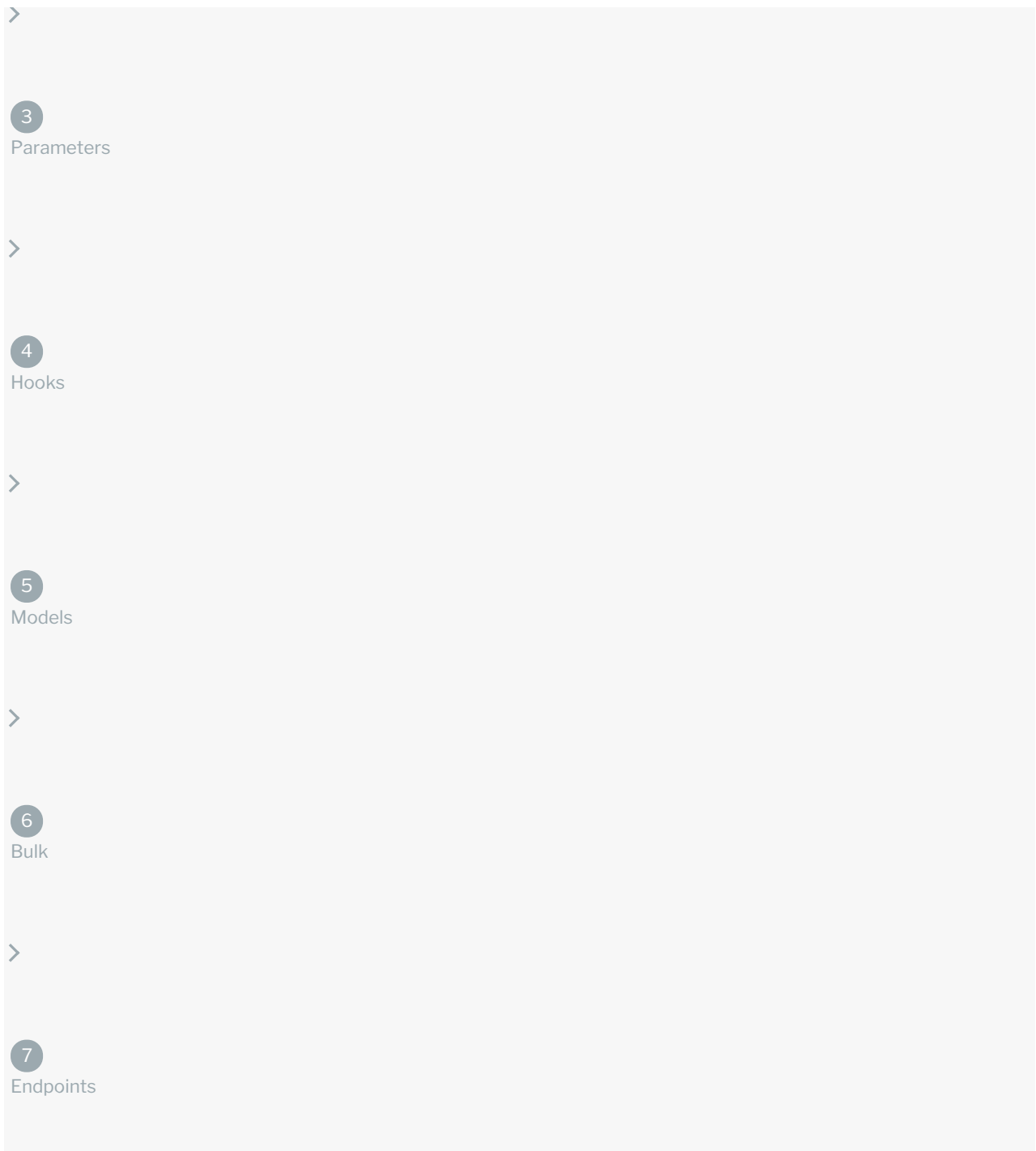
For a new deals resource with all methods, our basic resource information looks like this:

The screenshot shows a configuration form for an Open Connectors Resource. At the top, there are two input fields: "Open Connectors Resource Name" with the value "deals" and "Vendor Resource Name" with the value "deals". A blue button labeled "Maps to →" is positioned between them. Below these fields, there are three input fields for keys: "Primary Key" with "id", "Created Date Key" with "created_at", and "Updated Date Key" with "updated_at". To the right of these key fields is a list of HTTP methods with checkboxes: GET, GET by ID, POST, PATCH, PUT, and DELETE, all of which are checked. At the bottom right of the form, there are two buttons: "Go" and "Cancel".

8. Click **Go**.
9. Continue to [Configure Endpoints](#).

Configure Endpoints





After you provide the basic information to create a resource, SAP Cloud Platform Open Connectors shows the endpoints associated with each method that you chose to configure for the resource in an editable API documentation format. Use the Endpoints tab (highlighted below) to configure each of the endpoints created from the combination of the resource and the methods that you selected in the previous step. If you did not select the correct methods in the previous step, you can add or remove endpoints on the Endpoints tab.

deals Endpoints Bulk ^

GET	/deals	Maps to →	GET	/deals	 
GET	/deals/{id}	Maps to →	GET	/deals/{id}	 
POST	/deals	Maps to →	POST	/deals	 
PATCH	/deals/{id}	Maps to →	PATCH	/deals/{id}	 
PUT	/deals/{id}	Maps to →	PUT	/deals/{id}	 
DELETE	/deals/{id}	Maps to →	DELETE	/deals/{id}	 

+ Add a new endpoint

If you have any authenticated connector instances for the connector, they appear on the left. Select a connector instance to test the endpoints as you build them.













To set up endpoints:

1. Click



2. Expand the Configuration section.

deals Endpoints Bulk ^

GET	/deals	Maps to →	GET	/deals	 
GET	/deals/{id}	Maps to →	GET	/deals/{id}	 
POST	/deals	Maps to →	POST	/deals	 
PATCH	/deals/{id}	Maps to →	PATCH	/deals/{id}	 
PUT	/deals/{id}	Maps to →	PUT	/deals/{id}	 
DELETE	/deals/{id}	Maps to →	DELETE	/deals/{id}	 

3. In **Resource Type** select a resource type other than **API** only if you want to alter how the API documentation treats the endpoint.
4. Add a **Root Key** to identify the top level field of the resource and limit what you send (**Request Root Key**) or receive (**Response Root Key**). For example, if you receive the following payload, but only want `items`, not `numberOfItems` and `items`, enter `items`.

```

{
  "numberOfItems": 10,
  "items": {
    "itemOne" : "hello",
    "itemtwo" : "world"
  }
}

```

- In **Pagination Type** select to override the default pagination settings of the connector. If you select nothing, the default is **Supported**.

Note: If the API provider does not support paging, SAP Cloud Platform Open Connectors uses the `page` or `nextPage` and `pageSize` parameters to page through the result set.

- In **Next Resource** select another endpoint if your use case requires requests to multiple endpoints one after another.
- Enter a description. This appears in the API documentation and should help a user understand what the request is

for and what to expect in the response. A description of the `GET /deals` endpoint could be: "Retrieves a list of deals. Use OCNQL to filter by related fields like company and contact."

Tip: The descriptions that you enter for each endpoint should help a user understand what the endpoint does. Keep the descriptions short, no more than three sentences. Start with a verb associated with a method like gets, retrieves, checks, creates, returns, updates, or deletes. Then describe what resource is being manipulated and add any other helpful information about required fields, filtering, or formatting.

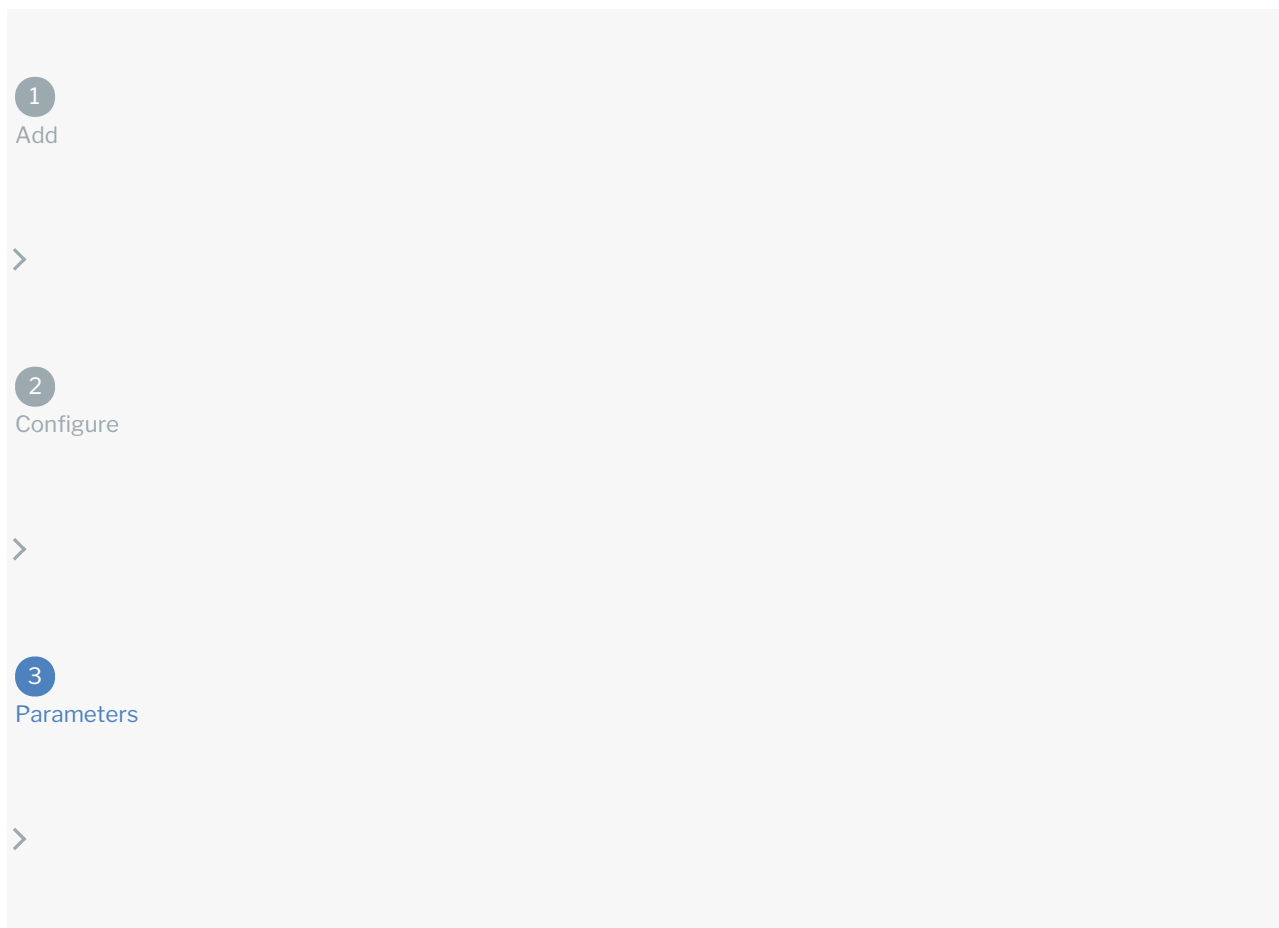
- Continue to [Add Parameters](#).

Endpoint Configuration Parameters

Parameter	Description	Required
Resource Type	Describes the endpoint, when it executes, and whether it appears in the API documentation.	Yes
	API – The default resource type where the endpoint makes a request to the API provider and is documented within the API documentation.	
	API No Documentation – The endpoint makes a request to the API provider but it is hidden from the API documentation.	
	On Delete – The endpoint makes a request when you delete a connector instance. Use this type of resource to clean up after someone deletes an instance of the connector.	
	On Provision – The endpoint makes a request when you authenticate a connector instance. Use this type of resource to extract information during the authentication process to add to the connector configuration. For example, use an On Provision request to verify credentials prior to authenticating a connector instance .	
	On Refresh – The endpoint makes a request after the connector makes an OAuth 2.0 token refresh request.	
	Provision Auth Validation – The endpoint makes a request during authentication validation.	
	On Provision Webhook – The endpoint makes a request during authentication of a connector instance to register one or more webhooks with the API provider.	

Parameter	Description	Required
	On Delete Webhook — The endpoint makes a request during deletion of a connector instance to remove one or more webhooks from the API provider.	
	OAuth On Authorize URL — The endpoint makes a request bypassing the generic OAuth flow.	
	OAuth On Token Exchange — The endpoint makes a request bypassing the generic OAuth flow.	
	OAuth On Token Refresh — The endpoint makes a request bypassing the generic OAuth flow.	
	OAuth On Token Revoke — The endpoint makes a request bypassing the generic OAuth flow.	
	OAuth On Token Request — The endpoint makes a request bypassing the generic OAuth flow.	
	OAuth1 On Token Request — The endpoint makes a request bypassing the generic OAuth flow.	
Request Root Key	Identifies the root object in the JSON request that contains the relevant information about the resource. See the Connector Builder: Request Root Key and Response Root Key knowledgebase article for more information.	No
Response Root Key	Identifies the root object in the JSON response that contains the relevant information about the resource. See the Connector Builder: Request Root Key and Response Root Key knowledgebase article for more information.	No
Pagination Type	Identifies whether the resource supports the default pagination settings of the connector. If you leave this parameter empty it defaults to Supported.	No
Next Resource	If chaining resources , identifies the endpoint request that follows this request in the chain.	No

Add Parameters



4

Hooks

>

5

Models

>

6

Bulk

>

7

Endpoints

Endpoint parameters allow you to pass various properties to the endpoint. Use the endpoint parameters to configure searches, pagination, ids, and required fields. You can configure most required and optional parameters for most endpoints. SAP Cloud Platform Open Connectors provides some default common parameters for each method, except DELETE.

Default Parameters for Each Method

GET	GET {id}	POST, PATCH & PUT	DELETE
<p>where: OCNQL search expression. In Vendor Name, keep the default <code>converter: toQueryParameters</code> in most cases. For some API providers that use an OData service you can use <code>converter: toODataFilter</code>. In some cases querying in the API provider cannot be supported by the existing parameters and you should contact SAP Cloud Platform Open Connectors support.</p>	<p>id: The id of a specific object.</p>	<p>body: The object payload to create or update.</p>	<p>No default, but the id of the deleted object is a common parameter.</p>
<p>page: The next token or link to get additional results.</p>			
<p>pageSize: The number of records to return.</p>			

Map parameters that you send as part of the request from SAP Cloud Platform Open Connectors on the top row to parameters available to the resource at the API provider on the second row.

The screenshot shows an API configuration tool. At the top, there are two endpoints: `/hubs/crm/deals` and `/deals/v1/deal/paged`. Below this is a 'Configuration' section and a 'Parameters' section. The 'Parameters' section contains a table with the following data:

Name	Type	Data Type	Source	Description	Required
Associations	query	boolean	request	If you choose true than associations are returned	<input type="checkbox"/>
includeAssociations	query	boolean	← vendors information		
dealname	value	string	request	The deal name parameter so we can pull in more info	<input type="checkbox"/>
properties	query	string	← vendors information		

To define a parameter :

1. Select an endpoint, and then click



2. If you need to add a parameter, click **Add New Parameter**.
3. In **Parameter Name**, enter the name of the parameter. The name appears in the API documentation in some cases or can be a value passed to the API provider.
4. In **Vendor Name** enter the name of the parameter to map to. For example, if you are adding an `id` parameter, **Vendor Name** should be the unique id field for the resource like `dealId`.
5. In **Parameter Type** select the source of the parameter.
6. In **Vendor Type** select how the API provider receives the parameter.
7. In **Parameter Datatype** and **Vendor Datatype** select the data type of the parameter.
8. If the **Parameter Type** is `body`, enter the name of an existing model in **Model Name**. See [Add Models](#) to create a model for the endpoint.
9. If you want to switch the standard workflow where the parameters on the left are part of the request, click **Parameter Source**, and then select **Request**. ID, GET,
10. To make the parameter a required part of the request, switch **Required** on.
11. In **Parameter Description** enter a brief description of the parameter. If the parameter appears in the API documentation, this description also appears.
12. Click **Save**:
 - o If you need to add any more endpoints, continue to [Add Endpoints](#).
 - o If the resource requires more logic to interact with it, continue to [Add Hooks](#).
 - o if you need to add a model to a POST, PUT, or PATCH request, continue to [Add Models](#)
 - o If you need to be able to upload or download bulk data in JSON or CSV format, continue to [Configure Bulk](#).

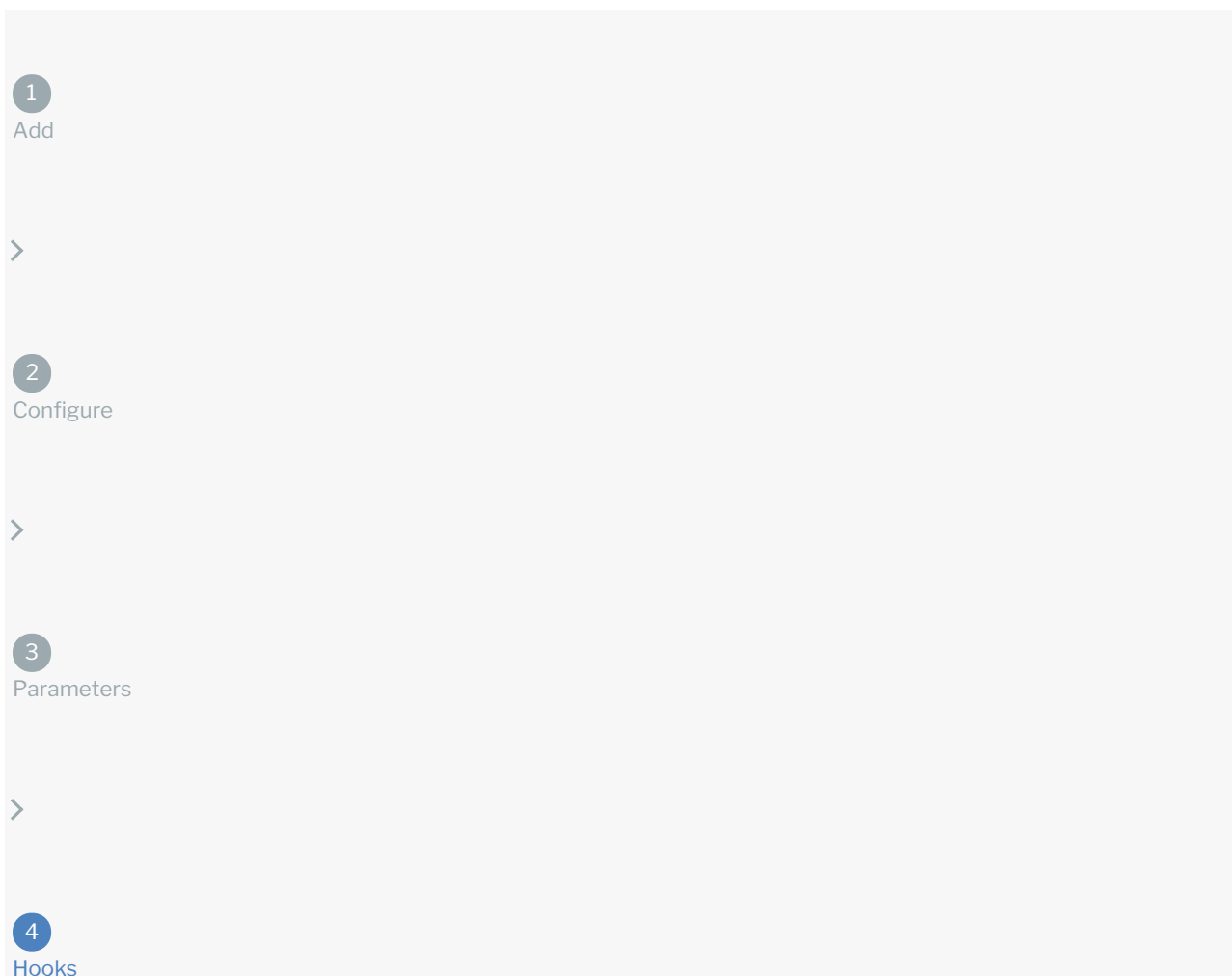
Parameters

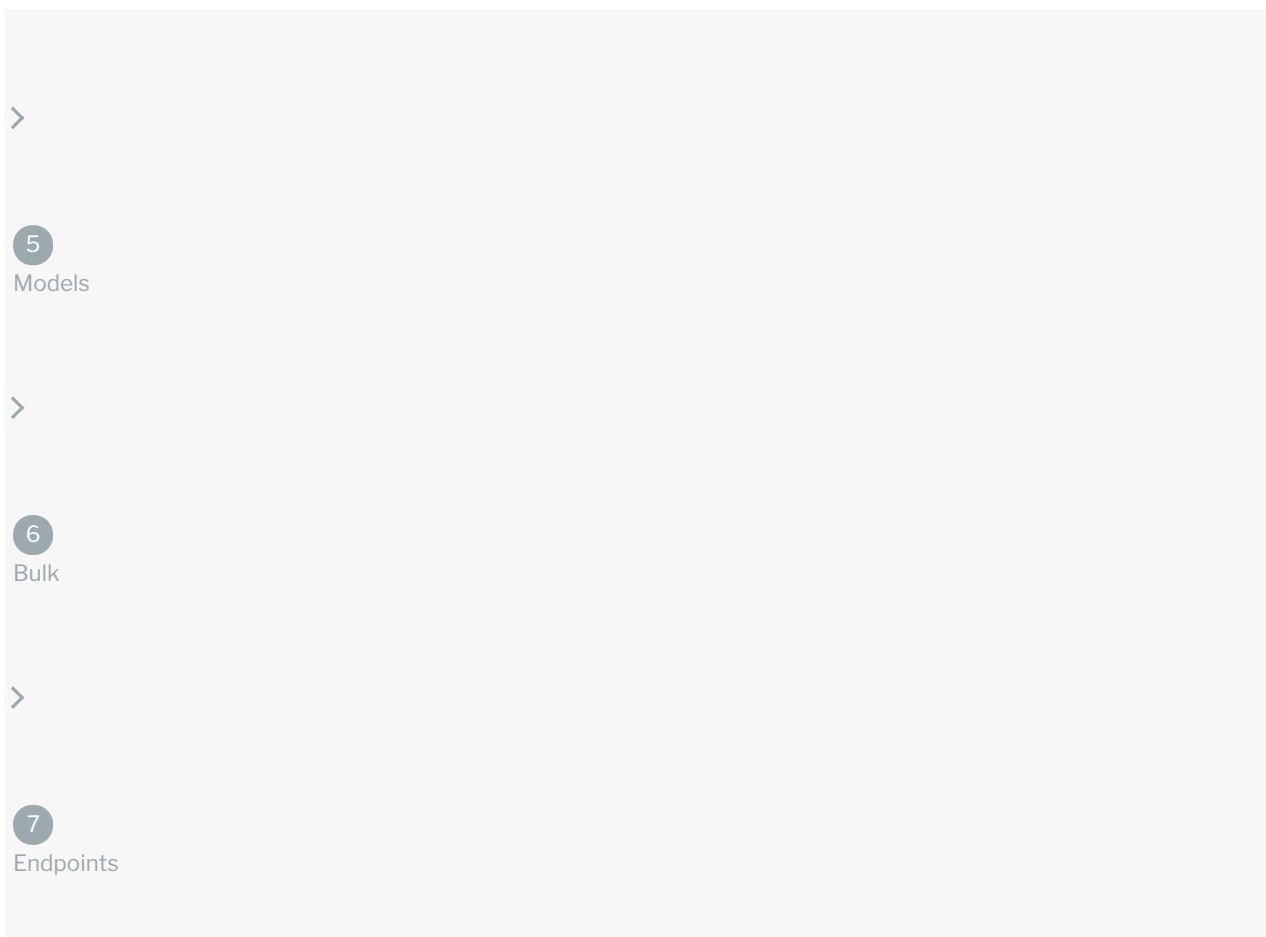
Parameter	Description	Required
Parameter Type	Body	Body
	configuration — The value of the parameter is the value of the configuration identified by the Configuration Key specified in the Parameter Name. The Parameter Name must match a Configuration Key in the connector configuration.	
	header — The value is the request header parameter that matches the Parameter Name.	
	path — The value is the portion of the request path that matches the Parameter Name.	

Parameter	Description	Required
	body — The value is the part of the request body that matches the Parameter Name.	
	query — The value is the query parameter that matches the Parameter Name.	
	form — The value is the value of the key that matches the Parameter Name in the x-www-form-urlencoded body of a request. If a file, then use "file" as the Parameter Name.	
	multipart — The value is the value of the key that matches the Parameter Name in the x-www-form-urlencoded body of a request. If a file, then use "file" as the Parameter Name.	
	value — The value is the Parameter Name.	
	bodyField — The value is the value of the field in a request body that matches the Parameter Name.	
	prevBody - SAP Cloud Platform Open Connectors parameter type only. If chaining requests, the value is the part of the request body of the previous request in the chain that matches the Parameter Name.	
	prevBodyField - SAP Cloud Platform Open Connectors parameter type only. If chaining requests, the value is the field in the request body of the previous request in the chain that matches the Parameter Name	
Vendor Type	Body	Body
	configuration — Requests to the API provider pass the parameter value as part of the configuration.	
	header — Requests to the API provider pass the parameter value in the header.	
	path — Requests to the API provider pass the parameter value in the path.	
	body — Requests to the API provider pass the parameter value in the body.	
	query — Requests to the API provider pass the parameter value as a query parameter.	
	form — Requests to the API provider pass the parameter value as part of the x-www-form-urlencoded body of a request.	
	multipart — Requests to the API provider pass the parameter value as part of the x-www-form-urlencoded body of a request.	
	value — Requests to the API provider pass the parameter value as a value.	
	bodyField — Requests to the API provider pass the parameter value as a body field.	
	bodyToken — Requests to the API provider pass the parameter value as a body token.	
	no-op — Indicates that the API provider does not need to operate on the parameter. Use no-op if you use the parameter in hooks.	
Parameter Datatype	The datatype of the parameter in the request.	Y
	integer — A 32 bit binary signed integer.	
	long — A 32 bit binary signed integer.	
	float — A specific data type for a number.	
	double — A specific data type for a number.	
	string — A free text string.	

Parameter	Description	Required
	64 encoded characters.	
	binatry — Any sequence of octets.	
	boolean — Any true/false or yes/no data.	
	date — Any true/false or yes/no data.	
	dateTime — As defined by full-date - RFC3339.	
	boolean — As defined by date-time - RFC3339.	
	password — A hint to UIs to obscure input.	
Vendor Datatype	The datatype of the parameter as expected by the API provider. See options for Parameter Datatype.	Body
Parameter Source	Identifies the side that represents the source, or left side of the parameter. The default request identifies SAP Cloud Platform Open Connectors as the source. If you choose response, you effectively flip the SAP Cloud Platform Open Connectors and API provider sides.	Y
Required	Identifies whether the parameter is required.	Y
Parameter Description	A free text area to describe the parameter.	Y

Add Hooks



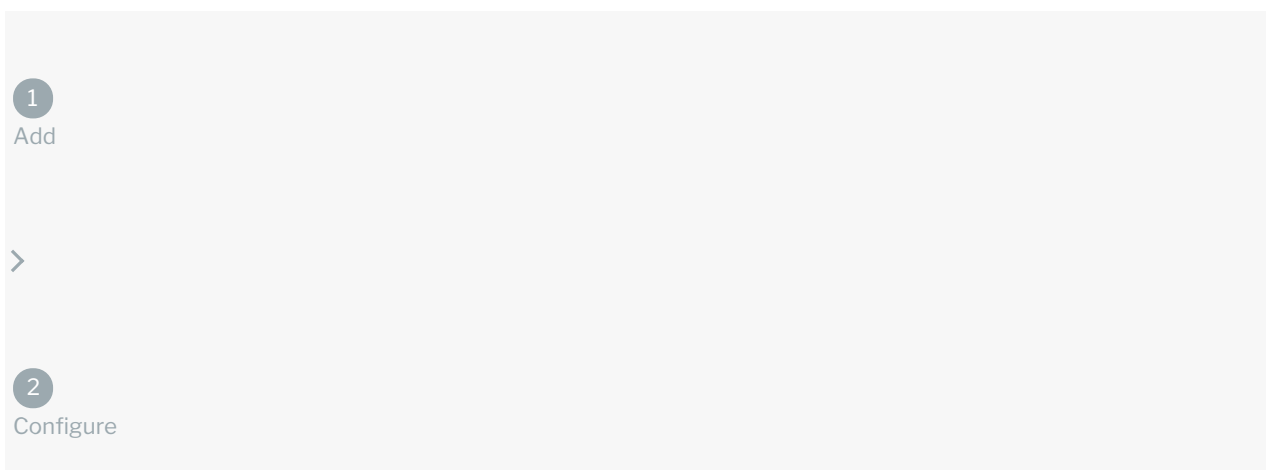


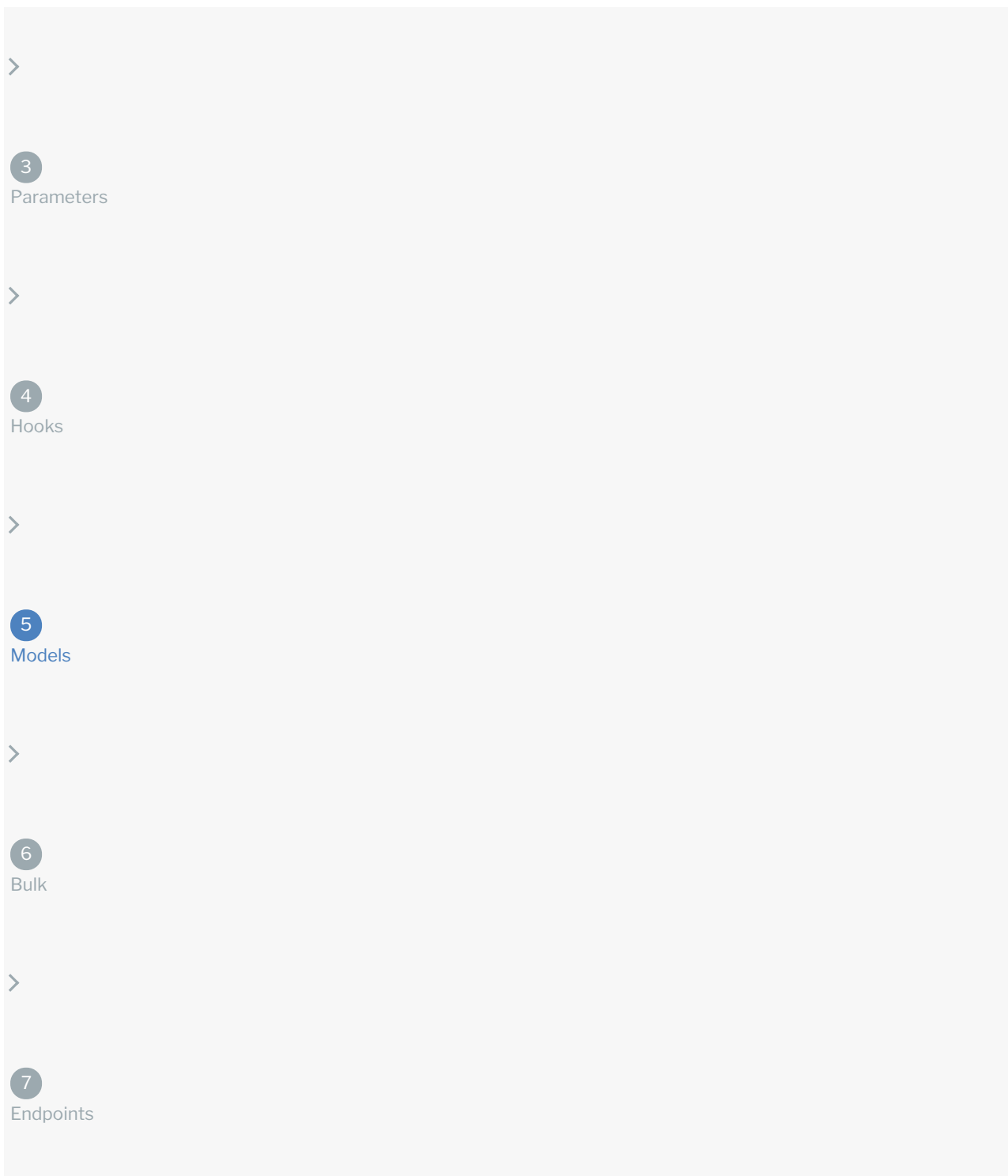
You can create [resource hooks](#) to manipulate any part of a request or response or to operate on a configuration. Resource hooks work differently than [global hooks](#) because they happen only on requests and responses related to a specific endpoint. [Custom Hooks](#) provides detailed information about using hooks and includes examples.

To create a resource hook:

1. In the endpoint edit view, click **Add a pre-request hook** or **Add a post-response hook** depending on what you need to manipulate.
2. Write the script needed for your use case. See [Custom Hooks](#) for more information about the functions and libraries available to you.
3. Save the endpoint.

Add Models





Depending on the endpoint method, you can add request models and response models. Request models provide an example of how you should structure the JSON body of a POST, PUT, or PATCH request. Response models give you an idea of what the response from the API vendor should look like.

Request models are required for POST, PUT, or PATCH requests, and the model that you set up should match the Model Name in the **body** parameter.

You can add request models in two ways: entering the model schema directly or generating the model schema from a sample payload.

To add a model:

1. Identify what the request body should look like in the API provider's documentation or acquire a sample payload.
2. Click **Request Model** or **Response Model**.
3. Enter a name for the model.
4. Depending on how you want to enter the model:
 - Enter the model as a schema object as defined in the [OpenAPI version 2.0 Specification](#).
 - Or, click **Generate from Sample Payload**, paste the sample payload, and then click **Generate**.

Create the response model for *GET /deals/{id}*

Model Display Name

 [Generate from Sample payload](#)

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5. Click **Save**.

Sample Model

The following sample model is a request model called postDeals for a `deals` resource.

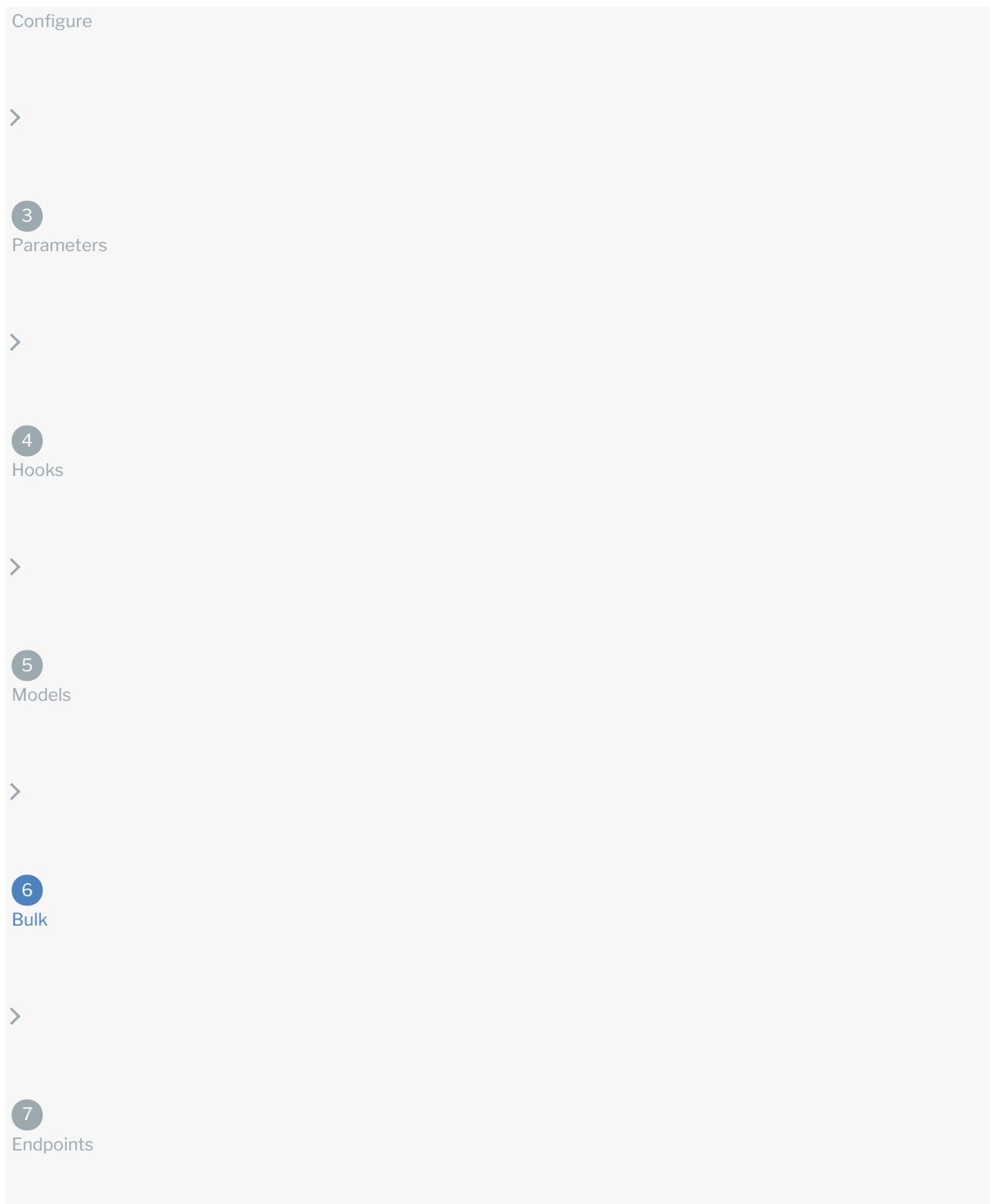
```
{
  "postDeals": {
    "id": "postDeals",
    "properties": {
      "deal": {
        "type": "deal"
      }
    }
  },
  "deal": {
    "id": "deal",
    "properties": {
      "owner": {
        "type": "string"
      },
      "stage": {
        "type": "string"
      },
      "contact": {
        "type": "string"
      },
      "currency": {
        "type": "string"
      },
      "title": {
        "type": "string"
      },
      "percent": {
        "type": "unknown"
      },
      "value": {
        "format": "int32",
        "type": "integer"
      },
      "group": {
        "type": "string"
      },
      "status": {
        "format": "int32",
        "type": "integer"
      }
    }
  }
}
```

Configure Bulk

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Add

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You can set up each resource to be able to upload and download bulk data in either JSON or CSV format.

To configure bulk:

1. Click the **Bulk** tab.
2. Select to enable bulk upload, download, or both.
3. In each of the fields, select the format that the endpoint expects.
4. Click **Save Bulk Configuration**.

Add Endpoints

1
Add



2
Configure



3
Parameters



4
Hooks



5
Models



6
Bulk



7


Endpoints

You can add a new endpoint for a resource.


To add an endpoint:

1. Under the last endpoint associated with the resource, click **Add a new endpoint**.
2. Select the Method for the new endpoint. The left side represents the SAP Cloud Platform Open Connectors side of the endpoint.
3. On the right side, select the vendor method associate with the endpoint, and then enter the URL of that endpoint.
4. Click **Go**, and then follow the steps to [define the resource](#).

Delete Endpoints

If you no longer need an endpoint, click , and then confirm the deletion. To completely remove a resource, delete all of the endpoints associated with it.

Copy Endpoints

To copy an endpoint, click . After you copy an endpoint, SAP Cloud Platform Open Connectors creates a new resource and endpoint with the word **_copy** appended to it.

Chaining Resources

You can create sequences of requests and perform operations based on the results of earlier requests in a sequence. Data from earlier resources in a chain are available to hooks through the `request_previous_response` and `request_previous_response_headers` parameters. Data is also available to parameters in the `prevBodyField` and `prevBody` Parameter Types.

To chain requests start with the earliest requests in the chain. While working with the endpoint configuration, select the next resource in the chain from the **Next Resource** list.
