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DBMS_CLOUD

The `DBMS_CLOUD` package provides database routines for working with cloud resources.

This chapter contains the following topics:

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  This section covers the installation of the `DBMS_CLOUD` packages.
- DBMS_CLOUD Endpoint Management
  Describes the format of pre-configured endpoint URIs in operations with DBMS_CLOUD.
- DBMS_CLOUD Subprograms and REST APIs
  This section covers the DBMS_CLOUD subprograms and REST APIs provided with Oracle Database.
- DBMS_CLOUD URI Formats
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- DBMS_CLOUD Package Format Options
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- DBMS_CLOUD Package Format Options for EXPORT_DATA
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- DBMS_CLOUD Avro and Parquet Support
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- DBMS_CLOUD Exceptions
  This section describes exceptions for DBMS_CLOUD.

Installing DBMS_CLOUD

The `DBMS_CLOUD` family of packages is not pre-installed or configured with Oracle Database. You need to manually install the `DBMS_CLOUD` packages and also configure users or roles to use this package.

For information on installation and configuration with Oracle Database 23.7, see Using the DBMS_CLOUD Autonomous Database Packages.

For any other supported releases on installing the `DBMS_CLOUD` package and configuring users/roles, see the MOS-NOTE with Doc ID 2748362.1.

DBMS_CLOUD Endpoint Management

Describes the format of pre-configured endpoint `URIs` in operations with `DBMS_CLOUD`.
The `DBMS_CLOUD` package supports a number of object store and REST endpoints that are all pre-configured for the service. This package also allows you to access additional non-preconfigured endpoints after properly enabling such endpoints through network access control lists (**ACLs**).

The authentication for pre-configured endpoints is automatically understood and derived in DBMS_CLOUD. In order to know the proper authentication type for additional, customer-managed endpoints, DBMS_CLOUD supports URI schemes to indicate the authentication type for the URI endpoint. The URI endpoint must support HTTPS on port 443 for secure HTTP requests.

- For more information on pre-configured URIs, see DBMS_CLOUD URI Formats.
- For more information on customer-managed URIs, see Additional Customer-Managed URI Formats.

DBMS_CLOUD Subprograms and REST APIs

This section covers the DBMS_CLOUD subprograms and REST APIs provided with Oracle Database.

The DBMS_CLOUD package is made up of the following:

DBMS_CLOUD for Access Management

The subprograms for credential management within the DBMS_CLOUD package, including creating, deleting, and updating credentials.

Subprogram	Description
CREATE_CREDENTIAL Procedure	This procedure stores cloud service credentials in Oracle Database.
DROP_CREDENTIAL Procedure	This procedure removes an existing credential from Oracle Database.
UPDATE_CREDENTIAL Procedure	This procedure updates cloud service credential attributes in Oracle Database.

CREATE_CREDENTIAL Procedure

This procedure stores cloud service credentials in Oracle Database.

Use stored cloud service credentials to access the cloud service for data loading, for querying external data residing in the cloud, or for other cases when you use DBMS_CLOUD procedures with a credential_name parameter. This procedure is overloaded:

- Use the Oracle Cloud Infrastructure-related parameters, including: user_ocid, tenancy_ocid, private_key, and fingerprint only when you are using Oracle Cloud Infrastructure Signing Keys authentication.

Syntax

```
DBMS_CLOUD.CREATE_CREDENTIAL (
      credential_name   IN VARCHAR2,
      username          IN VARCHAR2,
      password          IN VARCHAR2 DEFAULT NULL);


DBMS_CLOUD.CREATE_CREDENTIAL (
      credential_name IN VARCHAR2,
      user_ocid       IN VARCHAR2,
      tenancy_ocid    IN VARCHAR2,
```

```
    private_key     IN VARCHAR2,
    fingerprint     IN VARCHAR2);
```

Parameters

Parameter	Description
credential_name	The name of the credential to be stored. The credential_name parameter must conform to Oracle object naming conventions, which do not allow spaces or hyphens.
username	The username and password arguments together specify your cloud service credentials. See the usage notes for what to specify for the username and password for different cloud services.
password	The username and password arguments together specify your cloud service credentials.
user_ocid	Specifies the user's OCID. See Where to Get the Tenancy's OCID and User's OCID for details on obtaining the User's OCID.
tenancy_ocid	Specifies the tenancy's OCID. See Where to Get the Tenancy's OCID and User's OCID for details on obtaining the Tenancy's OCID.
private_key	Specifies the generated private key. Private keys generated with a passphrase are not supported. You need to generate the private key without a passphrase. See How to Generate an API Signing Key for details on generating a key pair in PEM format.
fingerprint	Specifies a fingerprint. After a generated public key is uploaded to the user's account the fingerprint is displayed in the console. Use the displayed fingerprint for this argument. See How to Get the Key's Fingerprint and How to Generate an API Signing Key for more details.

Usage Notes

- This operation stores the credentials in the database in an encrypted format.
- You can see the credentials in your schema by querying the user_credentials table.
- The ADMIN user can see all the credentials by querying the dba_credentials table.
- You only need to create credentials once unless your cloud service credentials change. Once you store the credentials you can then use the same credential name for DBMS_CLOUD procedures that require a credential_name parameter.
- This procedure is overloaded. If you provide one of the key based authentication attributes, user_ocid, tenancy_ocid, private_key, or fingerprint, the call is assumed to be an Oracle Cloud Infrastructure Signing Key based credential.
- You can list credentials from the view ALL_CREDENTIALS. For example, run the following command to list credentials:

```
SELECT credential_name, username, comments FROM all_credentials;
```

Oracle Cloud Infrastructure Credentials (Auth Tokens)

For Oracle Cloud Infrastructure the username is your Oracle Cloud Infrastructure user name. The password is your Oracle Cloud Infrastructure auth token. See Working with Auth Tokens.

For example:

```
BEGIN
  DBMS_CLOUD.CREATE_CREDENTIAL(
    credential_name => 'DEF_CRED_NAME',
    username => 'adb_user@example.com',
    password => 'password' );
END;
/
```

Use Auth Token based credentials when you are authenticating calls to . For calls to any other type of Oracle Cloud Infrastructure cloud service, use Oracle Cloud Infrastructure Signing Key Based Credentials.

For , `username` parameter value must include the Identity domain and the user name from your profile. You can find the Identity domain associated with a user in the Oracle Cloud Infrastructure Console.

For example:

```
oracleidentitycloudservice/adb_user@example.com
```

With the default Identity domain you are not required to include the domain name `Default`. For example:

```
adb_user@example.com
```

Oracle Cloud Infrastructure Signing Key Based Credentials

Use the Oracle Cloud Infrastructure signing key related parameters, including: `user_ocid`, `tenancy_ocid`, `private_key`, and `fingerprint` with Oracle Cloud Infrastructure Signing Keys authentication.

For example:

```
BEGIN
   DBMS_CLOUD.CREATE_CREDENTIAL (
       credential_name => 'OCI_KEY_CRED',
       user_ocid       =>
'ocid1.user.oc1..aaaaaaaauq54mi7zdyfhw33ozkwuontjceel7fok5nq3bf2vwetkpqsoa',
       tenancy_ocid    =>
'ocid1.tenancy.oc1..aabbbbbbaafcue47pqmrf4vigneebgbcmmoy5r7xvoypicjqqge32ewnrc
yx2a',
       private_key     =>
'MIIEogIBAAKCAQEAtUnxbmrekwgVac6FdWeRzoXvIpA9+0r1.....wtnNpESQQQ0QLGPD8NM//
JEBg=',
       fingerprint     => 'f2:db:f9:18:a4:aa:fc:94:f4:f6:6c:39:96:16:aa:27');
END;
/
```

Private keys generated with a passphrase are not supported. You need to generate the private key without a passphrase. See How to Generate an API Signing Key for more information.

Oracle Cloud Infrastructure Object Storage Classic Credentials

If your source files reside in Oracle Cloud Infrastructure Object Storage Classic, the `username` is your Oracle Cloud Infrastructure Classic user name and the `password` is your Oracle Cloud Infrastructure Classic password.

Amazon Web Services (AWS) Credentials

If your source files reside in Amazon S3 or you are calling an AWS API, the `username` is your AWS access key ID and the `password` is your AWS secret access key. See AWS Identity and Access Management.

Microsoft Azure Credentials

If your source files reside in Azure Blob Storage or you are calling an Azure API, the `username` is your Azure storage account name and the `password` is an Azure storage account access key. See About Azure storage accounts.

GitHub Personal Access Token

If your source files reside in a GitHub repository or you are calling a GitHub API, the `username` is your GitHub email and the `password` is your GitHub personal access token. See Creating a personal access token for more information.

For example:

```
BEGIN
  DBMS_CLOUD.CREATE_CREDENTIAL(
    credential_name => 'MY_GITHUB_CRED',
    username => 'user@example.com',
    password => 'your_personal_access_token' );
END;
/
```

DROP_CREDENTIAL Procedure

This procedure removes an existing credential from Oracle Database.

Syntax

```
DBMS_CLOUD.DROP_CREDENTIAL (
   credential_name     IN VARCHAR2);
```

Parameters

Parameter	Description
`credential_name`	The name of the credential to be removed.

UPDATE_CREDENTIAL Procedure

This procedure updates an attribute with a new value for a specified `credential_name`.

Use stored credentials for data loading, for querying external data residing in the Cloud, or wherever you use `DBMS_CLOUD` procedures with a `credential_name` parameter.

Syntax

```
DBMS_CLOUD.UPDATE_CREDENTIAL (
    credential_name   IN VARCHAR2,
    attribute         IN VARCHAR2,
    value             IN VARCHAR2);
```

Parameters

Parameter	Description
`credential_name`	The name of the credential to be updated.
`attribute`	Name of attribute to update. For a username/password type credential, the valid `attribute` values are: `USERNAME` and `PASSWORD`. See CREATE_CREDENTIAL Procedure for more information.
`value`	New value for the specified attribute.

Usage Notes

- The username value is case sensitive. It cannot contain double quotes or spaces.
- A user with DBA privileges can see all the credentials by querying `dba_credentials`.
- You only need to create credentials once unless your cloud service credentials change. Once you store the credentials you can then use the same credential name for `DBMS_CLOUD` procedures that require a `credential_name` parameter.
- You can list credentials from the view `ALL_CREDENTIALS`. For example, run the following command to list credentials:

  ```
  SELECT credential_name, username, comments FROM all_credentials;
  ```

Examples

```
BEGIN
  DBMS_CLOUD.UPDATE_CREDENTIAL(
     credential_name => 'OBJ_STORE_CRED',
     attribute => 'PASSWORD',
     value => 'password');
END;
/


BEGIN
  DBMS_CLOUD.UPDATE_CREDENTIAL(
     credential_name => 'ARN_CRED',
```

```
    attribute => 'aws_role_arn',
    value => 'NEW_AWS_ARN');
END;
/
```

DBMS_CLOUD for Objects and Files

The subprograms for object and file management within the DBMS_CLOUD package.

Subprogram	Description
COPY_COLLECTION Procedure	This procedure loads data into existing JSON collection either from Cloud Object Storage or from files in a directory.
COPY_DATA Procedure	This procedure loads data into existing Oracle Database tables either from Cloud Object Storage or from files in a directory.
COPY_DATA Procedure for Avro or Parquet Files	This procedure with the `format` parameter `type` set to the value `orc`, `parquet`, or `avro` loads data into existing Oracle Database tables from ORC, Parquet, or Avro files in the Cloud or from ORC, Parquet, or Avro files in a directory. Similar to text files, the data is copied from the source ORC, Parquet, or Avro file into the preexisting internal table.
COPY_OBJECT Procedure	This procedure copies files from one Cloud Object Storage bucket to another.
CREATE_EXTERNAL_TABLE Procedure	This procedure creates an external table on files in the Cloud or on files in a directory. This allows you to run queries on external data from Oracle Database.
CREATE_EXTERNAL_TABLE Procedure for Apache Iceberg	This procedure creates external tables for Apache Iceberg tables in the supported configurations.
CREATE_EXTERNAL_TABLE Procedure for Avro or Parquet Files	This procedure with the `format` parameter `type` set to the value `parquet`, `orc`, or `avro`, creates an external table with either Parquet, ORC, or Avro format files in the Cloud or in a directory. This allows you to run queries on external data from Oracle Database.
CREATE_EXTERNAL_PART_TABLE Procedure	This procedure creates an external partitioned table on files in the Cloud. This allows you to run queries on external data from Oracle Database.
CREATE_HYBRID_PART_TABLE Procedure	This procedure creates a hybrid partitioned table. This allows you to run queries on hybrid partitioned data from Oracle Database.
DELETE_ALL_OPERATIONS Procedure	This procedure clears either all data load operations logged in the `user_load_operations` table in your schema or clears all the data load operations of the specified type, as indicated with the `type` parameter.
DELETE_FILE Procedure	This procedure removes the specified file from the specified directory on Oracle Database
DELETE_OBJECT Procedure	This procedure deletes the specified object on object store.
DELETE_OPERATION Procedure	This procedure accepts an `operation_id` as input and deletes the logs associated with the specified `operation_id`.

Subprogram	Description
EXPORT_DATA Procedure	This procedure exports data from Oracle Database to files in the Cloud based on the result of a query. The overloaded form enables you to use the `operation_id` parameter. Depending on the `format` parameter `type` option specified, the procedure exports rows to the Cloud Object store as text with options of CSV, JSON, or XML; or using the ORACLE_DATAPUMP access driver to write data to a dump file.
GET_OBJECT Procedure and Function	This procedure is overloaded. The procedure form reads an object from Cloud Object Storage and copies it to Oracle Database. The function form reads an object from Cloud Object Storage and returns a `BLOB` to Oracle Database.
LIST_FILES Function	This function lists the files in the specified directory. The results include the file names and additional metadata about the files such as file size in bytes, creation timestamp, and the last modification timestamp.
LIST_OBJECTS Function	This function lists objects in the specified location on object store. The results include the object names and additional metadata about the objects such as size, checksum, creation timestamp, and the last modification timestamp.
MOVE_OBJECT Procedure	This procedure moves an object from one Cloud Object Storage bucket to another one.
PUT_OBJECT Procedure	This procedure is overloaded. In one form the procedure copies a file from Oracle Database to the Cloud Object Storage. In another form the procedure copies a `BLOB` from Oracle Database to the Cloud Object Storage.
SYNC_EXTERNAL_PART_TABLE Procedure	This procedure simplifies updating an external partitioned table from files in the Cloud. Run this procedure whenever new partitions are added or when partitions are removed from the Object Store source for the external partitioned table.
VALIDATE_EXTERNAL_TABLE Procedure	This procedure validates the source files for an external table, generates log information, and stores the rows that do not match the format options specified for the external table in a *badfile* table on Oracle Database.
VALIDATE_EXTERNAL_PART_TABLE Procedure	This procedure validates the source files for an external partitioned table, generates log information, and stores the rows that do not match the format options specified for the external table in a *badfile* table on Oracle Database.
VALIDATE_HYBRID_PART_TABLE Procedure	This procedure validates the source files for a hybrid partitioned table, generates log information, and stores the rows that do not match the format options specified for the hybrid table in a *badfile* table on Oracle Database.

COPY_COLLECTION Procedure

This procedure loads data into a JSON collection from Cloud Object Storage or from a directory. If the specified JSON collection does not exist, the procedure creates it. The overloaded form enables you to use the `operation_id` parameter.

Syntax

```
DBMS_CLOUD.COPY_COLLECTION (
    collection_name   IN VARCHAR2,
```

```
    credential_name   IN VARCHAR2 DEFAULT NULL,
    file_uri_list     IN CLOB,
    format            IN CLOB     DEFAULT NULL
);

DBMS_CLOUD.COPY_COLLECTION (
    collection_name   IN VARCHAR2,
    credential_name   IN VARCHAR2 DEFAULT NULL,
    file_uri_list     IN CLOB,
    format            IN CLOB     DEFAULT NULL,
    operation_id      OUT NOCOPY NUMBER
);
```

Parameters

Parameter	Description
`collection_name`	The name of the JSON collection into which data will be loaded. If a collection with this name already exists, the specified data will be loaded, otherwise a new collection is created.
`credential_name`	The name of the credential to access the Cloud Object Storage. This parameter is not used when you specify a directory with `file_uri_list`.

Parameter	Description
file_uri_list	This parameter specifies either a comma-delimited list of source file URIs or one or more directories and source files. **Cloud source file URIs** You can use wildcards as well as regular expressions in the file names in Cloud source file URIs. Regular expressions can only be used when the regexuri format parameter is set to TRUE. The characters "*" and "?" are considered wildcard characters when the regexuri parameter is set to FALSE. When the regexuri parameter is set to TRUE the characters "*" and "?" are part of the specified regular expression pattern. Regular expression patterns are only supported for the file name or subfolder path in your URIs and the pattern matching is identical to that performed by the REGEXP_LIKE function. For example: `file_uri_list => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname/o(/)*year=[0-9]+(/)*month=[0-9]+(/)*[a-z]+[1-3]??.csv'` The format of the URIs depends on the Cloud Object Storage service you are using, for details see DBMS_CLOUD URI Formats. See REGEXP_LIKE Condition for more information on REGEXP_LIKE condition. **Directory** You can specify one directory and one or more file names or use a comma separated list of directories and file names. The format to specify a directory is: '*MY_DIR*:*filename.ext*'. By default the directory name *MY_DIR* is a database object and is case-insensitive. The file name is case sensitive. You can use wildcards to specify file names in a directory. The character "*" can be used as the wildcard for multiple characters, the character "?" can be used as the wildcard for a single character. For example: '*MY_DIR*:*" or '*MY_DIR*:test?' To specify multiple directories, use a comma separated list of directories: For example: '*MY_DIR1*:*, *MY_DIR2*:test?' Use double quotes to specify a case-sensitive directory name. For example: '"*my_dir1*":*, "*my_dir2*":Test?' To include a quote character, use two quotes. For example: '*MY_DIR*:''filename.ext'. This specifies the filename starts with a quote (') .
format	The options describing the format of the source files. These options are specified as a JSON string. Supported formats are: characterset, compression, ignoreblanklines, jsonpath, maxdocsize, recorddelimiter, rejectlimit, type, unpackarrays, keyassignment, and keypath. Apart from the mentioned formats for JSON data, Autonomous Database supports other formats too. For the list of format arguments supported by Autonomous Database, see DBMS_CLOUD Package Format Options.

Parameter	Description
operation_id	Use this parameter to track the progress and final status of the load operation as the corresponding ID in the USER_LOAD_OPERATIONS view.

Example

```
BEGIN
    DBMS_CLOUD.CREATE_CREDENTIAL(
            credential_name => 'OBJ_STORE_CRED',
            username        => 'user_name@oracle.com',
            password        => 'password'
            );

    DBMS_CLOUD.COPY_COLLECTION(
            collection_name => 'myCollection',
            credential_name => 'OBJ_STORE_CRED',
            file_uri_list   => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/adbexample/b/json/o/myCollection.json'
            );
END;
/
```

COPY_DATA Procedure

This procedure loads data into existing Oracle Database tables from files in the Cloud, or from files in a directory. The overloaded form enables you to use the operation_id parameter.

Syntax

```
DBMS_CLOUD.COPY_DATA (
    table_name        IN VARCHAR2,
    credential_name   IN VARCHAR2 DEFAULT NULL,
    file_uri_list     IN CLOB,
    schema_name       IN VARCHAR2,
    field_list        IN CLOB,
    format            IN CLOB);

DBMS_CLOUD.COPY_DATA (
    table_name        IN VARCHAR2,
    credential_name   IN VARCHAR2 DEFAULT NULL,
    file_uri_list     IN CLOB DEFAULT NULL,
    schema_name       IN VARCHAR2 DEFAULT NULL,
    field_list        IN CLOB DEFAULT NULL,
    format            IN CLOB DEFAULT NULL
    operation_id      OUT NOCOPY NUMBER);
```

Parameters

Parameter	Description
table_name	The name of the target table on the database. The target table needs to be created before you run COPY_DATA.

Parameter	Description
credential_name	The name of the credential to access the Cloud Object Storage. This parameter is not used when you specify a directory or Pre-Authenticated Request (PAR) URL with file_uri_list.

Parameter	Description

file_uri_list	This parameter specifies one of the following:
	• Comma-delimited list of source file URIs
	• Comma-delimited list of Pre-Authenticated Request (PAR) URL
	• One or more directories and source files
	You can use wildcards as well as regular expressions in the file names in Cloud source file URIs.
	Cloud source file URIs
	This parameter specifies either a comma-delimited list of source file URIs or one or more directories and source files.
	Regular expressions can only be used when the regexuri format parameter is set to TRUE.
	The characters "*" and "?" are considered wildcard characters when the regexuri parameter is set to FALSE. When the regexuri parameter is set to TRUE the characters "*" and "?" are part of the specified regular expression pattern.
	Regular expression patterns are only supported for the file name or subfolder path in your URIs and the pattern matching is identical to that performed by the REGEXP_LIKE function.
	For example:
	`file_uri_list => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname/o(/)*year=[0-9]+(/)*month=[0-9]+(/)*[a-z]+[1-3]??.csv'`
	The format of the URIs depends on the Cloud Object Storage service you are using, for details see DBMS_CLOUD URI Formats.
	Pre-Authenticated Request (PAR) URL
	You can create an external table on the following:
	• A Pre-Authenticated Request (PAR) URL and also apply filters and clauses on the data. For example, you can filter the data using the WHERE clause or sort it using the ORDER BY clause.
	For example:
	`file_uri_list => 'https://dataaccess.adb.us-chicago-1.oraclecloudapps.com/adb/p/K6XExample/data'`
	• A comma-delimited list of Pre-Authenticated Request (PAR) URLs, you must ensure that all included PAR URLs must have the same column names, column order, and column data types.
	For example:
	`file_uri_list => 'https://dataaccess.adb.us-chicago-1.oraclecloudapps.com/adb/p/K6XExample/data','https://dataaccess.adb.us-chicago-1.oraclecloudapps.com/adb/p/K7XExample/data'`
	Directory
	You can specify one directory and one or more file names or use a comma separated list of directories and file names. The format to specify a directory is:'*MY_DIR*:*filename.ext*'. By default the directory name

Parameter	Description
	MY_DIR is a database object and is case-insensitive. The file name is case sensitive. You can use wildcards to specify file names in a directory. The character "*" can be used as the wildcard for multiple characters, the character "?" can be used as the wildcard for a single character. For example: '*MY_DIR*:*" or '*MY_DIR*:test?' To specify multiple directories, use a comma separated list of directories: For example: '*MY_DIR1*:*, *MY_DIR2*:test?' Use double quotes to specify a case-sensitive directory name. For example: '"*my_dir1*":*, "*my_dir2*":Test?' To include a quote character, use two quotes. For example: '*MY_DIR*:''filename.ext'. This specifies the `filename` starts with a quote (`'`).
`schema_name`	The name of the schema where the target table resides. The default value is NULL meaning the target table is in the same schema as the user running the procedure.
`field_list`	Identifies the fields in the source files and their data types. The default value is NULL meaning the fields and their data types are determined by the target table definition. This argument's syntax is the same as the `field_list` clause in regular Oracle external tables. For an example using `field_list`, see CREATE_EXTERNAL_TABLE Procedure.
`format`	The options describing the format of the source, log, and bad files. For the list of the options and how to specify the values see DBMS_CLOUD Package Format Options. For Avro or Parquet file format options, see DBMS_CLOUD Package Format Options for Avro or Parquet.
`operation_id`	Use this parameter to track the progress and final status of the load operation as the corresponding ID in the `USER_LOAD_OPERATIONS` view.

Usage Note

The default record delimiter is `detected newline`. With `detected newline`, `DBMS_CLOUD` tries to automatically find the correct newline character to use as the record delimiter. `DBMS_CLOUD` first searches for the Windows newline character `\r\n`. If it finds the Windows newline character, this is used as the record delimiter for all files in the procedure. If a Windows newline character is not found, `DBMS_CLOUD` searches for the UNIX/Linux newline character `\n`, and if it finds one it uses `\n` as the record delimiter for all files in the procedure. If the source files use a combination of different record delimiters, you may encounter an error such as, "`KUP-04020: found record longer than buffer size supported`". In this case, you need to either modify the source files to use the same record delimiter or only specify the source files that use the same record delimiter.

See DBMS_CLOUD Package Format Options for information on the `recorddelmiter` format option.

Examples

```
BEGIN
    DBMS_CLOUD.CREATE_CREDENTIAL(
            credential_name => 'DEF_CRED_NAME',
            username        => 'user_name@oracle.com',
```

```
            password        => 'password'
            );
END;
/


BEGIN
 DBMS_CLOUD.COPY_DATA(
    table_name =>'CHANNELS',
    credential_name =>'DEF_CRED_NAME',
    file_uri_list =>'https://objectstorage.us-phoenix-1.oraclecloud.com/n/
namespace-string/b/bucketname/o/channels.txt',
    format => json_object('delimiter' value ',')
 );
END;
/


BEGIN
    DBMS_CLOUD.COPY_DATA(
            table_name      => 'ORDERS',
            schema_name     => 'TEST_SCHEMA',
            credential_name => 'DEF_CRED_NAME',
         file_uri_list   => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/adbexample/b/json/o/orde[r]s.tbl.1'
            format          =>  json_object('ignoreblanklines' value TRUE,
                                            'rejectlimit' value '0',
                                            'dateformat' value 'yyyy-mm-dd',
                                            'regexuri' value TRUE)
            );
END;
/
```

COPY_DATA Procedure for Avro or Parquet Files

This procedure with the `format` parameter `type` set to the value `avro` or `parquet` loads data into existing Oracle Database tables from Avro or Parquet files in the Cloud or from files in a directory.

Similar to text files, the data is copied from the source Avro or Parquet file into the preexisting internal table.

Syntax

```
DBMS_CLOUD.COPY_DATA (
    table_name        IN VARCHAR2,
    credential_name   IN VARCHAR2 DEFAULT NULL,
    file_uri_list     IN CLOB,
    schema_name       IN VARCHAR2 DEFAULT,
    field_list        IN CLOB DEFAULT,
    format            IN CLOB DEFAULT);
```

Parameters

Parameter	Description
table_name	The name of the target table on the database. The target table needs to be created before you run COPY_DATA.
credential_name	The name of the credential to access the Cloud Object Storage. This parameter is not used when you specify a directory with file_uri_list.
file_uri_list	This parameter specifies either a comma-delimited list of source file URIs or one or more directories and source files. **Cloud source file URIs** You can use wildcards as well as regular expressions in the file names in Cloud source file URIs. Regular expressions can only be used when the regexuri format parameter is set to TRUE. The characters "*" and "?" are considered wildcard characters when the regexuri parameter is set to FALSE. When the regexuri parameter is set to TRUE the characters "*" and "?" are part of the specified regular expression pattern. Regular expression patterns are only supported for the file name or subfolder path in your URIs and the pattern matching is identical to that performed by the REGEXP_LIKE function. For example: `file_uri_list => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname/o(/)*year=[0-9]+(/)*month=[0-9]+(/)*[a-z]+[1-3]??.csv'` The format of the URIs depends on the Cloud Object Storage service you are using, for details see DBMS_CLOUD URI Formats. **Directory** You can specify one directory and one or more file names or use a comma separated list of directories and file names. The format to specify a directory is: '*MY_DIR*:*filename.ext*'. By default the directory name *MY_DIR* is a database object and is case-insensitive. The file name is case sensitive. You can use wildcards to specify file names in a directory. The character "*" can be used as the wildcard for multiple characters, the character "?" can be used as the wildcard for a single character. For example: '*MY_DIR*:*" or '*MY_DIR*:test?' To specify multiple directories, use a comma separated list of directories: For example: '*MY_DIR1*:*, *MY_DIR2*:test?' Use double quotes to specify a case-sensitive directory name. For example: '"*my_dir1*":*, "*my_dir2*":Test?' To include a quote character, use two quotes. For example: '*MY_DIR*:''filename.ext'. This specifies the filename starts with a quote (').
schema_name	The name of the schema where the target table resides. The default value is NULL meaning the target table is in the same schema as the user running the procedure.

Parameter	Description
field_list	Ignored for Avro or Parquet files. The fields in the source match the external table columns by name. Source data types are converted to the external table column data type. For Parquet files, see DBMS_CLOUD Package Parquet to Oracle Data Type Mapping for details on mapping. For Avro files, see DBMS_CLOUD Package Avro to Oracle Data Type Mapping for details on mapping.
format	The options describing the format of the source files. For Avro or Parquet files, only two options are supported: see DBMS_CLOUD Package ORC to Oracle Data Type Mapping.

Usage Notes

- As with other data files, Avro and Parquet data loads generate logs that are viewable in the tables dba_load_operations and user_load_operations. Each load operation adds a record to dba[*user*]_load_operations that indicates the table containing the logs.

  The log table provides summary information about the load.

- For Avro or Parquet, when the format parameter type is set to the value avro or parquet, the BADFILE_TABLE table is always empty.
  - For Parquet files, PRIMARY KEY constraint errors throw an ORA error.
  - If data for a column encounters a conversion error, for example, the target column is not large enough to hold the converted value, the value for the column is set to NULL. This does not produce a rejected record.

COPY_OBJECT Procedure

This procedure copies an object from one Cloud Object Storage bucket or folder to another.

The source and target bucket or folder can be in the same or different Cloud Object store provider.

When the source and target are in distinct Object Stores or have different accounts with the same cloud provider, you can give separate credential names for the source and target locations.

The source credential name is by default also used by the target location when target credential name is not provided.

Syntax

```
DBMS_CLOUD.COPY_OBJECT (
    source_credential_name  IN  VARCHAR2 DEFAULT NULL,
    source_object_uri       IN  VARCHAR2,
    target_object_uri       IN  VARCHAR2,
    target_credential_name  IN  VARCHAR2 DEFAULT NULL
);
```

Parameters

Parameter	Description
source_credential_name	The name of the credential to access the source Cloud Object Storage. If you do not supply a source_credential_name value, the credential_name is set to NULL.
source_object_uri	Specifies URI, that point to the source Object Storage bucket or folder location. This parameter is mandatory. The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
target_object_uri	Specifies the URI for the target Object Store. This parameter is mandatory. The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
target_credential_name	The name of the credential to access the target Cloud Object Storage location. If you do not supply a target_credential_name value, the target_object_uri is set to the source_credential_name value.

Example

```
BEGIN
DBMS_CLOUD.COPY_OBJECT (
    source_credential_name => 'OCI_CRED',
    source_object_uri    => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname1/bgfile.csv',
    target_object_uri    => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname2/myfile.csv'
);
END;
/
```

CREATE_EXTERNAL_PART_TABLE Procedure

This procedure creates an external partitioned table on files in the Cloud, or from files in a directory. This allows you to run queries on external data from Oracle Database.

Syntax

```
DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE (
    table_name           IN VARCHAR2,
    credential_name      IN VARCHAR2,
    partitioning_clause  IN CLOB,
    column_list          IN CLOB,
    field_list           IN CLOB DEFAULT,
    format               IN CLOB DEFAULT);


DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE (
    table_name           IN VARCHAR2,
```

```
    credential_name      IN VARCHAR2,
    file_uri_list        IN VARCHAR2,
    column_list          IN CLOB,
    field_list           IN CLOB DEFAULT,
    format               IN CLOB DEFAULT);
```

Parameters

Parameter	Description
`table_name`	The name of the external table.
`credential_name`	The name of the credential to access the Cloud Object Storage.
`partitioning_clause`	Specifies the complete partitioning clause, including the location information for individual partitions. If you use the `partitioning_clause` parameter, the `file_uri_list` parameter is not allowed.

Parameter	Description

file_uri_list	This parameter specifies one of the following:
	• Comma-delimited list of source file URIs
	• Comma-delimited list of Pre-Authenticated Request (PAR) URL
	• One or more directories and source files
	Cloud source file URIs
	You can use wildcards as well as regular expressions in the file names in Cloud source file URIs.
	Regular expressions can only be used when the regexuri format parameter is set to TRUE.
	The characters "*" and "?" are considered wildcard characters when the regexuri parameter is set to FALSE. When the regexuri parameter is set to TRUE the characters "*" and "?" are part of the specified regular expression pattern.
	Regular expression patterns are only supported for the file name or subfolder path in your URIs and the pattern matching is identical to that performed by the REGEXP_LIKE function.
	This option is only supported with external tables that are created on a file in the Object Storage.
	For example:
	`file_uri_list => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname/o(/)*year=[0-9]+(/)*month=[0-9]+(/)*[a-z]+[1-3]??.csv'`
	If you use the parameter file_uri_list, the partitioning_clause parameter is not allowed.
	The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
	Pre-Authenticated Request (PAR) URL
	You can create an external table on the following:
	• An Oracle Database Pre-Authenticated Request (PAR) URL and also apply filters and clauses on the data. For example, you can filter the data using the WHERE clause or sort it using the ORDER BY clause.
	For example:
	`file_uri_list => 'https://dataaccess.adb.us-chicago-1.oraclecloudapps.com/adb/p/K6XExample/data'`
	• A comma-delimited list of Oracle Database Pre-Authenticated Request (PAR) URLs, you must ensure that all included PAR URLs must have the same column names, column order, and column data types in the same schema.
	For example:
	`file_uri_list => 'https://dataaccess.adb.us-chicago-1.oraclecloudapps.com/adb/p/K6XExample/data','https://dataaccess.adb.us-`

Parameter	Description
	chicago-1.oraclecloudapps.com/adb/p/K7XExample/data'
column_list	Comma-delimited list of column names and data types for the external table. This parameter has the following requirements, depending on the type of the data files specified with the file_uri_list parameter: • The column_list parameter is required with unstructured files. Using unstructured files, for example with CSV text files, the column_list parameter must specify all the column names and data types inside the data file as well as the partition columns derived from the object name. • The column_list parameter is optional with structured files. For example, with Avro, ORC, or Parquet data files, the column_list is not required. When the column_list is not included, the format parameter partition_columns option must include specifications for both column names (name) and data types (type).
field_list	Identifies the fields in the source files and their data types. The default value is NULL meaning the fields and their data types are determined by the *column_list* parameter. This argument's syntax is the same as the field_list clause in regular Oracle external tables. For more information about field_list see *Oracle® Database Utilities*.

Parameter	Description
format	The format option partition_columns specifies the DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE column names and data types of partition columns when the partition columns are derived from the file path, depending on the type of data file, structured or unstructured: • When the DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE includes the column_list parameter and the data files are unstructured, such as with CSV text files, partition_columns does not include the data type. For example, use a format such as the following for this type of partition_columns specification: '"partition_columns":["state","zipcode"]' The data type is not required because it is specified in the DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE column_list parameter. • When the DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE does not include the column_list parameter and the data files are structured, such as Avro, ORC, or Parquet files, the partition_columns option includes both the column name, name sub-clause, and the data type, type sub-clause. For example, the following shows a partition_columns specification: '"partition_columns":[{"name":"country", "type":"varchar2(10)"}, {"name":"year", "type":"number"}, {"name":"month", "type":"varchar2(10)"}]' If the data files are unstructured and the type sub-clause is specified with partition_columns, the type sub-clause is ignored. For object names that are not based on hive format, the order of the partition_columns specified columns must match the order as they appear in the object name in the file path specified in the file_uri_list parameter. To see all the format parameter options describing the format of the source files, see DBMS_CLOUD Package Format Options.

Usage Notes

- You cannot call this procedure with both partitioning_clause and file_uri_list parameters.
- Specifying the column_list parameter is optional with structured data files, including Avro, Parquet, or ORC data files. If column_list is not specified, the format parameter partition_columns option must include both name and type.
- The column_list parameter is required with unstructured data files, such as CSV text files.
- The procedure DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE supports external partitioned files in the supported cloud object storage services, including:
  - Oracle Cloud Infrastructure Object Storage

  - Azure Blob Storage
  - Amazon S3
  - GitHub Repository

  See DBMS_CLOUD URI Formats for more information.

- The procedure `DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE` supports external partitioned files in directories, either in a local file system or in a network file system.
- When you call `DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE` with the `file_uri_list` parameter, the types for columns specified in the Cloud Object Store file name must be one of the following types:

  ```
  VARCHAR2(n)
  NUMBER(n)
  NUMBER(p,s)
  NUMBER
  DATE
  TIMESTAMP(9)
  ```

- The default record delimiter is `detected newline`. With `detected newline`, `DBMS_CLOUD` tries to automatically find the correct newline character to use as the record delimiter. `DBMS_CLOUD` first searches for the Windows newline character `\r\n`. If it finds the Windows newline character, this is used as the record delimiter for all files in the procedure. If a Windows newline character is not found, `DBMS_CLOUD` searches for the UNIX/Linux newline character `\n`, and if it finds one it uses `\n` as the record delimiter for all files in the procedure. If the source files use a combination of different record delimiters, you may encounter an error such as, "`KUP-04020: found record longer than buffer size supported`". In this case, you need to either modify the source files to use the same record delimiter or only specify the source files that use the same record delimiter.

  See DBMS_CLOUD Package Format Options for information on the `recorddelmiter` format option.

- The external partitioned tables you create with `DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE` include two invisible columns `file$path` and `file$name`. These columns help identify which file a record is coming from.
  - `file$path`: Specifies the file path text up to the beginning of the object name.
  - `file$name`: Specifies the object name, including all the text that follows the bucket name.

Examples

Example using the `partitioning_clause` parameter:

```
BEGIN
   DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE(
      table_name =>'PET1',
      credential_name =>'OBJ_STORE_CRED',
      format => json_object('delimiter' value ',', 'recorddelimiter' value
'newline', 'characterset' value 'us7ascii'),
      column_list => 'col1 number, col2 number, col3 number',
      partitioning_clause => 'partition by range (col1)
                              (partition p1 values less than (1000) location
                                  ( ''&base_URL//file_11.txt'')
                               ,
```

```
                                        partition p2 values less than (2000) location
                                           ( ''&base_URL/file_21.txt'')
                                        ,
                                        partition p3 values less than (3000)
location
                                           ( ''&base_URL/file_31.txt'')
                                        )'
     );
   END;
/


BEGIN
    DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE(
       table_name          => 'PET',
       format              => json_object('delimiter'value ','),
       column_list         => 'name varchar2(20), gender varchar2(10), salary
number',
       partitioning_clause => 'partition by range (salary)
              (   -- Use test1.csv in the DEFAULT DIRECTORY DATA_PUMP_DIR
                  partition p1 values less than (100) LOCATION
(''test1.csv''),
                   -- Use test2.csv in a specified directory MY_DIR
                  partition p2 values less than (300) DEFAULT DIRECTORY
MY_DIR LOCATION (''test2.csv'')        )'   );
END;
/
```

Example using the `file_uri_list` and `column_list` parameters with unstructured data files:

```
BEGIN
  DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE(
   table_name => 'MYSALES',
   credential_name => 'DEF_CRED_NAME',
   file_uri_list     => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/namespace-
string/b/bucketname/o/*.csv',
   column_list       => 'product varchar2(100), units number, country varchar2(100), year
number, month varchar2(2)',
   field_list        => 'product, units', --[Because country, year and month are not in the
file, they are not listed in the field list]
   format            => '{"type":"csv", "partition_columns":["country","year","month"]}');
END;
/
```

Example using the `file_uri_list` without the `column_list` parameter with structured data files:

```
BEGIN
  DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE(
  table_name => 'MYSALES',
  credential_name => 'DEF_CRED_NAME',
  DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE(
    table_name      => 'MYSALES',
    credential_name => 'DEF_CRED_NAME',
    file_uri_list   => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/namespace-
```

```
string/b/bucketname/o/*.parquet',
    format          =>
        json_object('type' value 'parquet', 'schema' value 'first',
                    'partition_columns' value
                          json_array(
                                json_object('name' value 'country', 'type' value
'varchar2(100)'),
                                json_object('name' value 'year', 'type' value 'number'),
                                json_object('name' value 'month', 'type' value 'varchar2(2)')
                          )
         )
    );
END;
/
```

CREATE_EXTERNAL_TABLE Procedure

This procedure creates an external table on files in the Cloud or from files in a directory. This allows you to run queries on external data from Oracle Database.

Syntax

```
DBMS_CLOUD.CREATE_EXTERNAL_TABLE (
    table_name       IN VARCHAR2,
    credential_name  IN VARCHAR2 DEFAULT NULL,
    file_uri_list    IN CLOB,
    column_list      IN CLOB,
    field_list       IN CLOB DEFAULT,
    format           IN CLOB DEFAULT);
```

Parameters

Parameter	Description
`table_name`	The name of the external table.
`credential_name`	The name of the credential to access the Cloud Object Storage. This parameter is not used when you specify a directory or Pre-Authenticated Request (PAR) URL with `file_uri_list`.

Parameter	Description

file_uri_list	This parameter specifies one of the following:
	• Comma-delimited list of source file URIs.
	• Comma-delimited list of Pre-Authenticated Request (PAR) URL.
	• One or more directories and source files.
	Cloud source file URIs
	You can use wildcards as well as regular expressions in the file names in Cloud source file URIs.
	Regular expressions can only be used when the regexuri format parameter is set to TRUE.
	The characters "*" and "?" are considered wildcard characters when the regexuri parameter is set to FALSE. When the regexuri parameter is set to TRUE the characters "*" and "?" are part of the specified regular expression pattern.
	Regular expression patterns are only supported for the file name or subfolder path in your URIs and the pattern matching is identical to that performed by the REGEXP_LIKE function.
	This option is only supported with external tables that are created on a file in the Object Storage.
	For example:
	`file_uri_list => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname/o(/)*year=[0-9]+(/)*month=[0-9]+(/)*[a-z]+[1-3]??.csv'`
	The format of the URIs depends on the Cloud Object Storage service you are using, for details see DBMS_CLOUD URI Formats.
	Pre-Authenticated Request (PAR) URL
	You can create an external table on the following:
	• An Oracle Database Pre-Authenticated Request (PAR) URL and also apply filters and clauses on the data. For example, you can filter the data using the WHERE clause or sort it using the ORDER BY clause.
	For example:
	`file_uri_list => 'https://dataaccess.adb.us-chicago-1.oraclecloudapps.com/adb/p/K6XExample/data'`
	• A comma-delimited list of Oracle Database Pre-Authenticated Request (PAR) URLs, you must ensure that all included PAR URLs must have the same column names, column order, and column data types in the same schema.
	For example:
	`file_uri_list => 'https://dataaccess.adb.us-chicago-1.oraclecloudapps.com/adb/p/K6XExample/data','https://dataaccess.adb.us-chicago-1.oraclecloudapps.com/adb/p/K7XExample/data'`
	Directory
	You can specify one directory and one or more file names or use a comma separated list of directories and file names. The format to

Parameter	Description
	specify a directory is:'*MY_DIR*:*filename.ext*'. By default the directory name *MY_DIR* is a database object and is case-insensitive. The file name is case sensitive. You can use wildcards to specify file names in a directory. The character "*" can be used as the wildcard for multiple characters, the character "?" can be used as the wildcard for a single character. For example:'*MY_DIR*:*" or '*MY_DIR*:test?' To specify multiple directories, use a comma separated list of directories: For example:'*MY_DIR1*:*, *MY_DIR2*:test?' Use double quotes to specify a case-sensitive directory name. For example:'"*my_dir1*":*, "*my_dir2*":Test?' To include a quote character, use two quotes. For example:'*MY_DIR*:''filename.ext'. This specifies the `filename` starts with a quote (`'`).
`column_list`	Comma-delimited list of column names and data types for the external table.
`field_list`	Identifies the fields in the source files and their data types. The default value is NULL meaning the fields and their data types are determined by the `column_list` parameter. This argument's syntax is the same as the `field_list` clause in regular Oracle Database external tables. For more information about `field_list` see ORACLE_LOADER Access Driver field_list under field_definitions Clause in *Oracle Database Utilities*.
`format`	The options describing the format of the source files. For the list of the options and how to specify the values see DBMS_CLOUD Package Format Options. For Avro or Parquet format files, see CREATE_EXTERNAL_TABLE Procedure for Avro or Parquet Files.

Usage Notes

- The procedure `DBMS_CLOUD.CREATE_EXTERNAL_TABLE` supports external partitioned files in the supported cloud object storage services, including:
  - Oracle Cloud Infrastructure Object Storage
  - Azure Blob Storage
  - Amazon S3
  - GitHub Repository

  The credential is a table level property; therefore, the external files must be on the same object store.

  See DBMS_CLOUD URI Formats for more information.
- The default record delimiter is `detected newline`. With `detected newline`, `DBMS_CLOUD` tries to automatically find the correct newline character to use as the record delimiter. `DBMS_CLOUD` first searches for the Windows newline character `\r\n`. If it finds the Windows newline character, this is used as the record delimiter for all files in the procedure. If a Windows newline character is not found, `DBMS_CLOUD` searches for the UNIX/Linux newline character `\n`, and if it finds one it uses `\n` as the record delimiter for all files in the procedure. If the source files use a combination of different record delimiters, you may encounter an error such as, "`KUP-04020: found record longer than buffer size`

`supported`". In this case, you need to either modify the source files to use the same record delimiter or only specify the source files that use the same record delimiter.

See DBMS_CLOUD Package Format Options for information on the `recorddelimiter` format option.

Example

```
BEGIN
   DBMS_CLOUD.CREATE_EXTERNAL_TABLE(
      table_name =>'WEATHER_REPORT_DOUBLE_DATE',
      credential_name =>'OBJ_STORE_CRED',
      file_uri_list =>'&base_URL/
Charlotte_NC_Weather_History_Double_Dates.csv',
      format => json_object('type' value 'csv', 'skipheaders' value '1'),
      field_list => 'REPORT_DATE DATE''mm/dd/yy'',
                     REPORT_DATE_COPY DATE ''yyyy-mm-dd'',
                     ACTUAL_MEAN_TEMP,
                     ACTUAL_MIN_TEMP,
                     ACTUAL_MAX_TEMP,
                     AVERAGE_MIN_TEMP,
                     AVERAGE_MAX_TEMP,
                     AVERAGE_PRECIPITATION',
      column_list => 'REPORT_DATE DATE,
                     REPORT_DATE_COPY DATE,
                     ACTUAL_MEAN_TEMP NUMBER,
                     ACTUAL_MIN_TEMP NUMBER,
                     ACTUAL_MAX_TEMP NUMBER,
                     AVERAGE_MIN_TEMP NUMBER,
                     AVERAGE_MAX_TEMP NUMBER,
                     AVERAGE_PRECIPITATION NUMBER');
   END;
/

SELECT * FROM WEATHER_REPORT_DOUBLE_DATE where
   actual_mean_temp > 69 and actual_mean_temp < 74
```

CREATE_EXTERNAL_TABLE Procedure for Apache Iceberg

This procedure creates external tables for Apache Iceberg tables in the supported configurations.

For a description of supported configurations, see About Querying Apache Iceberg Tables

Syntax

```
DBMS_CLOUD.CREATE_EXTERNAL_TABLE (
    table_name       IN VARCHAR2,
    credential_name  IN VARCHAR2 DEFAULT NULL,
    file_uri_list    IN CLOB,
    column_list      IN CLOB DEFAULT NULL,
    field_list       IN CLOB DEFAULT NULL,
    format           IN CLOB DEFAULT NULL
);
```

Parameters

Parameter	Description
table_name	The name of the external table.
credential_name	The name of the credential used to access the data files, the metadata files and the Iceberg Catalog (if used). For AWS and OCI configurations, the credential should be created as described in CREATE_CREDENTIAL Procedure. AWS Amazon Resource Names (ARN) credentials are currently not supported.
file_uri_list	Must be NULL if an Iceberg catalog is specified (see format parameter below). If an iceberg catalog is not used, then the file_uri_list must contain the URI to the iceberg metadata file.
column_list	Must be NULL, as the column names and types are automatically derived from Iceberg metadata. The column names match the names found in the underlying data files (Parquet, Avro, ORC). The Oracle data types are derived using the Parquet/Avro/ORC mappings between Iceberg and the Parquet, Avro and ORC data types. Therefore users cannot specify the column_list.
field_list	Must be NULL, as column names and data types are automatically derived from the Iceberg metadata.
format	The format parameter has a different structure depending on the type of Iceberg table, AWS or OCI, and what information is used to create the external table, for example information from a data catalog or a direct metadata URI. For examples and further information: see the examples below, Iceberg Support on OCI Data Flow Samples, DBMS_CLOUD URI Formats.

Example AWS Iceberg tables using an AWS Glue Catalog

The format parameter when creating tables over an AWS Iceberg table using an AWS Glue Catalog is as follows:

```
format => json_object('access_protocol' value
       json_object('protocol_type' value 'iceberg',
                   'protocol_config' value
                    json_object('iceberg_catalog_type' value 'aws_glue',
                                'iceberg_glue_region'  value 'glue region',
                                'iceberg_table_path'   value
'database_name.table_name')));
```

Where, the access_protocol parameter contains a JSON object with two elements as follows:

- protocol_type: Must be 'iceberg'
- protocol_config: A nested JSON object specifying the iceberg catalog details.
  - iceberg_catalog_type: Must be 'aws_glue'
  - iceberg_glue_region: The catalog region, e.g. 'us-west-1'
  - iceberg_table_path: A *glue database.glue table name* path.

Example AWS Iceberg table using a metadata file URI

The `format` parameter when creating tables over an AWS Iceberg table using a metadata file URI, is as follows:

```
format => json_object('access_protocol' value
       json_object('protocol_type' value 'iceberg')
```

Example OCI Iceberg table using HadoopCatalog catalog

The `format` parameter when creating tables over an OCI Iceberg table created by OCI Data Flow using HadoopCatalog catalog, is as follows:

```
format => json_object('access_protocol' value
       json_object('protocol_type'   value 'iceberg',
                   'protocol_config' value
                   json_object('iceberg_catalog_type'  value 'hadoop',
                               'iceberg_warehouse'     value '<OCI folder
URI>',
                               'iceberg_table_path'    value
'database_name.table_name')));
```

Where, the `access_protocol` parameter contains a JSON object with two elements as follows:

- `protocol_type`: Must be `'iceberg'`
- `protocol_config`: A nested JSON object specifying the iceberg catalog details.
  - `iceberg_catalog_type`: Must be `'hadoop'`
  - `iceberg_warehouse`: The warehouse directory path used when generating the table, in native URI format.
  - `iceberg_table_path`: The *`database_name.table_name`* path used when creating the table.

Example OCI Iceberg table using the URI of the metadata file

The `format` parameter when creating tables over an OCI Iceberg table using the URI of the metadata file, is as follows:

```
format => json_object('access_protocol' value
       json_object('protocol_type' value 'iceberg')
```

Where, the `access_protocol` parameter contains a JSON object with one element as follows:

- `protocol_type`: Must be `'iceberg'`

CREATE_EXTERNAL_TABLE Procedure for Avro or Parquet Files

This procedure with the `format` parameter `type` set to the value `avro` or `parquet` creates an external table with either Avro or Parquet format files in the Cloud or in a directory.

This allows you to run queries on external data from Oracle Database.

Syntax

```
DBMS_CLOUD.CREATE_EXTERNAL_TABLE (
    table_name       IN VARCHAR2,
    credential_name  IN VARCHAR2 DEFAULT NULL,
    file_uri_list    IN CLOB,
    column_list      IN CLOB,
    field_list       IN CLOB DEFAULT,
    format           IN CLOB DEFAULT);
```

Parameters

Parameter	Description
`table_name`	The name of the external table.
`credential_name`	The name of the credential to access the Cloud Object Storage. This parameter is not used when you specify a directory with `file_uri_list`.

Parameter	Description
file_uri_list	This parameter specifies either a comma-delimited list of source file URIs or one or more directories and source files. **Cloud source file URIs** You can use wildcards as well as regular expressions in the file names in Cloud source file URIs. Regular expressions can only be used when the regexuri format parameter is set to TRUE. The characters "*" and "?" are considered wildcard characters when the regexuri parameter is set to FALSE. When the regexuri parameter is set to TRUE the characters "*" and "?" are part of the specified regular expression pattern. Regular expression patterns are only supported for the file name or subfolder path in your URIs and the pattern matching is identical to that performed by the REGEXP_LIKE function. This option is only supported with external tables that are created on a file in the Object Storage. For example: `file_uri_list => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname/o(/)*year=[0-9]+(/)*month=[0-9]+(/)*[a-z]+[1-3]??.parquet'` The format of the URIs depends on the Cloud Object Storage service you are using, for details see DBMS_CLOUD URI Formats. **Directory** You can specify one directory and one or more file names or use a comma separated list of directories and file names. The format to specify a directory is:'*MY_DIR*:*filename.ext*'. By default the directory name *MY_DIR* is a database object and is case-insensitive. The file name is case sensitive. You can use wildcards to specify file names in a directory. The character "*" can be used as the wildcard for multiple characters, the character "?" can be used as the wildcard for a single character. For example:'*MY_DIR*:*" or '*MY_DIR*:test?' To specify multiple directories, use a comma separated list of directories: For example:'*MY_DIR1*:*, *MY_DIR2*:test?' Use double quotes to specify a case-sensitive directory name. For example:'"*my_dir1*":*, "*my_dir2*":Test?' To include a quote character, use two quotes. For example:'*MY_DIR*:''filename.ext'. This specifies the filename starts with a quote ().

Parameter	Description
column_list	(Optional) This field, when specified, overrides the format->schema parameter which specifies that the schema, columns, and data types, are derived automatically. See the format parameter for details. When the column_list is specified for Avro or Parquet source, the column names must match those columns found in the file. Oracle data types must map appropriately to the Avro or Parquet data types. For Parquet files, see DBMS_CLOUD Package Parquet to Oracle Data Type Mapping for details. For Avro files, see DBMS_CLOUD Package Avro to Oracle Data Type Mapping for details.
field_list	Ignored for Avro or Parquet files. The fields in the source match the external table columns by name. Source data types are converted to the external table column data type. For Parquet files, see DBMS_CLOUD Package Parquet to Oracle Data Type Mapping for details. For Avro files, see DBMS_CLOUD Package Avro to Oracle Data Type Mapping for details.
format	For Avro or Parquet type source files, see DBMS_CLOUD Package Format Options for Avro or Parquet for details.

Examples Avro

```
format => '{"type":"avro", "schema": "all"}'
```

```
format => json_object('type' value 'avro', 'schema' value 'first')
```

Examples Parquet

```
format => '{"type":"parquet", "schema": "all"}'
```

```
format => json_object('type' value 'parquet', 'schema' value 'first')
```

Avro or Parquet Column Name Mapping to Oracle Column Names

See DBMS_CLOUD Package Avro and Parquet to Oracle Column Name Mapping for information on column name mapping and column name conversion usage in Oracle SQL.

CREATE_HYBRID_PART_TABLE Procedure

This procedure creates a hybrid partitioned table. This allows you to run queries on hybrid partitioned data from Oracle Database using database objects and files in the Cloud, or database objects and files in a directory.

Syntax

```
DBMS_CLOUD.CREATE_HYBRID_PART_TABLE (
    table_name           IN VARCHAR2,
    credential_name      IN VARCHAR2,
    partitioning_clause  IN CLOB,
```

```
    column_list          IN CLOB,
    field_list           IN CLOB DEFAULT,
    format               IN CLOB DEFAULT);
```

Parameters

Parameter	Description
table_name	The name of the external table.
credential_name	The name of the credential to access the Cloud Object Storage.
partitioning_clause	Specifies the complete partitioning clause, including the location information for individual partitions. To use directories, the partitioning clause supports the LOCATION and DEFAULT DIRECTORY values. You can use wildcards as well as regular expressions in the file names in Cloud source file URIs. Regular expressions can only be used when the regexuri format parameter is set to TRUE. The characters "*" and "?" are considered wildcard characters when the regexuri parameter is set to FALSE. When the regexuri parameter is set to TRUE the characters "*" and "?" are part of the specified regular expression pattern. Regular expression patterns are only supported for the file name or subfolder path in your URIs and the pattern matching is identical to that performed by the REGEXP_LIKE function. Regular expression patterns are not supported for directory names. For example: `partitioning_clause => 'partition by range (col1) (partition p1 values less than (1000) external location ( ''https://objectstorage.us-phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname/o(/)*year=[0-9]+(/)*month=[0-9]+(/)*[a-z]+[1-3]??.txt''),….` You can use a Pre-Authenticated Request (PAR) URL to create an external table as follows: • Specify a single Oracle Database Pre-Authenticated Request (PAR) URL and apply filters and clauses on the data. For example, you can filter the data using the WHERE clause or sort it using the ORDER BY clause. • Specify comma-delimited list of Oracle Database Pre-Authenticated Request (PAR) URLs, you must ensure that all included PAR URLs must have the same column names, column order, and column data types.
column_list	Comma-delimited list of column names and data types for the external table.
field_list	Identifies the fields in the source files and their data types. The default value is NULL meaning the fields and their data types are determined by the *column_list* parameter. This argument's syntax is the same as the field_list clause in regular Oracle external tables. For more information about field_list see *Oracle® Database Utilities*.

Parameter	Description
format	The options describing the format of the source files. For the list of the options and how to specify the values see DBMS_CLOUD Package Format Options.

Usage Notes

- The procedure DBMS_CLOUD.CREATE_HYBRID_PART_TABLE supports external partitioned files in the supported cloud object storage services, including:
  - Oracle Cloud Infrastructure Object Storage
  - Azure Blob Storage
  - Amazon S3
  - GitHub Repository

  The credential is a table level property; therefore, the external files must be on the same object store.

  See DBMS_CLOUD URI Formats for more information.
- The procedure DBMS_CLOUD.CREATE_HYBRID_PART_TABLE supports hybrid partitioned files in directories, either in a local file system or in a network file system.
- The external partitioned tables you create with DBMS_CLOUD.CREATE_HYBRID_PART_TABLE include two invisible columns file$path and file$name. These columns help identify which file a record is coming from.
  - file$path: Specifies the file path text up to the beginning of the object name.
  - file$name: Specifies the object name, including all the text that follows the bucket name.

Examples

```
BEGIN
   DBMS_CLOUD.CREATE_HYBRID_PART_TABLE(
      table_name =>'HPT1',
      credential_name =>'OBJ_STORE_CRED',
      format => json_object('delimiter' value ',', 'recorddelimiter' value
'newline', 'characterset' value 'us7ascii'),
      column_list => 'col1 number, col2 number, col3 number',
      partitioning_clause => 'partition by range (col1)
                                 (partition p1 values less than (1000)
external location
                                     ( ''&base_URL/file_11.txt'')
                                 ,
                                 partition p2 values less than (2000)
external location
                                     ( ''&base_URL/file_21.txt'')
                                 ,
                                 partition p3 values less than (3000)
                                 )'
     );
   END;
/
```

```
BEGIN
   DBMS_CLOUD.CREATE_HYBRID_PART_TABLE(
    table_name  => 'HPT1',
    format      => json_object('delimiter'value ',', 'recorddelimiter'value
'newline'),
    column_list => 'NAME VARCHAR2(30), GENDER VARCHAR2(10), BALANCE number',
    partitioning_clause => 'partition by range (B  2  ALANCE)
                (partition p1 values less than (1000) external DEFAULT
DIRECTORY DATA_PUMP_DIR LOCATION (''Scott_male_1000.csv''),
                 partition p2 values less than (2000) external DEFAULT
DIRECTORY DATA_PUMP_DIR LOCATION (''Mary_female_3000.csv''),
                 partition p3 values less than (3000))' );
END;
/
```

DELETE_ALL_OPERATIONS Procedure

This procedure clears either all data load operations logged in the `user_load_operations` table in your schema or clears all the data load operations of the specified type, as indicated with the `type` parameter.

Syntax

```
DBMS_CLOUD.DELETE_ALL_OPERATIONS (
    type      IN VARCHAR DEFAULT NULL);
```

Parameters

Parameter	Description
`type`	Specifies the type of operation to delete. Type values can be found in the `TYPE` column in the `user_load_operations` table. If no `type` is specified all rows are deleted.

Usage Note

- `DBMS_CLOUD.DELETE_ALL_OPERATIONS` does not delete currently running operations (operations in a "Running" status).

DELETE_FILE Procedure

This procedure removes the specified file from the specified directory on Oracle Database.

Syntax

```
 DBMS_CLOUD.DELETE_FILE (
       directory_name     IN VARCHAR2,
       file_name          IN VARCHAR2);
```

Parameters

Parameter	Description
directory_name	The name of the directory on the Oracle Database instance.
file_name	The name of the file to be removed.

> **Note:**
>
> To run DBMS_CLOUD.DELETE_FILE you need to grant write privileges on the directory that contains the file to the user. For example, run the following command as ADMIN to grant write privileges to db_user:
>
> ```
> GRANT WRITE ON DIRECTORY data_pump_dir TO db_user;
> ```

Example

```
BEGIN
   DBMS_CLOUD.DELETE_FILE(
      directory_name =>  'DATA_PUMP_DIR',
      file_name => 'exp1.dmp' );
   END;
/
```

DELETE_OBJECT Procedure

This procedure deletes the specified object on object store.

Syntax

```
DBMS_CLOUD.DELETE_OBJECT (
       credential_name      IN VARCHAR2,
       object_uri           IN VARCHAR2,
       force                IN BOOLEAN DEFAULT FALSE);
```

Parameters

Parameter	Description
credential_name	The name of the credential to access the Cloud Object Storage.
object_uri	Object or file URI for the object to delete. The format of the URI depends on the Cloud Object Storage service you are using, for details see DBMS_CLOUD URI Formats.
force	Ignore and do not report errors if object does not exist. Valid values are: TRUE and FALSE. The default value is FALSE.

Example

```
BEGIN
   DBMS_CLOUD.DELETE_OBJECT(
       credential_name => 'DEF_CRED_NAME',
       object_uri => 'https://objectstorage.us-ashburn-1.oraclecloud.com/n/
namespace-string/b/bucketname/o/exp1.dmp' );
   END;
/
```

DELETE_OPERATION Procedure

This procedure clears the data load entries for the specified operation ID logged in the `user_load_operations` or `dba_load_operations` tables in your schema.

Syntax

```
DBMS_CLOUD.DELETE_OPERATION (
    id      IN NUMBER);
```

Parameters

Parameter	Description
`id`	Specifies the operation ID associated with the log file entries you want to delete.

Example

```
SELECT id FROM user_load_operations WHERE type LIKE '%BAD%';
EXEC DBMS_CLOUD.DELETE_OPERATION(id);
```

EXPORT_DATA Procedure

This procedure exports data from Oracle Database based on the result of a query. This procedure is overloaded and supports writing files to the cloud or to a directory.

Based on the `format type` parameter, the procedure exports files to the Cloud or to a directory location as text files in CSV, JSON, or XML format, or using the ORACLE_DATAPUMP access driver to write data to an Oracle Datapump dump file.

Syntax

```
DBMS_CLOUD.EXPORT_DATA (
      credential_name   IN VARCHAR2 DEFAULT NULL,
      file_uri_list     IN CLOB,
      format            IN CLOB,
      query             IN CLOB);

DBMS_CLOUD.EXPORT_DATA (
      credential_name   IN VARCHAR2 DEFAULT NULL,
      file_uri_list     IN CLOB DEFAULT NULL,
      format            IN CLOB DEFAULT NULL,
```

```
    query             IN CLOB DEFAULT NULL,
    operation_id      OUT NOCOPY NUMBER);
```

Parameters

Parameter	Description
credential_name	The name of the credential to access the Cloud Object Storage. When the credential parameter is not included, this specifies output to a directory.
file_uri_list	There are different forms, depending on the value of the format parameter and depending on whether you include a credential parameter: • When the format parameter type value is json: The JSON on Object Store or to the specified directory location is saved with a generated file name based on the value of the file_uri_list parameter. See File Naming for Text Output (CSV, JSON, Parquet, or XML) for more information. • When the format parameter type value is datapump, the file_uri_list is a comma-delimited list of the dump files. This specifies the files to be created on the Object Store. Use of wildcard and substitution characters is not supported in the file_uri_list. • When the credential_name parameter is not specified you provide a directory name in file_uri_list. The format of the URIs depend on the Cloud Object Storage service you are using, for details see DBMS_CLOUD URI Formats.
format	A JSON string that provides export format options. Supported option is: • type: The type format option is required and must have one of the values: csv | datapump | json | xml.
query	Use this parameter to specify a SELECT statement so that only the required data is exported. The query determines the contents of the files you export as text files CSV, JSON, or XML, or as dump files. For example: SELECT warehouse_id, quantity FROM inventories When the format type value is json, each query result is checked and if it is not JSON, as determined with the function: JSON_OBJECT_T.parse(), DBMS_CLOUD.EXPORT_DATA transforms the query to include JSON_OBJECT function to convert the row into JSON. For example: SELECT JSON_OBJECT(* RETURNING CLOB) from(SELECT warehouse_id, quantity FROM inventories)
operation_id	Use this parameter to track the progress and final status of the export operation as the corresponding ID in the USER_LOAD_OPERATIONS view.

Usage Notes:

- The query parameter value that you supply can be an advanced query, if required, such as a query that includes joins or subqueries.
- Depending on the format parameter specified, DBMS_CLOUD.EXPORT_DATA outputs the results of the specified query on the Cloud Object Store or to a directory location in one of these formats:
  - CSV, JSON, or XML files.

    See Export Data to Object Store as Text and Export Data to a Directory for more information on using DBMS_CLOUD.EXPORT_DATA with CSV, JSON, or XML output files.

  - Using the ORACLE_DATAPUMP access driver to write data to a dump file.

- For CSV, JSON, or XML output, by default when a generated file contains 10MB of data a new output file is created. However, if you have less than 10MB of result data you may have multiple output files, depending on the database service and the number of ECPUs (OCPUs if your database uses OCPUs) for the Autonomous Database instance.

  See File Naming for Text Output (CSV, JSON, Parquet, or XML) for more information.

  The default output file chunk size is 10MB for CSV, JSON, or XML. You can change this value with the `format` parameter `maxfilesize` option. See DBMS_CLOUD Package Format Options for EXPORT_DATA for more information.

Usage Notes for ORACLE_DATAPUMP Output (`DBMS_CLOUD.EXPORT_DATA` with `format` parameter `type` option `datapump`):

- `EXPORT_DATA` uses `DATA_PUMP_DIR` as the default logging directory. So the write privilege on `DATA_PUMP_DIR` is required when using `ORACLE_DATAPUMP` output.
- Oracle Database export using `DBMS_CLOUD.EXPORT_DATA` with `format` parameter `type` option `datapump` only supports Oracle Cloud Infrastructure Object Storage, Oracle Cloud Infrastructure Object Storage Classic object stores or directory output.
- Oracle Data Pump divides each dump file part into smaller chunks for faster uploads. The Oracle Cloud Infrastructure Object Storage console shows multiple files for each dump file part that you export. The size of the actual dump files will be displayed as zero (0) and its related file chunks as 10mb or less. For example:

  ```
  exp01.dmp
  exp01.dmp_aaaaaa
  exp02.dmp
  exp02.dmp_aaaaaa
  ```

  Downloading the zero byte dump file from the Oracle Cloud Infrastructure console or using the Oracle Cloud Infrastructure CLI will not give you the full dump files. To download the full dump files from the Object Store, use a tool that supports Swift such as curl, and provide your user login and Swift auth token.

  ```
  curl -O -v -X GET -u 'user1@example.com:auth_token' \
     https://swiftobjectstorage.us-ashburn-1.oraclecloud.com/v1/namespace-
  string/bucketname/exp01.dmp
  ```

  If you import a file with the `DBMS_CLOUD` procedures that support the `format` parameter `type` with the value '`datapump`', you only need to provide the primary file name. The procedures that support the '`datapump`' format type automatically discover and download the chunks.

  When you use `DBMS_CLOUD.DELETE_OBJECT`, the procedure automatically discovers and deletes the chunks when the procedure deletes the primary file.

- The `DBMS_CLOUD.EXPORT_DATA` procedure creates the dump file(s) from the `file_uri_list` values that you specify, as follows:
  - As more files are needed, the procedure creates additional files from the `file_uri_list`.
  - The procedure does not overwrite files. If a dump file in the `file_uri_list` exists, `DBMS_CLOUD.EXPORT_DATA` reports an error.
  - `DBMS_CLOUD.EXPORT_DATA` does not create buckets.

- The number of dump files that DBMS_CLOUD.EXPORT_DATA generates is determined when the procedure runs. The number of dump files that are generated depends on the number of file names you provide in the file_uri_list parameter.
- The dump files you create with DBMS_CLOUD.EXPORT_DATA cannot be imported using Oracle Data Pump impdp. Depending on the database, you can use these files as follows:
  - On Oracle Database instance you can use the dump files with the DBMS_CLOUD procedures that support the format parameter type with the value 'datapump'. You can import the dump files using DBMS_CLOUD.COPY_DATA or you can call DBMS_CLOUD.CREATE_EXTERNAL_TABLE to create an external table.
  - On any other Oracle Database, you can import the dump files created with the procedure DBMS_CLOUD.EXPORT_DATA using the ORACLE_DATAPUMP access driver.
- The query parameter value that you supply can be an advanced query, if required, such as a query that includes joins or subqueries.

Usage Notes for DBMS_CLOUD.EXPORT_DATA with Output to a Directory

- The provided directory must exist and you must be logged in as the ADMIN user or have WRITE access to the directory.
- DBMS_CLOUD.EXPORT_DATA does not create directories.
- The procedure does not overwrite files. For example, if a dump file in the file_uri_list exists, DBMS_CLOUD.EXPORT_DATA reports an error such as:

```
ORA-31641: unable to create dump file  "/u02/exports/123.dmp"
ORA-27038: created file already exists
```

Examples

The following example shows DBMS_CLOUD.EXPORT_DATA with the format type parameter with the value datapump:

```
BEGIN
   DBMS_CLOUD.EXPORT_DATA(
      credential_name =>'OBJ_STORE_CRED',
      file_uri_list =>'https://objectstorage.us-phoenix-1.oraclecloud.com/n/
namespace-string/b/bucketname/o/exp1.dmp',
      format => json_object('type' value 'datapump', 'compression' value
'basic', 'version' value 'latest'),
      query => 'SELECT warehouse_id, quantity FROM inventories'
     );
   END;
/
```

In this example, *namespace-string* is the Oracle Cloud Infrastructure object storage namespace and *bucketname* is the bucket name. See Understanding Object Storage Namespaces for more information.

The following example shows `DBMS_CLOUD.EXPORT_DATA` with the format `type` parameter with the value `json`:

```
BEGIN
   DBMS_CLOUD.EXPORT_DATA(
      credential_name => 'OBJ_STORE_CRED',
      file_uri_list   => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname/o/exp1.json',
      query           => 'SELECT * FROM DEPT',
      format          => JSON_OBJECT('type' value 'json', 'compression' value
'gzip'));
     );
   END;
/
```

The following example shows `DBMS_CLOUD.EXPORT_DATA` with the format `type` parameter with the value `xml`:

```
BEGIN
   DBMS_CLOUD.EXPORT_DATA(
      credential_name => 'OBJ_STORE_CRED',
      file_uri_list   => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname/o/exp1.xml',
      query           => 'SELECT * FROM DEPT',
      format          => JSON_OBJECT('type' value 'xml', 'compression' value
'gzip'));
     );
   END;
/
```

The following example shows `DBMS_CLOUD.EXPORT_DATA` with the format `type` parameter with the value `csv`:

```
BEGIN
   DBMS_CLOUD.EXPORT_DATA(
      credential_name => 'OBJ_STORE_CRED',
      file_uri_list   => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname/o/exp.csv',
      query           => 'SELECT * FROM DEPT',
      format          => JSON_OBJECT('type' value 'csv', 'delimiter' value
'|', 'compression' value 'gzip', 'header' value true, 'encryption' value
('user_defined_function' value 'ADMIN.decryption_callback')));
     );
   END;
/
```

The following example shows `DBMS_CLOUD.EXPORT_DATA` exporting data to a directory location with the `type` parameter with the value `datapump`:

```
BEGIN
 DBMS_CLOUD.EXPORT_DATA(
    file_uri_list => 'export_dir:sales.dmp',
    format        => json_object('type' value 'datapump'),
```

```
    query         => 'SELECT * FROM sales'
 );
END;
/
```

GET_OBJECT Procedure and Function

This procedure is overloaded. The procedure form reads an object from Cloud Object Storage and copies it to Oracle Database. The function form reads an object from Cloud Object Storage and returns a `BLOB` to Oracle Database.

Syntax

```
DBMS_CLOUD.GET_OBJECT (
       credential_name      IN VARCHAR2,
       object_uri           IN VARCHAR2,
       directory_name       IN VARCHAR2,
       file_name            IN VARCHAR2 DEFAULT  NULL,
       startoffset          IN NUMBER DEFAULT  0,
       endoffset            IN NUMBER DEFAULT  0,
       compression          IN VARCHAR2 DEFAULT  NULL);


DBMS_CLOUD.GET_OBJECT(
       credential_name      IN VARCHAR2 DEFAULT NULL,
       object_uri           IN VARCHAR2,
       startoffset          IN NUMBER DEFAULT  0,
       endoffset            IN NUMBER DEFAULT  0,
       compression          IN VARCHAR2 DEFAULT  NULL)
RETURN BLOB;
```

Parameters

Parameter	Description
`credential_name`	The name of the credential to access the Cloud Object Storage.
`object_uri`	Object or file URI. The format of the URI depends on the Cloud Object Storage service you are using, for details see DBMS_CLOUD URI Formats.
`directory_name`	The name of the directory on the database. 1 You can use a Pre-Authenticated Request (PAR) URL to create an external table as follows: • Specify a single Oracle Database Pre-Authenticated Request (PAR) URL and apply filters and clauses on the data. For example, you can filter the data using the `WHERE` clause or sort it using the `ORDER BY` clause. • Specify comma-delimited list of Oracle Database Pre-Authenticated Request (PAR) URLs, you must ensure that all included PAR URLs must have the same column names, column order, and column data types in the same schema.

Parameter	Description
file_name	Specifies the name of the file to create. If file name is not specified, the file name is taken from after the last slash in the object_uri parameter. For special cases, for example when the file name contains slashes, use the file_name parameter.
startoffset	The offset, in bytes, from where the procedure starts reading.
endoffset	The offset, in bytes, until where the procedure stops reading.
compression	Specifies the compression used to store the object. When compression is set to 'AUTO' the file is uncompressed (the value 'AUTO' implies the object specified with object_uri is compressed with Gzip).

Note:

To run DBMS_CLOUD.GET_OBJECT, you need to grant WRITE privileges on the directory to that user. For example, run the following command as a priviledged user to grant write privileges to db_user:

```
GRANT WRITE ON DIRECTORY data_pump_dir TO db_user;
```

Return Values

The function form reads from Object Store and DBMS_CLOUD.GET_OBJECT returns a BLOB.

Examples

```
BEGIN
   DBMS_CLOUD.GET_OBJECT(
     credential_name => 'OBJ_STORE_CRED',
     object_uri => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/
namespace-string/b/bucketname/o/file.txt',
     directory_name => 'DATA_PUMP_DIR');
END;
/
```

To read character data from a file in Object Store:

```
SELECT to_clob(
     DBMS_CLOUD.GET_OBJECT(
       credential_name => 'OBJ_STORE_CRED',
       object_uri => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/
namespace-string/b/bucketname/o/file.txt'))
FROM DUAL;
```

To add an image stored on Object Store in a BLOB in the database:

```
DECLARE
   l_blob BLOB := NULL;
BEGIN
   l_blob := DBMS_CLOUD.GET_OBJECT(
```

```
     credential_name => 'OBJ_STORE_CRED',
     object_uri => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/
namespace-string/b/bucketname/o/MyImage.gif' );
END;
/
```

In this example, *namespace-string* is the Oracle Cloud Infrastructure object storage namespace and *bucketname* is the bucket name. See Understanding Object Storage Namespaces for more information.

LIST_FILES Function

This function lists the files in the specified directory. The results include the file names and additional metadata about the files such as file size in bytes, creation timestamp, and the last modification timestamp.

Syntax

```
DBMS_CLOUD.LIST_FILES (
    directory_name      IN VARCHAR2)
       RETURN TABLE;
```

Parameters

Parameter	Description
directory_name	The name of the directory on the database.

Usage Notes

- DBMS_CLOUD.LIST_FILES is only supported for directory objects mapping to Oracle File System (OFS) or Database File System (DBFS) file systems.
- To run DBMS_CLOUD.LIST_FILES, you need to grant read privileges on the directory to the user. For example, run the following command as ADMIN to grant read privileges to db_user:

  ```
  GRANT READ ON DIRECTORY data_pump_dir TO db_user;
  ```

- This is a pipelined table function with return type as DBMS_CLOUD_TYPES.list_object_ret_t.
- DBMS_CLOUD.LIST_FILES does not obtain the checksum value and returns NULL for this field.

Example

This is a pipelined function that returns a row for each file. For example, use the following query to use this function:

```
SELECT * FROM DBMS_CLOUD.LIST_FILES('DATA_PUMP_DIR');

OBJECT_NAME       BYTES   CHECKSUM      CREATED              LAST_MODIFIED
------------ ---------- ----------    ---------------------
--------------------
```

```
cwallet.sso         2965                2018-12-12T18:10:47Z
2019-11-23T06:36:54Z
```

LIST_OBJECTS Function

This function lists objects in the specified location on object store. The results include the object names and additional metadata about the objects such as size, checksum, creation timestamp, and the last modification timestamp.

Syntax

```
DBMS_CLOUD.LIST_OBJECTS (
       credential_name      IN VARCHAR2,
       location_uri         IN VARCHAR2)
   RETURN TABLE;
```

Parameters

Parameter	Description
`credential_name`	The name of the credential to access the Cloud Object Storage.
`location_uri`	Object or file URI. The format of the URI depends on the Cloud Object Storage service you are using, for details see DBMS_CLOUD URI Formats.

Usage Notes

- Depending on the capabilities of the object store, `DBMS_CLOUD.LIST_OBJECTS` does not return values for certain attributes and the return value for the field is `NULL` in this case.

  All supported Object Stores return values for the `OBJECT_NAME`, `BYTES`, and `CHECKSUM` fields.

  The following table shows support for the fields `CREATED` and `LAST_MODIFIED` by Object Store:

Object Store	CREATED	LAST_MODIFIED
Oracle Cloud Infrastructure Native	Returns timestamp	Returns timestamp
Oracle Cloud Infrastructure Swift	Returns `NULL`	Returns timestamp
Oracle Cloud Infrastructure Classic	Returns `NULL`	Returns timestamp
Amazon S3	Returns `NULL`	Returns timestamp
Azure	Returns timestamp	Returns timestamp
GitHub Repository		

- The checksum value is the MD5 checksum. This is a 32-character hexadecimal number that is computed on the object contents.
- This is a pipelined table function with return type as `DBMS_CLOUD_TYPES.list_object_ret_t`.

Example

This is a pipelined function that returns a row for each object. For example, use the following query to use this function:

```
SELECT * FROM DBMS_CLOUD.LIST_OBJECTS('OBJ_STORE_CRED',
    'https://objectstorage.us-phoenix-1.oraclecloud.com/n/namespace-string/b/
bucketname/o/');


OBJECT_NAME   BYTES              CHECKSUM
CREATED         LAST_MODIFIED
------------ ---------- --------------------------------
-------------------- --------------------
cwallet.sso   2965      2339a2731ba24a837b26d344d643dc07
2019-11-23T06:36:54Z
```

In this example, *namespace-string* is the Oracle Cloud Infrastructure object storage namespace and *bucketname* is the bucket name. See Understanding Object Storage Namespaces for more information.

MOVE_OBJECT Procedure

This procedure moves an object from one Cloud Object Storage bucket or folder to another.

The source and target bucket or folder can be in the same or different Cloud Object store provider.

When the source and target are in distinct Object Stores or have different accounts with the same cloud provider, you can give separate credential names for the source and target locations.

The source credential name is by default also used by the target location when target credential name is not provided.

Syntax

```
DBMS_CLOUD.MOVE_OBJECT (
    source_credential_name  IN  VARCHAR2 DEFAULT NULL,
    source_object_uri       IN  VARCHAR2,
    target_object_uri       IN  VARCHAR2,
    target_credential_name  IN  VARCHAR2 DEFAULT NULL
);
```

Parameters

Parameter	Description
source_credential_name	The name of the credential to access the source Cloud Object Storage. If you do not supply a source_credential_name value, the credential_name is set to NULL.

Parameter	Description
source_object_uri	Specifies URI, that point to the source Object Storage bucket or folder location. This parameter is mandatory. The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
target_object_uri	Specifies the URI for the target Object Storage bucket or folder, where the files need to be moved. This parameter is mandatory. The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
target_credential_name	The name of the credential to access the target Cloud Object Storage location. If you do not supply a target_credential_name value, the target_object_uri is set to the source_credential_name value.

Example

```
BEGIN
DBMS_CLOUD.MOVE_OBJECT (
    source_credential_name => 'OCI_CRED',
    source_object_uri    => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname1/bgfile.csv',
    target_object_uri    => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname2/myfile.csv'
);
END;
/
```

PUT_OBJECT Procedure

This procedure is overloaded. In one form the procedure copies a file from Oracle Database to the Cloud Object Storage. In another form the procedure copies a BLOB from Oracle Database to the Cloud Object Storage.

Syntax

```
DBMS_CLOUD.PUT_OBJECT (
       credential_name      IN VARCHAR2,
       object_uri           IN VARCHAR2,
       directory_name       IN VARCHAR2,
       file_name            IN VARCHAR2
       compression          IN VARCHAR2 DEFAULT  NULL);


DBMS_CLOUD.PUT_OBJECT (
       credential_name      IN VARCHAR2,
       object_uri           IN VARCHAR2,
       contents             IN BLOB
       compression          IN VARCHAR2 DEFAULT  NULL);
```

Parameters

Parameter	Description
credential_name	The name of the credential to access the Cloud Object Storage.
object_uri	Object or file URI. The format of the URI depends on the Cloud Object Storage service you are using, for details see DBMS_CLOUD URI Formats.
directory_name	The name of the directory on the Oracle Database. [1]
contents	Specifies the BLOB to copy from Oracle Database to the Cloud Object Storage.
file_name	The name of the file in the specified directory.
compression	Specifies the compression used to store the object. Default value: NULL

> **Note:**
>
> To run DBMS_CLOUD.PUT_OBJECT, you need to grant read privileges on the directory to the user. For example, run the following command as a privileged user to grant read privileges to db_user:
>
> ```
> GRANT READ ON DIRECTORY data_pump_dir TO db_user;
> ```

Example

To handle BLOB data after in-database processing and then store the data directly into a file in the object store:

```
DECLARE
      my_blob_data BLOB;
BEGIN
 /* Some processing producing BLOB data and populating my_blob_data */
DBMS_CLOUD.PUT_OBJECT(
     credential_name => 'OBJ_STORE_CRED',
     object_uri => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/
namespace-string/b/bucketname/o/my_new_file',
     contents => my_blob_data));
END;
/
```

Usage Notes

Depending on your Cloud Object Storage, the size of the object you transfer is limited as follows:

Cloud Object Storage Service	Object Transfer Size Limit
Oracle Cloud Infrastructure Object Storage	50 GB
Amazon S3	5 GB

Cloud Object Storage Service	Object Transfer Size Limit
Azure Blob Storage	256 MB

Oracle Cloud Infrastructure object store does not allow writing files into a public bucket without supplying credentials (Oracle Cloud Infrastructure allows users to download objects from public buckets). Thus, you must supply a credential name with valid credentials to store an object in an Oracle Cloud Infrastructure public bucket using `PUT_OBJECT`.

See DBMS_CLOUD URI Formats for more information.

SYNC_EXTERNAL_PART_TABLE Procedure

This procedure simplifies updating an external partitioned table from files in the Cloud. Run this procedure whenever new partitions are added or when partitions are removed from the Object Store source for the external partitioned table.

Syntax

```
DBMS_CLOUD.SYNC_EXTERNAL_PART_TABLE (
    table_name        IN VARCHAR2,
    schema_name       IN VARCHAR2 DEFAULT,
    update_columns    IN BOOLEAN DEFAULT);
```

Parameters

Parameter	Description
`table_name`	The name of the target table. The target table needs to be created before you run `DBMS_CLOUD.SYNC_EXTERNAL_PART_TABLE`.
`schema_name`	The name of the schema where the target table resides. The default value is NULL meaning the target table is in the same schema as the user running the procedure.
`update_columns`	The new files may introduce a change to the schema. Updates supported include: new columns, deleted columns. Updates to existing columns, for example a change in the data type throw errors. Default Value: False

VALIDATE_EXTERNAL_PART_TABLE Procedure

This procedure validates the source files for an external partitioned table, generates log information, and stores the rows that do not match the format options specified for the external table in a *badfile* table on Oracle Database. The overloaded form enables you to use the `operation_id` parameter.

Syntax

```
DBMS_CLOUD.VALIDATE_EXTERNAL_PART_TABLE (
       table_name                IN VARCHAR2,
       partition_name            IN CLOB DEFAULT,
       subpartition_name         IN CLOB DEFAULT,
       schema_name               IN VARCHAR2 DEFAULT,
```

```
        rowcount                    IN NUMBER DEFAULT,
        partition_key_validation    IN BOOLEAN DEFAULT,
        stop_on_error               IN BOOLEAN DEFAULT);


DBMS_CLOUD.VALIDATE_EXTERNAL_PART_TABLE (
        table_name                  IN VARCHAR2,
        operation_id                OUT NUMBER,
        partition_name              IN CLOB DEFAULT,
        subpartition_name           IN CLOB DEFAULT,
        schema_name                 IN VARCHAR2 DEFAULT,
        rowcount                    IN NUMBER DEFAULT,
        partition_key_validation    IN BOOLEAN DEFAULT,
        stop_on_error               IN BOOLEAN DEFAULT);
```

Parameters

Parameter	Description
table_name	The name of the external table.
operation_id	Use this parameter to track the progress and final status of the load operation as the corresponding ID in the USER_LOAD_OPERATIONS view.
partition_name	If defined, then only a specific partition is validated. If not specified then read all partitions sequentially until rowcount is reached.
subpartition_name	If defined, then only a specific subpartition is validated. If not specified then read from all external partitions or subpartitions sequentially until rowcount is reached.
schema_name	The name of the schema where the external table resides. The default value is NULL meaning the external table is in the same schema as the user running the procedure.
rowcount	Number of rows to be scanned. The default value is NULL meaning all the rows in the source files are scanned.
partition_key_validation	For internal use only. Do not use this parameter.
stop_on_error	Determines if the validate should stop when a row is rejected. The default value is TRUE meaning the validate stops at the first rejected row. Setting the value to FALSE specifies that the validate does not stop at the first rejected row and validates all rows up to the value specified for the rowcount parameter.

VALIDATE_EXTERNAL_TABLE Procedure

This procedure validates the source files for an external table, generates log information, and stores the rows that do not match the format options specified for the external table in a *badfile* table on Oracle Database. The overloaded form enables you to use the operation_id parameter.

Syntax

```
DBMS_CLOUD.VALIDATE_EXTERNAL_TABLE (
    table_name      IN VARCHAR2,
    schema_name     IN VARCHAR2 DEFAULT,
    rowcount        IN NUMBER DEFAULT,
```

```
    stop_on_error   IN BOOLEAN DEFAULT);


DBMS_CLOUD.VALIDATE_EXTERNAL_TABLE(
    table_name      IN VARCHAR2,
    operation_id    OUT NOCOPY NUMBER,
    schema_name     IN VARCHAR2 DEFAULT NULL,
    rowcount        IN NUMBER DEFAULT 0,
    stop_on_error   IN BOOLEAN DEFAULT TRUE);
```

Parameters

Parameter	Description
table_name	The name of the external table.
operation_id	Use this parameter to track the progress and final status of the load operation as the corresponding ID in the USER_LOAD_OPERATIONS view.
schema_name	The name of the schema where the external table resides. The default value is NULL meaning the external table is in the same schema as the user running the procedure.
rowcount	Number of rows to be scanned. The default value is NULL meaning all the rows in the source files are scanned.
stop_on_error	Determines if the validate should stop when a row is rejected. The default value is TRUE meaning the validate stops at the first rejected row. Setting the value to FALSE specifies that the validate does not stop at the first rejected row and validates all rows up to the value specified for the rowcount parameter. If the external table refers to Avro or Parquet files then the validate stops at the first rejected row. When the external table specifies the format parameter type set to the value avro or parquet, the parameter stop_on_error effectively always has the value TRUE. Thus, the table badfile will always be empty for an external table referring to Avro or Parquet files.

Usage Notes

- DBMS_CLOUD.VALIDATE_EXTERNAL_TABLE works with both partitioned external tables and hybrid partitioned tables. This potentially reads data from all external partitions until rowcount is reached or stop_on_error applies. You do not have control over which partition, or parts of a partition, is read in which order.

VALIDATE_HYBRID_PART_TABLE Procedure

This procedure validates the source files for a hybrid partitioned table, generates log information, and stores the rows that do not match the format options specified for the hybrid table in a *badfile* table on Oracle Database. The overloaded form enables you to use the operation_id parameter.

Syntax

```
DBMS_CLOUD.VALIDATE_HYBRID_PART_TABLE (
       table_name                IN VARCHAR2,
       partition_name            IN CLOB DEFAULT,
       subpartition_name         IN CLOB DEFAULT,
```

```
        schema_name                 IN VARCHAR2 DEFAULT,
        rowcount                    IN NUMBER DEFAULT,
        partition_key_validation    IN BOOLEAN DEFAULT,
        stop_on_error               IN BOOLEAN DEFAULT);


DBMS_CLOUD.VALIDATE_HYBRID_PART_TABLE (
        table_name                  IN VARCHAR2,
        operation_id                OUT NUMBER,
        partition_name              IN CLOB DEFAULT,
        subpartition_name           IN CLOB DEFAULT,
        schema_name                 IN VARCHAR2 DEFAULT,
        rowcount                    IN NUMBER DEFAULT,
        partition_key_validation    IN BOOLEAN DEFAULT,
        stop_on_error               IN BOOLEAN DEFAULT);
```

Parameters

Parameter	Description
table_name	The name of the external table.
operation_id	Use this parameter to track the progress and final status of the load operation as the corresponding ID in the USER_LOAD_OPERATIONS view.
partition_name	If defined, then only a specific partition is validated. If not specified then read from all external partitions sequentially until rowcount is reached.
subpartition_name	If defined, then only a specific subpartition is validated. If not specified then read from all external partitions or subpartitions sequentially until rowcount is reached.
schema_name	The name of the schema where the external table resides. The default value is NULL meaning the external table is in the same schema as the user running the procedure.
rowcount	Number of rows to be scanned. The default value is NULL meaning all the rows in the source files are scanned.
partition_key_validation	For internal use only. Do not use this parameter.
stop_on_error	Determines if the validate should stop when a row is rejected. The default value is TRUE meaning the validate stops at the first rejected row. Setting the value to FALSE specifies that the validate does not stop at the first rejected row and validates all rows up to the value specified for the rowcount parameter.

DBMS_CLOUD for Bulk File Management

The subprograms for bulk file operations within the DBMS_CLOUD package.

Subprogram	Description
BULK_COPY Procedure	This procedure copies files from one Cloud Object Storage bucket to another.
BULK_DELETE Procedure	The procedure deletes files from Cloud Object Storage bucket or folder.

Subprogram	Description
BULK_DOWNLOAD Procedure	This procedure downloads files from Cloud Object store bucket to a directory in Autonomous Database.
BULK_MOVE Procedure	This procedure moves files from one Cloud Object Storage bucket to another.
BULK_UPLOAD Procedure	This procedure uploads files from a directory in Autonomous Database to the Cloud Object Storage.

BULK_COPY Procedure

This procedure bulk copies files from one Cloud Object Storage bucket to another. The overloaded form enables you to use the `operation_id` parameter.

You can filter the list of files to be deleted using a regular expression pattern compatible with `REGEXP_LIKE` operator.

The source and target bucket or folder can be in the same or different Cloud Object store provider.

When the source and target are in distinct Object Stores or have different accounts with the same cloud provider, you can give separate credential names for the source and target locations.

The source credential name is by default also used by the target location.

Syntax

```
DBMS_CLOUD.BULK_COPY (
      source_credential_name  IN  VARCHAR2 DEFAULT NULL,
      source_location_uri     IN  VARCHAR2,
      target_location_uri     IN  VARCHAR2,
      target_credential_name  IN  VARCHAR2 DEFAULT NULL,
      regex_filter            IN  VARCHAR2 DEFAULT NULL,
      format                  IN  CLOB     DEFAULT NULL
);

DBMS_CLOUD.BULK_COPY (
      source_credential_name  IN  VARCHAR2 DEFAULT NULL,
      source_location_uri     IN  VARCHAR2,
      target_location_uri     IN  VARCHAR2,
      target_credential_name  IN  VARCHAR2 DEFAULT NULL,
      regex_filter            IN  VARCHAR2 DEFAULT NULL,
      format                  IN  CLOB     DEFAULT NULL,
      operation_id            OUT NUMBER
);
```

Parameters

Parameter	Description
source_credential_name	The name of the credential to access the Cloud Object Storage. If you do not supply a source_credential_name value, the credential_name is set to NULL.
source_location_uri	Specifies URI, that point to the source Object Storage bucket or folder location. This parameter is mandatory. The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
target_location_uri	Specifies the URI for the target Object Storage bucket or folder, where the files need to be copied. This parameter is mandatory. The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
target_credential_name	The name of the credential to access the target Cloud Object Storage location. If you do not supply a target_credential_name value, the target_location_uri is set to the source_credential_name value.
regex_filter	Specifies the REGEX expression to filter files. The REGEX expression pattern must be compatible with the REGEXP_LIKE operator. If you do not supply a regex_filter value, the regex_filter is set to NULL.
format	Specifies the additional configuration options for the file operation. These options are specified as a JSON string. The supported format options are: • logretention: It accepts an integer value that determines the duration in days for which the status table is retained for a bulk operation. The default value is 2 days. • logprefix: It accepts a string value that determines the bulk operation status table name prefix string. The operation type is the default value. For BULK_COPY, the default logprefix value is COPYOBJ. If you do not supply a format value, the format is set to NULL.
operation_id	Use this parameter to track the progress and final status of the load operation as the corresponding ID in the USER_LOAD_OPERATIONS view.

Usage Notes

- An error is returned when the source and target URI point to the same Object Storage bucket or folder.

Example

```
BEGIN
DBMS_CLOUD.BULK_COPY (
     source_credential_name => 'OCI_CRED',
     source_location_uri    => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname1/o',
```

```
     target_location_uri    => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname2/o',
     format       => JSON_OBJECT ('logretention' value 7, 'logprefix' value
'BULKOP')
);
END;
/
```

BULK_DELETE Procedure

This procedure bulk deletes files from the Cloud Object Storage. The overloaded form enables you to use the `operation_id` parameter. You can filter the list of files to be deleted using a regular expression pattern compatible with `REGEXP_LIKE` operator.

Syntax

```
 DBMS_CLOUD.BULK_DELETE(
     credential_name  IN  VARCHAR2 DEFAULT NULL,
     location_uri     IN  VARCHAR2,
     regex_filter     IN  VARCHAR2 DEFAULT NULL,
     format           IN  CLOB     DEFAULT NULL
);

DBMS_CLOUD.BULK_DELETE (
     credential_name  IN  VARCHAR2 DEFAULT NULL,
     location_uri     IN  VARCHAR2,
     regex_filter     IN  VARCHAR2 DEFAULT NULL,
     format           IN  CLOB     DEFAULT NULL,
     operation_id     OUT NUMBER
);
```

Parameters

Parameter	Description
`credential_name`	The name of the credential to access the Cloud Object Storage. If you do not supply a `credential_name` value, the `credential_name` is set to `NULL`.
`location_uri`	Specifies URI, that point to an Object Storage location in the Autonomous Database. This parameter is mandatory. The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
`regex_filter`	Specifies the REGEX expression to filter files. The REGEX expression pattern must be compatible with the `REGEXP_LIKE` operator. If you do not supply a `regex_filter` value, the `regex_filter` is set to `NULL`.

Parameter	Description
format	Specifies the additional configuration options for the file operation. These options are specified as a JSON string. The supported format options are: • logretention: It accepts an integer value that determines the duration in days for which the status table is retained for a bulk operation . The default value is 2 days. • logprefix: It accepts a string value that determines the bulk operation status table name prefix string. The operation type is the default value. For BULK_DELETE, the default logprefix value is DELETE. If you do not supply a format value, the format is set to NULL.
operation_id	Use this parameter to track the progress and final status of the load operation as the corresponding ID in the USER_LOAD_OPERATIONS view.

Example

```
BEGIN
DBMS_CLOUD.BULK_DELETE (
     credential_name => 'OCI_CRED',
     location_uri    => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/
namespace-string/b/bucketname/o',
     format          => JSON_OBJECT ('logretention' value 5, 'logprefix'
value 'BULKDEL')
);
END;
/
```

BULK_DOWNLOAD Procedure

This procedure downloads files into an Autonomous Database directory from Cloud Object Storage. The overloaded form enables you to use the operation_id parameter. You can filter the list of files to be downloaded using a regular expression pattern compatible with REGEXP_LIKE operator.

Syntax

```
DBMS_CLOUD.BULK_DOWNLOAD (
     credential_name  IN  VARCHAR2 DEFAULT NULL,
     location_uri     IN  VARCHAR2,
     directory_name   IN  VARCHAR2,
     regex_filter     IN  VARCHAR2 DEFAULT NULL,
     format           IN  CLOB     DEFAULT NULL
);

DBMS_CLOUD.BULK_DOWNLOAD (
     credential_name  IN  VARCHAR2 DEFAULT NULL,
     location_uri     IN  VARCHAR2,
     directory_name   IN  VARCHAR2,
     regex_filter     IN  VARCHAR2 DEFAULT NULL,
     format           IN  CLOB     DEFAULT NULL,
```

```
    operation_id     OUT NUMBER
);
```

Parameters

Parameter	Description
credential_name	The name of the credential to access the Cloud Object Storage. If you do not supply a credential_name value, the credential_name is set to NULL.
location_uri	Specifies URI, that point to an Object Storage location in the Autonomous Database. This parameter is mandatory. The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
directory_name	The name of the directory on the Autonomous Database from where you want to download the files. This parameter is mandatory.
regex_filter	Specifies the REGEX expression to filter files. The REGEX expression pattern must be compatible with the REGEXP_LIKE operator. If you do not supply a regex_filter value, the regex_filter is set to NULL.
format	Specifies the additional configuration options for the file operation. These options are specified as a JSON string. The supported format options are: • logretention: It accepts an integer value that determines the duration in days for which the status table is retained for a bulk operation. The default value is 2 days. • logprefix: It accepts a string value that determines the bulk operation status table name prefix string. For BULK_DOWNLOAD, the default logprefix value is DOWNLOAD. The operation type is the default value. If you do not supply a format value, the format is set to NULL.
operation_id	Use this parameter to track the progress and final status of the load operation as the corresponding ID in the USER_LOAD_OPERATIONS view.

Example

```
BEGIN
DBMS_CLOUD.BULK_DOWNLOAD (
     credential_name => 'OCI_CRED',
     location_uri    => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/
namespace-string/b/bucketname/o',
     directory_name  => 'BULK_TEST',
     format          => JSON_OBJECT ('logretention' value 7, 'logprefix'
value 'BULKOP')
 );
END;
/
```

BULK_MOVE Procedure

This procedure bulk moves files from one Cloud Object Storage bucket or folder to another. The overloaded form enables you to use the `operation_id` parameter.

You can filter the list of files to be deleted using a regular expression pattern compatible with `REGEXP_LIKE` operator.

The source and target bucket or folder can be in the same or different Cloud Object store provider.

When the source and target are in distinct Object Stores or have different accounts with the same cloud provider, you can give separate credential names for the source and target locations.

The source credential name is by default also used by the target location when target credential name is not provided.

The first step in moving files is copying them to the target location, then deleting the source files, once they are successfully copied.

The object is renamed rather than moved if Object Store allows renaming operations between source and target locations.

Syntax

```
DBMS_CLOUD.BULK_MOVE (
      source_credential_name  IN  VARCHAR2 DEFAULT NULL,
      source_location_uri     IN  VARCHAR2,
      target_location_uri     IN  VARCHAR2,
      target_credential_name  IN  VARCHAR2 DEFAULT NULL,
      regex_filter            IN  VARCHAR2 DEFAULT NULL,
      format                  IN  CLOB     DEFAULT NULL
);

DBMS_CLOUD.BULK_MOVE (
      source_credential_name  IN  VARCHAR2 DEFAULT NULL,
      source_location_uri     IN  VARCHAR2,
      target_location_uri     IN  VARCHAR2,
      target_credential_name  IN  VARCHAR2 DEFAULT NULL,
      regex_filter            IN  VARCHAR2 DEFAULT NULL,
      format                  IN  CLOB     DEFAULT NULL,
      operation_id            OUT NUMBER
);
```

Parameters

Parameter	Description
`source_credential_name`	The name of the credential to access the source Cloud Object Storage. If you do not supply a `source_credential_name` value, the `credential_name` is set to `NULL`.

Parameter	Description
source_location_uri	Specifies URI, that point to the source Object Storage bucket or folder location. This parameter is mandatory. The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
target_location_uri	Specifies the URI for the target Object Storage bucket or folder, where the files need to be moved. This parameter is mandatory. The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
target_credential_name	The name of the credential to access the target Cloud Object Storage location. If you do not supply a target_credential_name value, the target_location_uri is set to the source_credential_name value.
regex_filter	Specifies the REGEX expression to filter files. The REGEX expression pattern must be compatible with the REGEXP_LIKE operator. If you do not supply a regex_filter value, the regex_filter is set to NULL.
format	Specifies the additional configuration options for the file operation. These options are specified as a JSON string. The supported format options are: • logretention: It accepts an integer value that determines the duration in days for which the status table is retained for a bulk operation. The default value is 2 days. • logprefix: It accepts a string value that determines the bulk operation status table name prefix string. The operation type is the default value. For BULK_MOVE, the default logprefix value is MOVE. If you do not supply a format value, the format is set to NULL.
operation_id	Use this parameter to track the progress and final status of the load operation as the corresponding ID in the USER_LOAD_OPERATIONS view.

Example

```
BEGIN
DBMS_CLOUD.BULK_MOVE (
     source_credential_name => 'OCI_CRED',
     source_location_uri    => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname1/o',
     target_location_uri    => 'https://objectstorage.us-
phoenix-1.oraclecloud.com/n/namespace-string/b/bucketname2/o',
     format                 => JSON_OBJECT ('logretention' value 7,
'logprefix' value 'BULKMOVE')
);
END;
/
```

> **Note:**
>
> An error is returned when the source and target URI point to the same Object Storage bucket or folder.

BULK_UPLOAD Procedure

This procedure copies files into Cloud Object Storage from an Autonomous Database directory. The overloaded form enables you to use the `operation_id` parameter.

Syntax

```
DBMS_CLOUD.BULK_UPLOAD (
     credential_name  IN  VARCHAR2 DEFAULT NULL,
     location_uri     IN  VARCHAR2,
     directory_name   IN  VARCHAR2,
     regex_filter     IN  VARCHAR2 DEFAULT NULL,
     format           IN  CLOB     DEFAULT NULL
);

DBMS_CLOUD.BULK_UPLOAD (
     credential_name  IN  VARCHAR2 DEFAULT NULL,
     location_uri     IN  VARCHAR2,
     directory_name   IN  VARCHAR2,
     regex_filter     IN  VARCHAR2 DEFAULT NULL,
     format           IN  CLOB     DEFAULT NULL,
     operation_id     OUT NUMBER
);
```

Parameters

Parameter	Description
`credential_name`	The name of the credential to access the Cloud Object Storage. If you do not supply a `credential_name` value, the `credential_name` is set to `NULL`.
`location_uri`	Specifies URI, that points to an Object Storage location to upload files. This parameter is mandatory. The format of the URIs depends on the Cloud Object Storage service. See DBMS_CLOUD URI Formats for more information.
`directory_name`	The name of the directory on the Autonomous Database from where you upload files. This parameter is mandatory.
`regex_filter`	Specifies the REGEX expression to filter files. The REGEX expression pattern must be compatible with `REGEXP_LIKE` operator. If you do not supply a `regex_filter` value, the `regex_filter` is set to `NULL`.

Parameter	Description
format	Specifies the additional configuration options for the file operation. These options are specified as a JSON string. The supported format options are: • logretention: It accepts an integer value that determines the duration in days for which the status table is retained for a bulk operation. The default value is 2 days. • logprefix: It accepts a string value that determines the bulk operation status table name prefix string. The operation type is the default value. For BULK_UPLOAD, the default logprefix value is UPLOAD. If you do not supply a format value, the format is set to NULL.
operation_id	Use this parameter to track the progress and final status of the load operation as the corresponding ID in the USER_LOAD_OPERATIONS view.

Example

```
BEGIN
DBMS_CLOUD.BULK_UPLOAD (
     credential_name => 'OCI_CRED',
     location_uri    => 'https://objectstorage.us-phoenix-1.oraclecloud.com/n/
namespace-string/b/bucketname/o',
     directory_name  => 'BULK_TEST',
     format          => JSON_OBJECT ('logretention' value 5, 'logprefix'
value 'BULKUPLOAD')
 );
END;
/
```

DBMS_CLOUD REST APIs

This section covers the DBMS_CLOUD REST APIs provided with Autonomous Database.

REST API	Description
GET_RESPONSE_HEADERS Function	This function returns the HTTP response headers as JSON data in a JSON object in Oracle Database.
GET_RESPONSE_RAW Function	This function returns the HTTP response in RAW format Oracle Database. This is useful if the HTTP response is expected to be binary format.
GET_RESPONSE_STATUS_CODE Function	This function returns the HTTP response status code as an integer in Oracle Database. The status code helps to identify if the request is successful.
GET_RESPONSE_TEXT Function	This function returns the HTTP response in TEXT format (VARCHAR2 or CLOB) in Oracle Database. Usually, most Cloud REST APIs return JSON response in text format. This function is useful if you expect the HTTP response is in text format.
GET_API_RESULT_CACHE_SIZE Function	This function returns the configured result cache size.
SEND_REQUEST Function and Procedure	This function begins an HTTP request, gets the response, and ends the response in Oracle Database. This function provides a workflow for sending a Cloud REST API request with arguments and a return response code and payload.

REST API	Description
SET_API_RESULT_CACHE_SIZE Procedure	This procedure sets the maximum cache size for current session.

DBMS_CLOUD REST API Overview

When you use PL/SQL in your application and you need to call Cloud REST APIs you can use `DBMS_CLOUD.SEND_REQUEST` to send the REST API requests.

The `DBMS_CLOUD` REST API functions allow you to make `HTTP` requests using `DBMS_CLOUD.SEND_REQUEST` and obtain and save results. These functions provide a generic API that lets you call any REST API with the following supported cloud services:

- Oracle Cloud Infrastructure
  See API Reference and Endpoints for information on Oracle Cloud Infrastructure REST APIs.
- Amazon Web Services (AWS)
  See Guides and API References for information on Amazon Web Services REST APIs.
- Azure Cloud [1]
  See Azure REST API Reference for information on Azure REST APIs.
- Oracle Cloud Infrastructure Classic
  See All REST Endpoints for information on Oracle Cloud Infrastructure Classic REST APIs.
- GitHub Repository
  See GitHub REST API for more information.

DBMS_CLOUD REST API Constants

Describes the `DBMS_CLOUD` constants for making `HTTP` requests using `DBMS_CLOUD.SEND_REQUEST`.

`DBMS_CLOUD` supports `GET`, `PUT`, `POST`, `HEAD` and `DELETE` HTTP methods. The REST API method to be used for an HTTP request is typically documented in the Cloud REST API documentation.

Name	Type	Value
METHOD_DELETE	VARCHAR2(6)	'DELETE'
METHOD_GET	VARCHAR2(3)	'GET'
METHOD_HEAD	VARCHAR2(4)	'HEAD'
METHOD_POST	VARCHAR2(4)	'POST'
METHOD_PUT	VARCHAR2(3)	'PUT'

[1] Support for Azure Cloud REST API calls is limited to the domain "blob.windows.net".

DBMS_CLOUD REST API Results Cache

You can save DBMS_CLOUD REST API results when you set the cache parameter to true with DBMS_CLOUD.SEND_REQUEST. The SESSION_CLOUD_API_RESULTS view describes the columns you can use when REST API results are saved.

By default DBMS_CLOUD REST API calls do not save results for your session. In this case you use the DBMS_CLOUD.SEND_REQUEST function to return results.

When you use DBMS_CLOUD.SEND_REQUEST and set the cache parameter to TRUE, results are saved and you can view past results in the SESSION_CLOUD_API_RESULTS view. Saving and querying historical results of DBMS_CLOUD REST API requests can help you when you need to work with your previous results in your applications.

For example, to query recent DBMS_CLOUD REST API results, use the view SESSION_CLOUD_API_RESULTS:

```
SELECT timestamp FROM SESSION_CLOUD_API_RESULTS;
```

When you save DBMS_CLOUD REST API results with DBMS_CLOUD.SEND_REQUEST the saved data is only available within the same session (connection). After the session exits, the saved data is no longer available.

Use DBMS_CLOUD.GET_API_RESULT_CACHE_SIZE and DBMS_CLOUD.SET_API_RESULT_CACHE_SIZE to view and set the DBMS_CLOUD REST API cache size, and to disable caching.

GET_RESPONSE_HEADERS Function

This function returns the HTTP response headers as JSON data in a JSON object.

Syntax

```
DBMS_CLOUD.GET_RESPONSE_HEADERS(
       resp          IN DBMS_CLOUD_TYPES.resp)
   RETURN JSON_OBJECT_T;
```

Parameters

Parameter	Description
resp	HTTP Response type returned from DBMS_CLOUD.SEND_REQUEST.

Exceptions

Exception	Error	Description
invalid_response	ORA-20025	Invalid response type object passed to DBMS_CLOUD.GET_RESPONSE_HEADERS.

GET_RESPONSE_RAW Function

This function returns the HTTP response in RAW format. This is useful if the HTTP response is expected to be binary format.

Syntax

```
DBMS_CLOUD.GET_RESPONSE_RAW(
       resp           IN DBMS_CLOUD_TYPES.resp)
   RETURN BLOB;
```

Parameters

Parameter	Description
resp	HTTP Response type returned from DBMS_CLOUD.SEND_REQUEST.

Exceptions

Exception	Error	Description
invalid_response	ORA-20025	Invalid response type object passed to DBMS_CLOUD.GET_RESPONSE_RAW.

GET_RESPONSE_STATUS_CODE Function

This function returns the HTTP response status code as an integer. The status code helps to identify if the request is successful.

Syntax

```
DBMS_CLOUD.GET_RESPONSE_STATUS_CODE(
       resp           IN DBMS_CLOUD_TYPES.resp)
   RETURN PLS_INTEGER;
```

Parameters

Parameter	Description
resp	HTTP Response type returned from DBMS_CLOUD.SEND_REQUEST.

Exceptions

Exception	Error	Description
invalid_response	ORA-20025	Invalid response type object passed to DBMS_CLOUD.GET_RESPONSE_STATUS_CODE.

GET_RESPONSE_TEXT Function

This function returns the HTTP response in `TEXT` format (`VARCHAR2` or `CLOB`). Usually, most Cloud REST APIs return JSON response in text format. This function is useful if you expect the HTTP response is in text format.

Syntax

```
DBMS_CLOUD.GET_RESPONSE_TEXT(
       resp          IN DBMS_CLOUD_TYPES.resp)
   RETURN CLOB;
```

Parameters

Parameter	Description
`resp`	HTTP Response type returned from `DBMS_CLOUD.SEND_REQUEST`.

Exceptions

Exception	Error	Description
`invalid_response`	`ORA-20025`	Invalid response type object passed to `DBMS_CLOUD.GET_RESPONSE_TEXT`.

GET_API_RESULT_CACHE_SIZE Function

This function returns the configured result cache size. The cache size value only applies for the current session.

Syntax

```
DBMS_CLOUD.GET_API_RESULT_CACHE_SIZE()
   RETURN NUMBER;
```

SEND_REQUEST Function and Procedure

This function and procedure begins an HTTP request, gets the response, and ends the response. This function provides a workflow for sending a cloud REST API request with arguments and the function returns a response code and payload. If you use the procedure, you can view results and response details from the saved results with the `SESSION_CLOUD_API_RESULTS` view.

Syntax

```
DBMS_CLOUD.SEND_REQUEST(
       credential_name    IN VARCHAR2,
       uri                IN VARCHAR2,
       method             IN VARCHAR2,
       headers            IN CLOB DEFAULT NULL,
```

```
      async_request_url  IN VARCHAR2 DEFAULT NULL,
      wait_for_states    IN DBMS_CLOUD_TYPES.wait_for_states_t DEFAULT NULL,
      timeout            IN NUMBER DEFAULT 0,
      cache              IN PL/SQL BOOLEAN DEFAULT FALSE,
      cache_scope        IN VARCHAR2 DEFAULT 'PRIVATE',
      body               IN BLOB DEFAULT NULL)
   RETURN DBMS_CLOUD_TYPES.resp;

DBMS_CLOUD.SEND_REQUEST(
      credential_name    IN VARCHAR2,
      uri                IN VARCHAR2,
      method             IN VARCHAR2,
      headers            IN CLOB DEFAULT NULL,
      async_request_url  IN VARCHAR2 DEFAULT NULL,
      wait_for_states    IN DBMS_CLOUD_TYPES.wait_for_states_t DEFAULT NULL,
      timeout            IN NUMBER DEFAULT 0,
      cache              IN PL/SQL BOOLEAN DEFAULT FALSE,
      cache_scope        IN VARCHAR2 DEFAULT 'PRIVATE',
      body               IN BLOB DEFAULT NULL);
```

Parameters

Parameter	Description
`credential_name`	The name of the credential for authenticating with the corresponding cloud native API.
`uri`	HTTP URI to make the request.
`method`	HTTP Request Method: `GET`, `PUT`, `POST`, `HEAD`, `DELETE`. Use the `DBMS_CLOUD` package constant to specify the method. See DBMS_CLOUD REST API Constants for more information.
`headers`	HTTP Request headers for the corresponding cloud native API in JSON format. The authentication headers are set automatically, only pass custom headers.
`async_request_url`	An asynchronous request URL. To obtain the URL select your request API from the list of APIs (see https://docs.cloud.oracle.com/en-us/iaas/api/). Then, navigate to find the API for your request in the left pane. For example, Database Services API → Autonomous Database → StopAutonomousDatabase. This page shows the API home (and shows the base endpoint). Then, append the base endpoint with the relative path obtained for your work request WorkRequest link.
`wait_for_states`	Wait for states is a status of type: `DBMS_CLOUD_TYPES.wait_for_states_t`. The following are valid values for expected states: `'ACTIVE'`, `'CANCELED'`, `'COMPLETED'`, `'DELETED'`, `'FAILED'`, `'SUCCEEDED'`. Multiple states are allowed for `wait_for_states`. The default value for `wait_for_states` is to wait for any of the expected states: `'ACTIVE'`, `'CANCELED'`, `'COMPLETED'`, `'DELETED'`, `'FAILED'`, `'SUCCEEDED'`.
`timeout`	Specifies the timeout, in seconds, for asynchronous requests with the parameters `async_request_url` and `wait_for_states`. Default value is `0`. This indicates to wait for completion of the request without any timeout.

Parameter	Description
cache	If TRUE specifies the request should be cached in REST result API cache. The default value is FALSE, which means REST API requests are not cached.
cache_scope	Specifies whether everyone can have access to this request result cache. Valid values: "PRIVATE" and "PUBLIC". The default value is "PRIVATE".
body	HTTP Request Body for PUT and POST requests.

Exceptions

Exception	Error	Description
invalid_req_method	ORA-20023	Request method passed to DBMS_CLOUD.SEND_REQUEST is invalid.
invalid_req_header	ORA-20024	Request headers passed to DBMS_CLOUD.SEND_REQUEST are not in valid JSON format.

Usage Notes

- If you are using Oracle Cloud Infrastructure, you must use a Signing Key based credential value for the credential_name. See CREATE_CREDENTIAL Procedure for more information.
- The optional parameters async_request_url, wait_for_states, and timeout allow you to handle long running requests. Using this asynchronous form of send_request, the function waits for the completion status specified in wait_for_states before returning. With these parameters in the send request, you pass the expected return states in the wait_for_states parameter, and you use the async_request_url parameter to specify an associated work request, the request does not return immediately. Instead, the request probes the async_request_url until the return state is one of the expected states or the timeout is exceeded (timeout is optional). If no timeout is specified, the request waits until a state found in wait_for_states occurs.

SET_API_RESULT_CACHE_SIZE Procedure

This procedure sets the maximum cache size for current session. The cache size value only applies for the current session.

Syntax

```
DBMS_CLOUD.SET_API_RESULT_CACHE_SIZE(
       cache_size          IN NUMBER);
```

Parameters

Parameter	Description
cache_size	Set the maximum cache size to the specified value cache_size. If the new maximum cache size is smaller than the current cache size, older records are dropped until the number of rows is equal to the specified maximum cache size. The maximum value is 10000. If the cache size is set to 0, caching is disabled in the session. The default cache size is 10.

Exceptions

Exception	Error	Description
invalid API result cache size	ORA-20032	The minimum value is 0 and the maximum value is 10000. This exception is shown when the input value is less than 0 or is larger than 10000.

Example

```
EXEC DBMS_CLOUD.SET_API_RESULT_CACHE_SIZE(101);
```

DBMS_CLOUD REST API Examples

Shows examples using DBMS_CLOUD.SEND_REQUEST to create and delete an Oracle Cloud Infrastructure Object Storage bucket, and an example to list all compartments in the tenancy.

Note:

These examples show Oracle Cloud Infrastructure request APIs and require that you use a Signing Key based credential for the `credential_name`. Oracle Cloud Infrastructure Signing Key based credentials include the `private_key` and `fingerprint` arguments.

For example:

```
BEGIN
   DBMS_CLOUD.CREATE_CREDENTIAL (
       credential_name => 'OCI_KEY_CRED',
       user_ocid       =>
'ocid1.user.oc1..aaaaaaaauq54mi7zdyfhw33ozkwuontjceel7fok5nq3bf2vwetkp
qsoa',
       tenancy_ocid    =>
'ocid1.tenancy.oc1..aabbbbbbaafcue47pqmrf4vigneebgbcmmoy5r7xvoypicjqqg
e32ewnrcyx2a',
       private_key     =>
'MIIEogIBAAKCAQEAtUnxbmrekwgVac6FdWeRzoXvIpA9+0r1.....wtnNpESQQQ0QLGPD
8NM//JEBg=',
       fingerprint     =>
'f2:db:f9:18:a4:aa:fc:94:f4:f6:6c:39:96:16:aa:27');
END;
/
```

See CREATE_CREDENTIAL Procedure for information on `DBMS_CLOUD.CREATE_CREDENTIAL`.

Create Bucket Example

Shows an example using `DBMS_CLOUD.SEND_REQUEST` with HTTP `POST` method to create an object store bucket named *`bucketname`*.

See CreateBucket for details on the Oracle Cloud Infrastructure Object Storage Service API for this example.

```
SET SERVEROUTPUT ON
DECLARE
  resp DBMS_CLOUD_TYPES.resp;
BEGIN
  -- Send request
  resp := DBMS_CLOUD.send_request(
            credential_name => 'OCI_KEY_CRED',
            uri => 'https://objectstorage.region.oraclecloud.com/n/namespace-
string/b/',
            method => DBMS_CLOUD.METHOD_POST,
            body => UTL_RAW.cast_to_raw(
                        JSON_OBJECT('name' value 'bucketname',
                                    'compartmentId' value 'compartment_OCID'))
          );

  -- Response Body in TEXT format
  dbms_output.put_line('Body: ' || '------------' || CHR(10) ||
```

```
  DBMS_CLOUD.get_response_text(resp) || CHR(10));

  -- Response Headers in JSON format
  dbms_output.put_line('Headers: ' || CHR(10) || '------------' || CHR(10) ||
  DBMS_CLOUD.get_response_headers(resp).to_clob || CHR(10));

  -- Response Status Code
  dbms_output.put_line('Status Code: ' || CHR(10) || '------------' ||
CHR(10) ||
  DBMS_CLOUD.get_response_status_code(resp));

END;
/
```

Notes:

- In this example, *namespace-string* is the Oracle Cloud Infrastructure object storage namespace and *bucketname* is the bucket name. See Understanding Object Storage Namespaces for more information.
- Where: *region* is an endpoint region. See Object Storage API reference in API Reference and Endpoints for more information. For example, where *region* is: `us-phoenix-1`.

Delete Bucket Example

Shows an example using `DBMS_CLOUD.SEND_REQUEST` with HTTP `DELETE` method to delete an object store bucket named *bucketname*.

See DeleteBucket for details on the Oracle Cloud Infrastructure Object Storage Service API for this example.

```
SET SERVEROUTPUT ON
DECLARE
  resp DBMS_CLOUD_TYPES.resp;
BEGIN
  -- Send request
  resp := DBMS_CLOUD.send_request(
            credential_name => 'OCI_KEY_CRED',
            uri => 'https://objectstorage.region.oraclecloud.com/n/namespace-
string/b/bucketname',
            method => DBMS_CLOUD.METHOD_DELETE
          );

  -- Response Body in TEXT format
  dbms_output.put_line('Body: ' || '------------' || CHR(10) ||
  DBMS_CLOUD.get_response_text(resp) || CHR(10));

  -- Response Headers in JSON format
  dbms_output.put_line('Headers: ' || CHR(10) || '------------' || CHR(10) ||
  DBMS_CLOUD.get_response_headers(resp).to_clob || CHR(10));

  -- Response Status Code
  dbms_output.put_line('Status Code: ' || CHR(10) || '------------' ||
CHR(10) ||
  DBMS_CLOUD.get_response_status_code(resp));
```

```
END;
/
```

Notes:

- In this example, *namespace-string* is the Oracle Cloud Infrastructure object storage namespace and *bucketname* is the bucket name. See Understanding Object Storage Namespaces for more information.
- Where: *region* is an endpoint region. See Object Storage API reference in API Reference and Endpoints for more information. For example, where *region* is: `us-phoenix-1`.

List Compartments Example

Shows an example using `DBMS_CLOUD.SEND_REQUEST` with HTTP `GET` method to list all compartments in the tenancy (root compartment). This example shows how to pass request headers in the `DBMS_CLOUD.SEND_REQUEST`.

See ListCompartments for details on the Oracle Cloud Infrastructure Identity and Access Management Service API for this example.

```
--
-- List compartments
--
DECLARE
  resp DBMS_CLOUD_TYPES.resp;
  root_compartment_ocid VARCHAR2(512) := '&1';
BEGIN
  -- Send request
  dbms_output.put_line('Send Request');
  resp := DBMS_CLOUD.send_request(
            credential_name => 'OCI_KEY_CRED',
            uri => 'https://identity.region.oraclecloud.com/20160918/
compartments?compartmentId=' || root_compartment_ocid,
            method => DBMS_CLOUD.METHOD_GET,
            headers => JSON_OBJECT('opc-request-id' value 'list-compartments')
          );
  dbms_output.put_line('Body: ' || '------------' || CHR(10) ||
DBMS_CLOUD.get_response_text(resp) || CHR(10));
  dbms_output.put_line('Headers: ' || CHR(10) || '------------' || CHR(10) ||
DBMS_CLOUD.get_response_headers(resp).to_clob || CHR(10));
  dbms_output.put_line('Status Code: ' || CHR(10) || '------------' ||
CHR(10) || DBMS_CLOUD.get_response_status_code(resp));
  dbms_output.put_line(CHR(10));
END;
/
```

Where: *region* is an endpoint region. See Identity and Access Management (IAM) API reference in API Reference and Endpoints for more information. For example, where *region* is: `uk-london-1`.

Asynchronous Request Example

Shows an example using `DBMS_CLOUD.SEND_REQUEST` with HTTP `POST` method to perform the Autonomous Database stop operation and wait for status. This example shows how to use

DBMS_CLOUD.SEND_REQUEST with the async_request_url, wait_for_states, and timeout parameters.

```
--
-- Sent Work Request Autonomous Database Stop Request with Wait for Status
DECLARE
    l_resp DBMS_CLOUD_TYPES.resp;
    l_resp_json JSON_OBJECT_T;
    l_key_shape JSON_OBJECT_T;
    l_body JSON_OBJECT_T;
    status_array DBMS_CLOUD_TYPES.wait_for_states_t;
BEGIN
  status_array := DBMS_CLOUD_TYPES.wait_for_states_t('SUCCEEDED');
  l_body := JSON_OBJECT_T('{}');
  l_body.put('autonomousDatabaseId', 'ocid');
-- Send request
  dbms_output.put_line(l_body.to_clob);
  dbms_output.put_line('Send Request');
  l_resp := DBMS_CLOUD.send_request(
                       credential_name    => 'NATIVE_CRED_OCI',
                       uri                => 'https://
database.region.oraclecloud.com/20160918/autonomousDatabases/ocid/actions/
stop',
                       method             => DBMS_CLOUD.METHOD_POST,
                       body               =>
UTL_RAW.cast_to_raw(l_body.to_clob),
                       async_request_url  => 'https://
iaas.region.oraclecloud.com/20160918/workRequests',
                       wait_for_states    => status_array,
                       timeout            => 600
                  );
   dbms_output.put_line('resp body: '||DBMS_CLOUD.get_response_text(l_resp));
   dbms_output.put_line('resp headers: '||
DBMS_CLOUD.get_response_headers(l_resp).to_clob);
END;
/
```

Where: *region* is an endpoint region. See Identity and Access Management (IAM) API reference in API Reference and Endpoints for more information. For example, where *region* is: uk-london-1.

The *ocid* is the Oracle Cloud Infrastructure resource identifier. See Resource Identifiers for more information.

DBMS_CLOUD URI Formats

Describes the format of the source file URIs in operations with DBMS_CLOUD. The format depends on the object storage service you are using.

DBMS_CLOUD guarantees secure communication and any URI that you specify must use HTTPS, with https:// as the prefix for the URI.

Oracle Cloud Infrastructure Object Storage Native URI Format

If your source files reside on Oracle Cloud Infrastructure Object Storage in the commercial realm (OC1), it is recommended that you use the following URI format which uses Object Storage Dedicated Endpoints. See Object Storage Dedicated Endpoints, for further information.

```
https://namespace-string.objectstorage.region.oci.customer-oci.com/n/
namespace-string/b/bucketname/o/filename
```

> **Note:**
>
> OCI Object Store dedicated endpoint URLs are only supported in commercial realms (OC1).

If your source files reside on Oracle Cloud Infrastructure Object Storage and are not in the commercial realm (OC1), you must use the following format:

```
https://objectstorage.region.oraclecloud.com/n/namespace-string/b/bucket/o/
filename
```

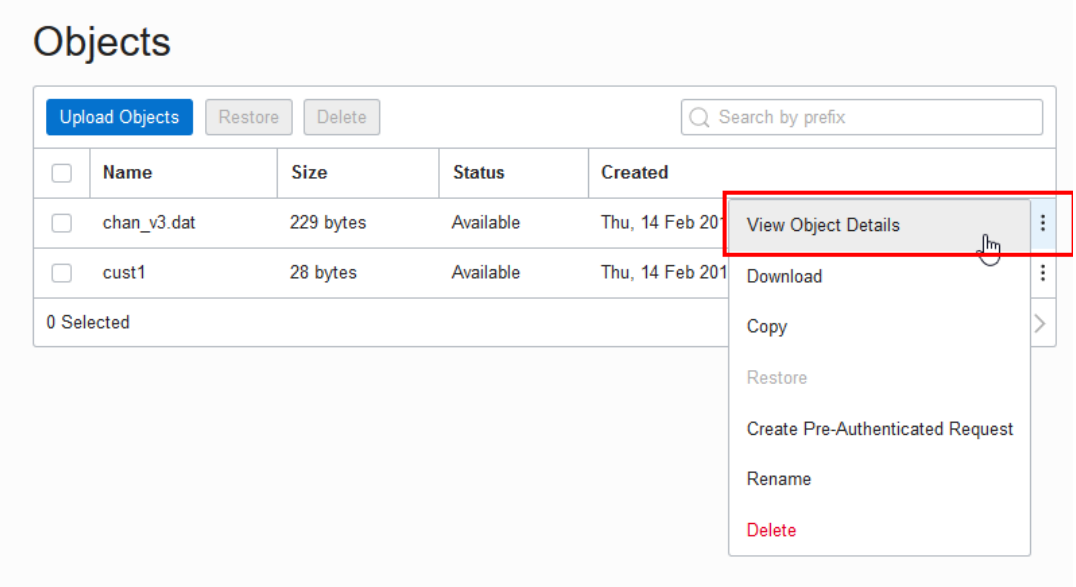
For example, in the commercial realm (OC1) the Native URI for the file `channels.txt` in the *`bucketname`* bucket in the `Phoenix` data center is:

```
https://namespace.objectstorage.region.oci.customer-oci.com/n/namespace/b/
bucketname/o/channels.txt
```

In this example, *`namespace-string`* is the Oracle Cloud Infrastructure object storage namespace and *`bucketname`* is the bucket name. See Understanding Object Storage Namespaces for more information.

You can find the URI from the Oracle Cloud Infrastructure Object Storage "Object Details" in the right hand side ellipsis menu in the Object Store:

1. Open the Oracle Cloud Infrastructure Console by clicking the ☰ next to Oracle Cloud.
2. From the Oracle Cloud Infrastructure left navigation menu click **Core Infrastructure**. Under **Object Storage**, click **Object Storage**.
3. Under List Scope, select a **Compartment**.
4. From the **Name** column, select a bucket.
5. In the Objects area, click **View Object Details**.



6. On the **Object Details** page, the **URL Path (URI)** field shows the URI to access the object.

> **Note:**
>
> The source files need to be stored in an Object Storage tier bucket. Oracle Database does not support buckets in the Archive Storage tier. See Overview of Object Storage for more information.

Oracle Cloud Infrastructure Object Storage Swift URI Format

If your source files reside on Oracle Cloud Infrastructure Object Storage in the commercial realm (OC1), it is recommended that you use the following URI format which uses Object Storage Dedicated Endpoints. See Object Storage Dedicated Endpoints, for further information.

```
https://namespace-string.swiftobjectstorage.region.oci.customer-oci.com/v1/
namespace-string/bucket/filename
```

> **Note:**
>
> OCI Object Store dedicated endpoint URLs are only supported in the commercial realms (OC1).

If your source files reside on Oracle Cloud Infrastructure Object Storage and are not in the commercial realm (OC1), you must use the following format:

```
https://swiftobjectstorage.region.oraclecloud.com/v1/namespace-string/bucket/
filename
```

For example, in the commercial realm (OC1) the Swift URI for the file `channels.txt` in the *bucketname* bucket in the `Phoenix` data center is:

```
https://namespace-string.swiftobjectstorage.us-phoenix-1.oci.customer-
oci.com/v1/namespace-string/bucketname/channels.txt
```

In this example, *namespace-string* is the Oracle Cloud Infrastructure object storage namespace and *bucketname* is the bucket name. See Understanding Object Storage Namespaces for more information.

> **Note:**
>
> The source files need to be stored in an Object Storage tier bucket. Oracle Database does not support buckets in the Archive Storage tier. See Overview of Object Storage for more information.

Oracle Cloud Infrastructure Object Storage URI Format Using Pre-Authenticated Request URL

If your source files reside on the Oracle Cloud Infrastructure Object Storage you can use Oracle Cloud Infrastructure pre-authenticated URIs. When you create a pre-authenticated request, a unique URL is generated. You can then provide the unique URL to users in your organization, partners, or third parties to access the Object Storage resource target identified in the pre-authenticated request.

> **Note:**
>
> Carefully assess the business requirement for and the security ramifications of pre-authenticated access. When you create the pre-authenticated request URL, note the **Expiration** and the **Access Type** to make sure they are appropriate for your use. A pre-authenticated request URL gives anyone who has the URL access to the targets identified in the request for as long as the request is active. In addition to considering the operational needs of pre-authenticated access, it is equally important to manage its distribution.

If your source files reside on Oracle Cloud Infrastructure Object Storage in the commercial realm (OC1), it is recommended that you use the following URI format which uses Object Storage Dedicated Endpoints. See Object Storage Dedicated Endpoints, for further information.

```
https://namespace-string.objectstorage.region.oci.customer-oci.com/p/encrypted_string/n/
namespace-string/b/bucket/o/filename
```

> **Note:**
>
> OCI Object Store dedicated endpoint URLs are only supported in the commercial realms (OC1).

If your source files reside on Oracle Cloud Infrastructure Object Storage and are not in the commercial realm (OC1), you must use the following format:

```
https://objectstorage.region.oraclecloud.com.com/p/encrypted_string/n/namespace-string/b/bucket/o/filename
```

For example, in the commercial realm (OC1) a sample pre-authenticated URI for the file `channels.txt` in the *bucketname* bucket in the `Phoenix` data center is:

```
https://namespace-string.objectstorage.us-phoenix-1.oci.customer-oci.com/p/2xN-uDtWJNsiD910UCYGue/n/namespace-string/b/bucketname/o/channels.txt
```

In this example, *`namespace-string`* is the Oracle Cloud Infrastructure object storage namespace and *`bucketname`* is the bucket name. See Understanding Object Storage Namespaces for more information.

You can use a pre-authenticated URL in any `DBMS_CLOUD` procedure that takes a URL to access files in Oracle Cloud Infrastructure object store, without the need to create a credential. You need to either specify the `credential_name` parameter as `NULL` or not supply a `credential_name` parameter.

For example:

```
BEGIN
  DBMS_CLOUD.COPY_DATA(
     table_name =>'CHANNELS',
     file_uri_list =>'https://objectstorage.us-phoenix-1.oraclecloud.com/p/unique-pre-authenticated-string/n/namespace-string/b/bucketname/o/channels.txt',
     format => json_object('delimiter' value ',') );
END;
/
```

> **Note:**
>
> A list of mixed URLs is valid. If the URL list contains both pre-authenticated URLs and URLs that require authentication, `DBMS_CLOUD` uses the specified `credential_name` to access the URLs that require authentication and for the pre-authenticated URLs the specified `credential_name` is ignored.

See Using Pre-Authenticated Requests for more information.

URI Format Using Public URL

If your source files reside on an Object Store that provides public URLs, you can use public URLs with `DBMS_CLOUD` procedures. Public means the Object Storage service supports anonymous, unauthenticated access to the Object Store files. See your Cloud Object Storage service for details on how to make an object public in a supported Object Store.

> **Note:**
>
> Carefully assess the business requirement for and the security ramifications of using public URLs. When you use public URLs, due to the file content not being authenticated, make sure this is appropriate for your use.

You can use a public URL in any `DBMS_CLOUD` procedure that takes a URL to access files in your object store, without the need to create a credential. You need to either specify the `credential_name` parameter as `NULL` or not supply a `credential_name` parameter.

For example the following uses `DBMS_CLOUD.COPY_DATA` without a `credential_name`:

```
BEGIN
  DBMS_CLOUD.COPY_DATA(
     table_name =>'CHANNELS',
     file_uri_list =>'https://objectstorage.us-ashburn-1.oraclecloud.com/n/
namespace-string/b/bucketname/o/chan_v3.dat',
     format => json_object('delimiter' value ',') );
END;
/
```

In this example, *`namespace-string`* is the Oracle Cloud Infrastructure object storage namespace and *`bucketname`* is the bucket name. See Understanding Object Storage Namespaces for more information.

> **Note:**
>
> A list of mixed URLs is valid. If the URL list contains both public URLs and URLs that require authentication, `DBMS_CLOUD` uses the specified `credential_name` to access the URLs that require authentication and for the public URLs the specified `credential_name` is ignored.

See Public Buckets for information on using Oracle Cloud Infrastructure public buckets.

Oracle Cloud Infrastructure Object Storage Classic URI Format

If your source files reside in Oracle Cloud Infrastructure Object Storage Classic, see the REST page for a description of the URI format for accessing your files: About REST URLs for Oracle Cloud Infrastructure Object Storage Classic Resources.

Amazon S3 URI Format

If your source files reside in Amazon S3, see the following for a description of the URI format for accessing your files: Accessing a bucket .

For example the following refers to the file `channels.txt` in the `adb` bucket in the `us-west-2` region.

```
https://s3-us-west-2.amazonaws.com/adb/channels.txt
```

You can use a presigned URL in any DBMS_CLOUD procedure that takes a URL to access files in Amazon S3 object store, without the need to create a credential. To use a presigned URL in any DBMS_CLOUD procedure, either specify the credential_name parameter as NULL, or do not supply a credential_name parameter.

> **Note:**
>
> DBMS_CLOUD supports the standard Amazon S3 endpoint syntax to access your buckets. DBMS_CLOUD does not support Amazon S3 legacy endpoints.

Amazon S3 Compatible URI Format

DBMS_CLOUD supports object storage service implementations that support Amazon S3 compatible URLs, including the following services:

- Oracle Cloud Infrastructure Object Storage with Amazon S3 compatible URL
- Google Cloud Storage with Amazon S3 compatible URL
- Wasabi Hot Cloud Storage with Amazon S3 compatible URL

> **Note:**
>
> To use DBMS_CLOUD with an Amazon S3 compatible object store you need to provide valid credentials. See CREATE_CREDENTIAL Procedure for more information.

If your source files reside on a service that supports Amazon S3 compatible URIs, use the following URI format to access your files:

- **Oracle Cloud Infrastructure Object Storage S3 Compatible URL**

  If your source files reside on Oracle Cloud Infrastructure Object Storage in the commercial realm (OC1), it is recommended that you use the object URL and bucket URL formats listed below for commercial realm (OC1). See Object Storage Dedicated Endpoints, for further information.

  > **Note:**
  >
  > OCI Object Store dedicated endpoint URLs are only supported in the commercial realms (OC1).

  Object URL Formats

  – Supported only in the commercial realm (OC1):

  ```
  https://mynamespace.compat.objectstorage.region.oci.customer-oci.com/
  bucket_name/object_name
  ```

  - Supported in all zones:

    ```
    https://mynamespace.compat.objectstorage.region.oraclecloud.com/
    bucket_name/object_name
    ```

  Bucket URL Formats:

  - Supported only in the commercial realm (OC1):

    ```
    https://mynamespace.compat.objectstorage.region.oci.customer-oci.com/
    bucket_name
    ```

  - Supported in all zones:

    ```
    https://mynamespace.compat.objectstorage.region.oraclecloud.com/
    bucket_name
    ```

  See Amazon S3 Compatibility and Object Storage Service API for more information.

- **Google Cloud Storage S3 Compatible URL**

  Object URL Format:

  ```
  https://bucketname.storage.googleapis.com/object_name
  ```

  Bucket URL Format:

  ```
  https://bucketname.storage.googleapis.com/
  ```

  See Migrating from Amazon S3 to Cloud Storage and Request Endpoints for more information.

- **Wasabi S3 Compatible URL**

  Object URL Format:

  ```
  https://bucketname.s3.region.wasabisys.com/object_name
  ```

  Bucket URL Format:

  ```
  https://bucketname.s3.region.wasabisys.com/
  ```

  See Wasabi S3 API Reference and Service URLs for Wasabi's Storage Regions for more information.

GitHub Raw URL Format

`DBMS_CLOUD` supports GitHub Raw URLs to access data from a GitHub Repository.

> **Note:**
>
> For DBMS_CLOUD access with GitHub Raw URLs, repository access is limited to read-only functionality. The DBMS_CLOUD APIs such as DBMS_CLOUD.PUT_OBJECT that write data are not supported with DBMS_CLOUD APIs on a GitHub Repository.
> As an alternative, use DBMS_CLOUD_REPO.PUT_FILE to upload data to a GitHub Repository.

Use GitHub Raw URLs with DBMS_CLOUD APIs to access source files that reside on a GitHub Repository. When you browse to a file on GitHub and click the **Raw** link, this shows the GitHub Raw URL. The raw.githubusercontent.com domain provides unprocessed versions of files stored in GitHub repositories.

For example, using DBMS_CLOUD.GET_OBJECT:

```
BEGIN
 DBMS_CLOUD.GET_OBJECT(
   credential_name => 'MY_CRED',
   object_uri      => 'https://raw.githubusercontent.com/myaccount/myrepo/
master/data-management-library/autonomous-database/adb-loading.csv',
   directory_name  => 'DATA_PUMP_DIR'
  );
END;
/
```

For example, using DBMS_CLOUD.CREATE_EXTERNAL_TABLE:

```
BEGIN
  DBMS_CLOUD.CREATE_EXTERNAL_TABLE(
    credential_name => 'MY_CRED',
    table_name      => 'EMPLOYEES_EXT',
    file_uri_list   => 'https://raw.githubusercontent.com/myaccount/myrepo/
master/data-management-library/autonomous-database/*.csv',
    column_list     => 'name varchar2(30), gender varchar2(30), salary
number',
    format          => JSON_OBJECT('type' value 'csv')
  );
END;
/
SELECT * FROM employees_ext;
```

DBMS_CLOUD procedures that take a URL to access a GitHub Repository do not require credentials with public visibility GitHub repositories. To use a public visibility URL you can specify the credential_name parameter as NULL or not supply a credential_name parameter. See Setting repository visibility for more information.

Additional Customer-Managed URI Formats

In addition to the pre-configured, recognized URIs with their fully-qualified domain names (FQDNs), DBMS_CLOUD cannot determine the proper authentication scheme for customer-

managed endpoints URIs. In those cases, DBMS_CLOUD relies on the proper URI scheme to identify the authentication scheme for the customer-managed endpoint.

URI Scheme	Authentication Type	Access Method Description	URI Example
basic://	Basic authentication	Username and password stored in database credential object is used to authenticate the HTTP request	basic://api.github.com/users/myaccount
bearer://	Bearer token authentication	Bearer token stored in the password field in database credential object is used to specify the Authorization header for the HTTP request	bearer://api.sendgrid.com/v3/resource
oci://	OCI native	OCI signing key obtained from database credential object stored and used to sign requests using the OCI authentication protocol	oci://objectstorage.us-ashburn-1.oraclecloud.com
public://	No authentication	Public URLs	public://cms.data.gov/
s3://	Amazon Web Services S3-compatible	Access key and secret key obtained from the username/password field of database credential object, and S3-compatible authentication performed for the HTTP request.	s3://bucket.myprivatesite.com/file1.csv

Examples:

Customer-managed endpoint using S3-compatible authentication.

This example shows how for new URIs, customers can add the public or private host name pattern using DBMS_NETWORK_ACL_ADMIN package. The code block, executed by user ADMIN, enables HTTPS access for user SCOTT to endpoints in domain *.myprivatesite.com. It then shows how user SCOTT accesses the newly enabled endpoint. Note that credential MY_CRED for user SCOTT must store the access key and secret key for S3-compatible authentication performed for the HTTP request indicated by the URI prefix.

```
BEGIN
   DBMS_NETWORK_ACL_ADMIN.APPEND_HOST_ACE(
         host => '*.myprivatesite.com',
         ace => xs$ace_type(privilege_list => xs$name_list('http'),
                            principal_name => 'SCOTT',
                            principal_type => xs_acl.ptype_db),
         private_target => TRUE   );
END;
/

BEGIN
   DBMS_CLOUD.get_object(
```

```
       credential_name => 'MY_CRED',
       object_uri      => 's3://bucket.myprivatesite.com/file1.csv',
       directory_name  => 'MY_DIR'  );
END;
/
```

Customer-managed endpoint with public access

This example shows how to register the `SCOTT` user to access public REST APIs. The `ADMIN` user creates a network ACL for the host to provide access to `SCOTT` user.

```
BEGIN
   DBMS_NETWORK_ACL_ADMIN.APPEND_HOST_ACE(
         host => 'data.cms.gov',
         ace => xs$ace_type(privilege_list => xs$name_list('http'),
                            principal_name => 'SCOTT',
                            principal_type => xs_acl.ptype_db)
   );
END;
/

SELECT DBMS_CLOUD.get_response_text(
          DBMS_CLOUD.send_request(
              uri     => 'public://data.cms.gov/provider-data/api/1/datastore/
imports/a',
              method  => DBMS_CLOUD.METHOD_GET,
              headers => JSON_OBJECT('Accept' VALUE 'application/json')
          )
       )
   FROM DUAL;
/
```

DBMS_CLOUD Package Format Options

The format argument in `DBMS_CLOUD` specifies the format of source files.

The two ways to specify the format argument are:

```
format => '{"format_option" : "format_value" }'
```

And:

```
format => json_object('format_option' value 'format_value'))
```

Examples:

```
format => json_object('type' VALUE 'CSV')
```

To specify multiple format options, separate the values with a ",".

For example:

```
format => json_object('ignoremissingcolumns' value 'true', 'removequotes' value 'true',
                      'dateformat' value 'YYYY-MM-DD-HH24-MI-SS', 'blankasnull'
value 'true', 'logretention' value 7)
```

> **Note:**
>
> For Avro or Parquet format options, see DBMS_CLOUD Package Format Options for Avro or Parquet.

Format Option	Description	Syntax
`access_protocol`	Specifies the type of Apache Iceberg table, such as AWS or OCI Object Storage, and what information is used to create the external table, for example information from a data catalog or from a direct metadata URI.	See CREATE_EXTERNAL_TABLE Procedure for Apache Iceberg, for details on the `access_protocol` syntax.
`blankasnull`	When set to `true`, loads fields consisting of spaces as null.	`blankasnull : true` Default value: `False`
`characterset` Valid with `format` JSON and `COPY_DATA`	Specifies the characterset of source files	`characterset`: *string* Default value: Database characterset
`columnpath` Only use with `format` JSON and `COPY_DATA`	Array of JSON path expressions that correspond to the fields that need to be extracted from the JSON records. Each of the JSON path expressions in the array should follow the rules described in SQL/JSON Path Expressions. Only use with format JSON and `DBMS_CLOUD.COPY_DATA`.	JSON Array of json path expressions expressed in string format. For example: 'columnpath' value `'["$.WEATHER_STATION_ID", "$.WEATHER_STATION_NAME"]'`
`compression`	Specifies the compression type of the source file. ZIP archiving format is not supported. Specifying the value `auto` checks for the compression types: `gzip, zlib, bzip2`.	`compression`: `auto|gzip|zlib|zstd|bzip2` Default value: Null value meaning no compression.
`conversionerrors`	If a row is rejected because of data type conversion errors, the related columns are stored as null or the row is rejected.	`conversionerrors : reject_record | store_null` Default value: `reject_record`

`dateformat`	Specifies the date format in the source file. The format option `AUTO` searches for the following formats:
	`J`
	`MM-DD-YYYYBC`
	`MM-DD-YYYY`
	`YYYYMMDD HHMISS`
	`YYMMDD HHMISS`
	`YYYY.DDD`
	`YYYY-MM-DD`
		`dateformat` : *string*
		Default value: Database date format

`delimiter`	Specifies the field delimiter. To use a special character as the delimiter, specify the HEX value of the ASCII code of the character. For example, the following specifies the TAB character as the delimiter: `format => json_object('delimiter' value 'X''9''')`	`delimiter` : *character* Default value `|` (pipe character)

Format Option	Description	Syntax
detectfieldorder	Specifies that the fields in the external data files are in a different order than the columns in the table. Detect the order of fields using the first row of each external data file and map it to the columns of the table. The field names in external data files are compared in case insensitive manner with the names of the table columns. This format option is applicable for the following procedures: • DBMS_CLOUD.COPY_DATA • DBMS_CLOUD.CREATE_EXTERNAL_TABLE • DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE • DBMS_CLOUD.CREATE_HYBRID_PART_TABLE Restrictions for detectfieldorder: • Field names in the data file must appear in the first record line and must not contain any white spaces between the field names. • The field delimiter in the field names record must be the same as the field delimiter for the data in the file. • Quoted field names are not supported. The field names in data files are compared, in case insensitive manner, with the names of the external table columns. • Embedded field delimiters are not allowed in the field names. • The number of columns in the table must match the number of fields in the data files. • This format option is not applicable for Bigdata or Oracle Data Pump formats, as those formats have precise column metadata information in the binary file format. The text formats, CSV, JSON, Parquet, or XML can benefit from this automatic field order detection when the first line contains the field names.	detectfieldorder: true Default value: false
enablelogs	The format option enablelogs is used with the following DBMS_CLOUD procedures: • COPY_DATA • COPY_COLLECTION • EXPORT_DATA enablelogs specifies a boolean value, when set to TRUE, logs are generated. When set to FALSE, logs are not generated. For example: format => JSON_OBJECT('enablelogs' value FALSE)	enablelogs: false Default value: true

Format Option	Description	Syntax
`encryption`	The format option `encryption` specifies the encryption and decryption options to export and import data to and from the Object Store. Use `encryption` to specify the following parameters to encrypt and decrypt: • `user_defined_function`: Specifies a fully qualified user defined function to decrypt or encrypt the specified BLOB (binary large object). It returns a decrypted or encrypted BLOB. `user_defined_function` is mutually exclusive with other parameters for `encryption`. For example, `ADMIN.DECRYPTION_CALLBACK`. • `type`: Specifies the `DBMS_CRYPTO` encryption algorithm to decrypt or encrypt. `type` accepts values in the *Block Cipher Algorithms* + *Block Cipher Chaining Modifiers* + *Block Cipher Padding Modifiers* format. Supported Block Cipher Algorithms are: – `DBMS_CRYPTO.ENCRYPT_AES256` Supported Block Cipher Chaining Modifiers are: – `DBMS_CRYPTO.CHAIN_CBC` – `DBMS_CRYPTO.CHAIN_CFB` – `DBMS_CRYPTO.CHAIN_ECB` – `DBMS_CRYPTO.CHAIN_OFB` Supported Block Cipher Padding Modifiers are: – `DBMS_CRYPTO.PAD_PKCS5` – `DBMS_CRYPTO.PAD_NONE` – `DBMS_CRYPTO.PAD_ZERO` – `DBMS_CRYPTO.PAD_ORCL` • `credential_name`: Specifies the credential used to store the encryption key. The Block Cipher Chaining Modifiers and Block Cipher Padding Modifiers values defaults to `DBMS_CRYPTO.CHAIN_CBC` and `DBMS_CRYPTO.PAD_PKCS5`, if you do not specify values for these parameters. The format option `encryption` is used with the following `DBMS_CLOUD` procedures: • Used to pass parameters to decrypt for these procedures: – `DBMS_CLOUD.COPY_DATA` – `DBMS_CLOUD.CREATE_EXTERNAL_TABLE` – `DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE` – `DBMS_CLOUD.CREATE_HYBRID_PART_TABLE` For `DBMS_CLOUD.CREATE_HYBRID_PART_TABLE` this option is only applicable to the Object Storage files. – `DBMS_CLOUD.COPY_COLLECTION`	`encryption:`*value* Where *value* is a JSON string that provides additional parameters for encryption: `type`: *value* Specifies the encryption type. `credential_name`: *value* Specifies the credential used to store the encryption key. `user_defined_function`: *value* Specifies a fully qualified user-defined function to decrypt or encrypt the specified BLOB (binary large object).

Format Option	Description	Syntax
	• Used to pass parameters to encrypt for these procedure: – DBMS_CLOUD.EXPORT_DATA For example: `format => JSON_OBJECT('encryption' value json_object ('type' value DBMS_CRYPTO.ENCRYPT_AES256 + DBMS_CRYPTO.CHAIN_CBC + DBMS_CRYPTO.PAD_PKCS5, 'credential_name' value 'ENCRYPTION_CRED'))`	
`endquote`	Data can be enclosed between two delimiters, specified with `quote` and `endquote`. The `quote` and `endquote` characters are removed during loading when specified. For example: `format => JSON_OBJECT('quote' value '(', 'endquote' value ')')`	`endquote:character` Default value: Null, meaning no `endquote`.
`escape`	The character "\" is used as the escape character when specified.	`escape : true` Default value: `false`
`ignoreblanklines`	Blank lines are ignored when set to true.	`ignoreblanklines : true` Default value: `False`
`ignoremissingcolumns`	If there are more columns in the `field_list` than there are in the source files, the extra columns are stored as null.	`ignoremissingcolumns : true` Default value `False`

Format Option	Description	Syntax

`implicit_partition_columns`	Enable implicit partitioning and specify the partition column names by using the `implicit_partition_columns` format option with `DBMS_CLOUD.CREATE_EXTERNAL_TABLE`.
	Implicit partitioning is enabled in the following ways:
	• Use `implicit_partition_columns` to provide a list of partition columns and specify the `implicit_partition_type`. For example:
	`format => '{"implicit_partition_type":"hive", "implicit_partition_columns": ["country","year","month"]}'`
	• Use `implicit_partition_columns` to provide a list of partition columns without providing the partition type. The partition type is automatically detected as hive or non-hive. For example:
	`format => '{"implicit_partition_columns": ["country","year","month"]}'`
	• Use `implicit_partition_type` to provide the type of partition columns without providing a list of partition columns. The automatic discovery of the partition keys in HIVE-style partitioned data is triggered to determine column names. For example:
	`format => '{"partition_type":"hive"}'`
		`implicit_partition_columns` : *array of strings*
		Default value: If `implicit_partition_type` is specified, the column names are derived through automatic discovery of the partition keys in HIVE-style partitioned data. Otherwise, the default is null and implicit partitioning is not enabled.

`implicit_partition_type`	Enable implicit partitioning and specify the data types of partition columns by using the `implicit_partition_type` format option with `DBMS_CLOUD.CREATE_EXTERNAL_TABLE`.	`implicit_partition_type` : hive Default value: If `implicit_partition_columns` is specified, the type is automatically detected as hive or non-hive. Otherwise, the default is null and implicit partitioning is not enabled.
`keyassignment` Only use with `COPY_COLLECTION`	Specifies whether a new collection is created as a mongo-compatible collection or as a JSON collection. When the value is set to `embedded_oid`, a new collection is created as a mongo-compatible collection. By default this parameter is not set, meaning a new collection is created as a JSON collection.	`keyassignment`: `embedded_oid` Default: `keyassignment` is not set

Format Option	Description	Syntax
keypath Only use with COPY_COLLECTION	Specifies an attribute in the data to be loaded as the '_id' value. If keypath is specified then you must also specify the keyassignment value as embedded_oid. Set the value to a path, for example, '$.mykey', to pick the value of the path as '_id' value. This parameter is optional and is only valid for loading into mongo-compatible collections. If not specified, Oracle generates a 12-byte unique system ID and populates that as the '_id' attribute, if an '_id' attribute is not already present in the data being loaded.	keypath: *string* Default: keypath is not set. When keypath is set, the default *string* value is NULL.
language	Specifies a language name (for example, FRENCH), from which locale-sensitive information can be derived.	language: *string* Default value: Null
logdir	Specifies a string value that determines the directory object name where the logfile_table or badfile_table files are saved. By default, the logdir is not case-sensitive, but the case is reserved when the specified value is enclosed in double-quotes. For example: format => JSON_OBJECT ('logdir' value 'test_log') The logdir format option specified in the above example saves the logfile_table or badfile_table files in the TEST_LOG directory object. format => JSON_OBJECT ('logdir' value '"test_log"') The logdir format option specified in the above example saves the logfile_table or badfile_table files in the test_log directory object.	logdir: *string* Default value: DATA_PUMP_DIR
logprefix	Specifies a string value that determines the prefix for the logfile_table and badfile_table files. The log table name format is: *logprefix*$*operation_id* By default, the logprefix is in upper case, but the case is reserved when the specified value is enclosed in double-quotes. For example: format => JSON_OBJECT ('logprefix' value 'TEST') Log files then use the TEST prefix, such as: TEST$2_LOG and TEST$2_BAD.	logprefix: *string* Default value: COPY

Format Option	Description	Syntax
`logretention`	Specifies a positive integer duration, in days, for which the `logfile_table` and `badfile_table` files are retained. Valid values: `0` to `99999` For example: `format => JSON_OBJECT ('logretention' value 7)`	`logretention`: *number* Default value: `2`
`numericcharacters`	Specifies the characters to use as the group separator and decimal character. *decimal_character*: The decimal separates the integer portion of a number from the decimal portion. *group_separator*: The group separator separates integer groups (that is, thousands, millions, billions, and so on).	`numericcharacters`: '*decimal_character group_separator*' Default value: `".,"`
`numberformat`	Specifies the number format model. Number format models cause the number to be rounded to the specified number of significant digits. A number format model is composed of one or more number format elements. This is used in combination with `numericcharacters`.	`numberformat`: *number_format_model* Default value: is derived from the setting of the `NLS_TERRITORY` parameter

Format Option	Description	Syntax
partition_columns	The format option partition_columns is used with DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE to specify the column names and data types of partition columns when the partition columns are derived from the file path, depending on the type of data file, structured or unstructured: • When the DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE includes the column_list parameter and the data file is unstructured, such as with CSV text files, partition_columns does not include the data type. For example, use a format such as the following for this type of partition_columns specification: '"partition_columns": ["state","zipcode"]' The data type is not required because it is specified in the DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE column_list parameter. • When the DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE does not include the column_list parameter and the data files are structured, such as Avro, ORC, or Parquet files, the partition_columns option includes the data type. For example, the following shows a partition_columns specification: '"partition_columns":[{"name":"country", "type":"varchar2(10)"}, {"name":"year", "type":"number"}, {"name":"month", "type":"varchar2(10)"}]' If the data files are unstructured and the type sub-clause is specified with partition_columns, the type sub-clause is ignored. For object names that are not based on hive format, the order of the partition_columns specified columns must match the order as they appear in the object name in the file_uri_list.	
quote	Specifies the quote character for the fields, the quote characters are removed during loading when specified.	quote: *character* Default value: Null meaning no quote

Format Option	Description	Syntax

`recorddelimiter`	Specifies the record delimiter.
	By default, `DBMS_CLOUD` tries to automatically find the correct newline character as the delimiter. It first searches the file for the Windows newline character "`\r\n`". If it finds the Windows newline character, this is used as the record delimiter for all files in the procedure. If a Windows newline character is not found, it searches for the UNIX/Linux newline character "`\n`" and if it finds one it uses "`\n`" as the record delimiter for all files in the procedure.
	Specify this argument explicitly if you want to override the default behavior, for example:
	`format => json_object('recorddelimiter' VALUE '''\r\n''')`
	To indicate that there is no record delimiter you can specify a `recorddelimiter` that does not occur in the input file. For example, to indicate that there is no delimiter, specify the control character 0x01 (SOH) as a value for the `recorddelimiter` and set the `recorddelimiter` value to `"0x''01''"` (this character does not occur in JSON text). For example:
	`format => '{"recorddelimiter" : "0x''01''"}'`
	The `recorddelimiter` is set once per procedure call. If you are using the default value, `detected newline`, then all files use the same record delimiter, if one is detected.
		`recorddelimiter`: *character*
		Default value: detected newline

Format Option	Description	Syntax
`regexuri`	The format option `regexuri` is used with the following DBMS_CLOUD procedures: • `COPY_COLLECTION` • `COPY_DATA` • `CREATE_EXTERNAL_TABLE` • `CREATE_EXTERNAL_PART_TABLE` • `CREATE_HYBRID_PART_TABLE` When the value of `regexuri` is set to `TRUE`, you can use wildcards as well as regular expressions in the file names in Cloud source file URIs. The characters "*" and "?" are considered wildcard characters when the `regexuri` parameter is set to `FALSE`. When the `regexuri` parameter is set to `TRUE` the characters "*" and "?" are part of the specified regular expression pattern. Regular expression patterns are only supported for the file name or subfolder path in your URIs and the pattern matching is identical to that performed by the `REGEXP_LIKE` function. Regular expression patterns are not supported for directory names. For external tables, this option is only supported with the tables that are created on a file in the Object Storage. For example: `format => JSON_OBJECT('regexuri' value TRUE)`	`regexuri`: `True` Default value : `False`
`rejectlimit`	The operation will error out after specified number of rows are rejected.	`rejectlimit`: *number* Default value: `0`
`removequotes`	Removes any quotes that are around any field in the source file.	`removequotes`: `true` Default value: `False`
`skipheaders`	Specifies how many rows should be skipped from the start of the file.	`skipheaders`: *number* Default value: 0 if not specified, 1 if specified without a value
`territory`	Specifies a territory name to further determine input data characteristics.	`territory`: *string* Default value: Null See Locale Data in *Oracle Database Globalization Support Guide* for a listing of Oracle-supported territories.

`timestampformat`	Specifies the timestamp format in the source file. The format option `AUTO` searches for the following formats:
	`YYYY-MM-DD HH:MI:SS.FF`
	`YYYY-MM-DD HH:MI:SS.FF3`
	`YYYY-MM-DD HH24:MI:SS.FF3`
	`MM/DD/YYYY HH:MI:SS.FF3`
		`timestampformat` : *string*
		Default value: Database timestamp format
		The string can contain wildcard characters such as "$".

Format Option	Description	Syntax
timestampltzformat	Specifies the timestamp with local timezone format in the source file. The format option AUTO searches for the following formats: DD Mon YYYY HH:MI:SS.FF TZR MM/DD/YYYY HH:MI:SS.FF TZR YYYY-MM-DD HH:MI:SS+/-TZR YYYY-MM-DD HH:MI:SS.FF3 DD.MM.YYYY HH:MI:SS TZR	timestampltzformat : *string* Default value: Database timestamp with local timezone format
timestamptzformat	Specifies the timestamp with timezone format in the source file. The format option AUTO searches for the following formats: DD Mon YYYY HH:MI:SS.FF TZR MM/DD/YYYY HH:MI:SS.FF TZR YYYY-MM-DD HH:MI:SS+/-TZR YYYY-MM-DD HH:MI:SS.FF3 DD.MM.YYYY HH:MI:SS TZR	timestamptzformat: *string* Default value: Database timestamp with timezone format
trimspaces	Specifies how the leading and trailing spaces of the fields are trimmed.	trimspaces: rtrim| ltrim| notrim| lrtrim| ldrtrim Default value: notrim
truncatecol	If the data in the file is too long for a field, then this option will truncate the value of the field rather than reject the row.	truncatecol:true Default value: False

DBMS_CLOUD Package Format Options for EXPORT_DATA

Describes the valid format parameter options for DBMS_CLOUD.EXPORT_DATA with text file formats, CSV, JSON, or XML, and for Oracle Data Pump.

These are the valid format parameters for use with DBMS_CLOUD.EXPORT_DATA. You specify text file output when you use the format type option and the value is one of: csv, json, or xml. This also shows the format options when the format type is datapump.

The two ways to specify the format argument are:

```
format => '{"format_option" : "format_value" }'
```

And:

```
format => json_object('format_option' value 'format_value'))
```

Examples:

```
format => json_object('type' VALUE 'json')
```

To specify multiple format options, separate the values with a ",".

For example:

```
format => json_object('compression' value 'gzip', 'type' value 'json')
```

This table covers the format options for DBMS_CLOUD.EXPORT_DATA when the format parameter type option is one of: CSV, JSON, or XML. For other procedures and other output types, see DBMS_CLOUD Package Format Options for the list of format options.

Format Option	Description	Syntax

`compression`	Specifies the compression type of the source file.
	Note: ZIP archiving format is not supported.
	When the `format type` is `csv`, `json`, or `xml`, the default compression is Null, meaning no compression.
	When the `format type` is `datapump` you can specify supported Oracle Data Pump access parameters:
	• `compression`: The valid values are: `BASIC`, `LOW`, `MEDIUM`, and `HIGH`.
	• `version`: The valid values are: `COMPATIBLE`, `LATEST`, and a specified *`version_number`*.
		When the `type` is:`csv` | `json` | `xml`
		`compression:gzip, zlib, zstd, bzip2`
		Default value: Null value meaning no compression.
		`compression: gzip` | `snappy`
		Default value: `snappy`
		When the type is `datapump`
		`compression: BASIC|LOW|MEDIUM|HIGH`

`delimiter`	Specifies a custom field delimiter. `format => json_object('delimiter' value '|')` The delimiter value cannot be an ASCII code or an escape character. **Note:** This option only applies with `csv type`.	`delimiter` : *character* Default value , (comma)
`endquote`	Specifies that fields can be enclosed between two delimiters, with `quote` and `endquote`. If `endquote` is not specified, then the `quote` character will be used by default as the `endquote` character. For example: `format => JSON_OBJECT('quote' value '(', 'endquote' value ')')` **Note:** This option only applies with `csv type`.	`endquote`:*character* Default value: Null, meaning no `endquote`.
`escape`	Specifies the occurrence of quote character in the field value using "\" character. **Note:** This option only applies with `csv type`.	`escape : true` Default value: `false`

Format Option	Description	Syntax
`encryption`	The format option `encryption` specifies the encryption and decryption options to export and import data to and from the Object Store. Use `encryption` to specify the following parameters to encrypt and decrypt: • `user_defined_function`: Specifies a fully qualified user-defined function to decrypt or encrypt the specified BLOB (binary large object). It returns a decrypted or encrypted BLOB. This parameter is mutually exclusive with other parameters for `encryption`. For example, `ADMIN.DECRYPTION_CALLBACK`. • `type`: Specifies the built-in encryption algorithm to decrypt or encrypt. `user_defined_function` and `type` are mutually exclusive. `type` accepts values in the *Block Cipher Algorithms* + *Block Cipher Chaining Modifiers* + *Block Cipher Padding Modifiers* format. Supported Block Cipher Algorithms are: – `DBMS_CRYPTO.ENCRYPT_AES256` Supported Block Cipher Chaining Modifiers are: – `DBMS_CRYPTO.CHAIN_CBC` – `DBMS_CRYPTO.CHAIN_CFB` – `DBMS_CRYPTO.CHAIN_ECB` – `DBMS_CRYPTO.CHAIN_OFB` Supported Block Cipher Padding Modifiers are: – `DBMS_CRYPTO.PAD_PKCS5` – `DBMS_CRYPTO.PAD_NONE` – `DBMS_CRYPTO.PAD_ZERO` – `DBMS_CRYPTO.PAD_ORCL` • `credential_name`: Specifies the credential used to store the encryption key. The Block Cipher Chaining Modifiers and Block Cipher Padding Modifiers values defaults to `DBMS_CRYPTO.CHAIN_CBC` and `DBMS_CRYPTO.PAD_PKCS5`, if you do not specify values for these parameters. The format option `encryption` is used with the following `DBMS_CLOUD` procedures: • Used to pass parameters to decrypt for these procedures: – `DBMS_CLOUD.COPY_DATA` – `DBMS_CLOUD.CREATE_EXTERNAL_TABLE` – `DBMS_CLOUD.CREATE_HYBRID_TABLE` – `DBMS_CLOUD.COPY_COLLECTION` • Used to pass parameters to encrypt for these procedure: – `DBMS_CLOUD.EXPORT_DATA` For example: `format => JSON_OBJECT('encryption' value json_object ('type' value DBMS_CRYPTO.ENCRYPT_AES256 +`	`encryption:`*value* Where *value* is a JSON string that provides additional parameters for encryption: `type`: *value* Specifies the encryption type. `credential_name`: *value* Specifies the credential used to store the encryption key. `user_defined_function`: *value* Specifies a fully qualified user-defined function to decrypt or encrypt the specified BLOB (binary large object).

Format Option	Description	Syntax
	`DBMS_CRYPTO.CHAIN_CBC + DBMS_CRYPTO.PAD_PKCS5, 'credential_name' value 'ENCRYPTION_CRED'))`	
`header`	Writes column names as the first line in output files of `csv` type. The `header` option can accept a `boolean` or a `string` value. The valid values are: • `false`: Skips the header row. • `true`: Includes the header row. The column names are based on the `SELECT` statement in the `query` parameter. You must specify column aliases in the `SELECT` statement when using virtual columns or expressions. • *`String to define custom header names`*: Enables you to define header rows with custom names. The number of columns and delimiters in the string value must match the number of columns and delimiters in the `SELECT` statement. The default delimiter is comma (,). For example: `format => JSON_OBJECT('type' value 'csv', 'delimiter' value '|', 'compression' value 'gzip', 'header' value true)` **Note:** This option only applies with `csv type`.	`header: true| false| String to define custom header names` Default value: `false`
`fileextension`	Custom file extension to override the default choice for the format type. This applies to text formats with `DBMS_CLOUD.EXPORT_DATA`: CSV, JSON, Parquet, or XML. If the specified string does not start with period (dot), then a dot is automatically inserted before the file extension in the final file name. If no file extension is desired, use the value: `fileextension ='none'`	Valid values: Any file extension. Default value: Depends on the `format type` option: • CSV format: `.csv` • JSON format: `.json` • XML format: `.xml`
`maxfilesize`	Number in bytes for maximum size of output generated. This applies to text based formats for exporting data with `DBMS_CLOUD.EXPORT_DATA` when the `format type` option is set to,`csv`, `json`, or `xml`.	Minimum value: `10485760` (10 MB) Maximum value: 1 GB Default value: `10485760` (10 MB)

Format Option	Description	Syntax
quote	In CSV format, fields can be enclosed between two delimiters. Specify the delimiters with quote and endquote. If endquote is not specified, then the quote character will be used by default as the endquote character. **Note:** This option only applies with csv type.	quote: *character* Default value: Null meaning do not enclose fields with quotes.
trimspaces	Specifies how the leading and trailing spaces of the fields are trimmed for CSV format. Trim spaces is applied before quoting the field, if the quote parameter is specified. **Note:** This option only applies with csv type.	trimspaces: rtrim| ltrim| notrim| lrtrim| ldrtrim Default value: notrim

DBMS_CLOUD Avro and Parquet Support

This section covers the DBMS_CLOUD Avro and Parquet support provided with Oracle Database.

DBMS_CLOUD Package Format Options for Avro or Parquet

The format argument in DBMS_CLOUD specifies the format of source files.

The two ways to specify the format argument are:

```
format => '{"format_option" : "format_value" }'
```

And:

```
format => json_object('format_option' value 'format_value'))
```

Examples:

```
format => json_object('type' VALUE 'CSV')
```

To specify multiple format options, separate the values with a ",".

For example:

```
format => json_object('ignoremissingcolumns' value 'true', 'removequotes' value 'true',
'dateformat' value 'YYYY-MM-DD-HH24-MI-SS', 'blankasnull' value 'true')
```

Format Option	Description	Syntax
regexuri	When the value of regexuri is set to TRUE, you can use wildcards as well as regular expressions in the file names in Cloud source file URIs. The characters "*" and "?" are considered wildcard characters when the regexuri parameter is set to FALSE. When the regexuri parameter is set to TRUE the characters "*" and "?" are part of the specified regular expression pattern. Regular expression patterns are only supported for the file name or subfolder path in your URIs and the pattern matching is identical to that performed by the REGEXP_LIKE function. Regular expression patterns are not supported for directory names. For external tables, this option is only supported with the tables that are created on a file in the Object Storage. For example: format => JSON_OBJECT('regexuri' value TRUE) See REGEXP_LIKE Condition for more information on REGEXP_LIKE condition.	regexuri: True Default value:False
type	Specifies the file type.	type : avro | parquet
schema	When schema is set to first or all, the external table columns and data types are automatically derived from the Avro or Parquet file metadata. The column names will match those found in Avro or Parquet. The data types are converted from Avro or Parquet data types to Oracle data types. All columns are added to the table. The value first specifies to use the metadata from the first Avro or Parquet file in the file_uri_list to auto generate the columns and their data types. Use first if all of the files have the same schema. The value all specifies to use the metadata from all Avro or Parquet files in the file_uri_list to auto generate the columns and their data types. Use all (slower) if the files may have different schemas. **Default**: If column_list is specified, then the schema value, if specified is ignored. If column_list is not specified then the schema default value is first. **Note**: For Avro or Parquet format files the schema format option is not available and the column_list parameter must be specified for partitioned external tables using the DBMS_CLOUD.CREATE_EXTERNAL_PART_TABLE procedure.	schema : first | all

DBMS_CLOUD Package Avro to Oracle Data Type Mapping

Describes the mapping of Avro data types to Oracle data types.

> **Note:**
>
> Complex types, such as maps, arrays, and structs are supported starting with Oracle Database 19c. See DBMS_CLOUD Package Avro and Parquet Complex Types for information on using Avro complex types.

Avro Type	Oracle Type
INT	NUMBER(10)
LONG	NUMBER(19)
BOOL	NUMBER(1)
UTF8 BYTE_ARRAY	RAW(2000)
FLT	BINARY_FLOAT
DBL	BINARY_DOUBLE
DECIMAL(p)	NUMBER(p)
DECIMAL(p,s)	NUMBER(p,s)
DATE	DATE
STRING	VARCHAR2
TIME_MILLIS	VARCHAR2(20 BYTE)
TIME_MICROS	VARCHAR2(20 BYTE)
TIMESTAMP_MILLIS	TIMESTAMP(3)
TIMESTAMP_MICROS	TIMESTAMP(6)
ENUM	VARCHAR2(*n*) Where: "*n*" is the actual maximum length of the AVRO ENUM's possible values
DURATION	RAW(2000)
FIXED	RAW(2000)
NULL	VARCHAR2(1) BYTE

See DBMS_CLOUD Package Avro and Parquet Complex Types for information on using Avro complex types.

DBMS_CLOUD Package ORC to Oracle Data Type Mapping

Describes the mapping of ORC data types to Oracle data types.

See DBMS_CLOUD Package Avro and Parquet Complex Types for information on using ORC complex types.

ORC Type	Oracle Type	More Information
array	VARCHAR2(*n*) JSON format	DBMS_CLOUD Package Avro and Parquet Complex Types
bigint (64 bit)	NUMBER(19)	
binary	BLOB	
boolean (1 bit)	NUMBER(1)	

ORC Type	Oracle Type	More Information
char	CHAR(*n*)	
date	DATE	
double	BINARY_DOUBLE	
float	BINARY_FLOAT	
int (32 bit)	NUMBER(10)	
list	VARCHAR2(*n*) JSON format	DBMS_CLOUD Package Avro and Parquet Complex Types
map	VARCHAR2(*n*) JSON format	DBMS_CLOUD Package Avro and Parquet Complex Types
smallint (16 bit)	NUMBER(5)	
string	VARCHAR2(4000) or VARCHAR2(32767)	Depending on the value of the format parameter option `maxvarchar` and on the `MAX_STRING_SIZE` value. See DBMS_CLOUD Package Format Options for Avro or Parquet for more information.
struct	VARCHAR2(*n*) JSON format	DBMS_CLOUD Package Avro and Parquet Complex Types
timestamp	TIMESTAMP	
tinyint (8 bit)	NUMBER(3)	
union	VARCHAR2(*n*) JSON format	DBMS_CLOUD Package Avro and Parquet Complex Types
varchar	VARCHAR2(*n*)	

DBMS_CLOUD Package Parquet to Oracle Data Type Mapping

Describes the mapping of Parquet data types to Oracle data types.

> **Note:**
>
> Complex types, such as maps, arrays, and structs are supported starting with Oracle Database 19c. See DBMS_CLOUD Package Avro and Parquet Complex Types for information on using Parquet complex types.

Parquet Type	Oracle Type
UINT_64	NUMBER(20)
INT_64	NUMBER(19)
UINT_32	NUMBER(10)
INT_32	NUMBER(10)
UINT_16	NUMBER(5)
INT_16	NUMBER(5)
UINT_8	NUMBER(3)
INT_8	NUMBER(3)
BOOL	NUMBER(1)
UTF8 BYTE_ARRAY	VARCHAR2(4000 BYTE)

Parquet Type	Oracle Type
FLT	BINARY_FLOAT
DBL	BINARY_DOUBLE
DECIMAL(p)	NUMBER(p)
DECIMAL(p,s)	NUMBER(p,s)
DATE	DATE
STRING	VARCHAR2(4000) or VARCHAR2(32767) Depending on the value of the format parameter option `maxvarchar` and on the Autonomous Database `MAX_STRING_SIZE` value. See DBMS_CLOUD Package Format Options for Avro or Parquet for more information.
TIME_MILLIS	VARCHAR2(20 BYTE)
TIME_MILLIS_UTC	VARCHAR2(20 BYTE)
TIME_MICROS	VARCHAR2(20 BYTE)
TIME_MICROS_UTC	VARCHAR2(20 BYTE)
TIMESTAMP_MILLIS	TIMESTAMP(3)
TIMESTAMP_MILLIS_UTC	TIMESTAMP(3)
TIMESTAMP_MICROS	TIMESTAMP(6)
TIMESTAMP_MICROS_UTC	TIMESTAMP(6)
TIMESTAMP_NANOS	TIMESTAMP(9)

See DBMS_CLOUD Package Avro and Parquet Complex Types for information on using Parquet complex types.

DBMS_CLOUD Package Oracle Data Type to Parquet Mapping

Describes the mapping of Oracle data types to Parquet data types.

Oracle Type	Parquet Type
BINARY_DOUBLE	DBL
BINARY_FLOAT	FLT
DATE	DATE
NUMBER(p,s)	DECIMAL(p,s)
NUMBER(p)	DECIMAL(p)
TIMESTAMP(3)	TIMESTAMP_MILLIS
TIMESTAMP(3)	TIMESTAMP_MILLIS_UTC
TIMESTAMP(6)	TIMESTAMP_MICROS
TIMESTAMP(6)	TIMESTAMP_MICROS_UTC
TIMESTAMP(9)	TIMESTAMP_NANOS
VARCHAR2(4000)	STRING

NLS Session Parameters

The NLS session parameters `NLS_DATE_FORMAT`, `NLS_TIMESTAMP_FORMAT`, `NLS_TIMESTAMP_TZ_FORMAT` and `NLS_NUMERIC_CHARACTERS` define how the date, timestamp, timestamp with time zone format, and radix separator for timestamp with decimal marker should be shown when a table with those column types are queried.

In addition, when you export data using `DBMS_CLOUD.EXPORT_DATA` and specify Parquet output, Oracle Database reads the values of these parameters from the `NLS_SESSION_PARAMETERS` table. Oracle Database uses these values to convert the Oracle data types `DATE` or `TIMESTAMP` to Parquet types.

The `NLS_SESSION_PARAMETERS` parameters support an `RR` format mask (two character year specification).

The `RR` format mask for the year is not supported for these parameters when you export data to Parquet with `DBMS_CLOUD.EXPORT_DATA`. An application error is raised if you attempt to export to parquet and the `NLS_SESSION_PARAMETERS` are set to use the `RR` format mask (the default value for the `RR` format depends on the value of the `NLS_TERRITORY` parameter).

When one of the parameters `NLS_DATE_FORMAT`, `NLS_TIMESTAMP_FORMAT` or `NLS_TIMESTAMP_TZ_FORMAT` uses the `RR` format mask, you must change the format value to supported value to export data to Parquet with `DBMS_CLOUD.EXPORT_DATA`. For example:

```
ALTER SESSION SET NLS_DATE_FORMAT = "MM/DD/YYYY";
ALTER SESSION SET NLS_TIMESTAMP_FORMAT = 'YYYY-MM-DD HH:MI:SS.FF';
ALTER SESSION SET  NLS_TIMESTAMP_TZ_FORMAT='YYYY-MM-DD HH:MI:SS.FF TZH:TZM';
```

After you change the value, you can verify the change by querying the `NLS_SESSION_PARAMETERS` view:

```
SELECT value FROM NLS_SESSION_PARAMETERS
       WHERE parameter IN
('NLS_DATE_FORMAT','NLS_TIMESTAMP_FORMAT','NLS_TIMESTAMP_TZ_FORMAT');
```

If `NLS_DATE_FORMAT` is set, it applies to the columns with `DATE` datatype. If `NLS_TIMESTAMP_FORMAT` is set, it applies to the columns with `TIMESTAMP` datattype. If `NLS_TIMESTAMP_TZ_FORMAT` is set, it applies to the columns with `TIMESTAMP WITH TIME ZONE` datatype.

DBMS_CLOUD Package Avro and Parquet Complex Types

Describes the mapping of Avro and Parquet complex data types to Oracle data types.

Oracle Database supports complex data types, including the following complex types:

- struct
- list
- map
- union
- array

When you specify a source file type of Avro or Parquet and the source file includes complex columns, Oracle Database queries return JSON for the complex columns. This simplifies processing of query results; you can use Oracle's powerful JSON parsing features consistently across the file types and data types. The following table shows the format for the complex types in Oracle Database:

> **Note:**
>
> The complex fields map to `VARCHAR2` columns and `VARCHAR2` size limits apply.

Type	Parquet	Avro	Oracle
List: sequence of values	List	Array	`VARCHAR2` (JSON format)
Map: list of objects with single key	Map	Map	`VARCHAR2` (JSON format)
Union: values of different type	Not Available	Union	`VARCHAR2` (JSON format)
Object: zero or more key-value pairs	Struct	Record	`VARCHAR2` (JSON format)

DBMS_CLOUD Package Avro and Parquet to Oracle Column Name Mapping

Describes rules for how Avro and Parquet column names are converted to Oracle column names.

The following are supported for Avro and Parquet column names, but may require use of double quotes for Oracle SQL references in external tables. Thus, for ease of use and to avoid having to use double quotes when referencing column names, if possible do not use the following in Avro and Parquet column names:

- Embedded blanks
- Leading numbers
- Leading underscores
- Oracle SQL reserved words

The following table shows various types of Avro and Parquet column names, and rules for using the column names in Oracle column names in external tables.

Avro or Parquet Name	CREATE TABLE Name	Oracle CATALOG	Valid SQL	Notes

part, Part, or PART	part, Part, PART	PART	`select part`
			`select Part`
			`select paRt`
			`select PART`
				Oracle implicitly uppercases unquoted column names

Ord No	"Ord No"	Ord No	`select "Ord No"`	Double quotes are required when there are embedded blanks, which also preserves the character case

Avro or Parquet Name	CREATE TABLE Name	Oracle CATALOG	Valid SQL	Notes
__index_key__	"__index_key__"	__index_key__	`select "__index_key__"`	Double quotes are required when there is a leading underscore, which also preserves the character case
6Way	"6Way"	6Way	`select "6Way"`	Double quotes are required when there is a leading numeric digit, which also preserves the character case
create, Create, or CREATE, and so on. (any case variation) partition, Partition, PARTITION, and so on (for an Oracle Reserved word)	"CREATE" "PARTITION"	CREATE PARTITION	`select "CREATE"` `select "PARTITION"`	Double quotes are required around Oracle SQL Reserved words. These are forced to uppercase, but must always be double-quoted when used anywhere in SQL

rowid, Rowid, ROWid, and so on (for ROWID see notes)	rowid		`select "rowid"`
			`select "Rowid"`
			`select "ROWid"`
			`select "rowid"`
				For ROWID, any mixed or lower-case variation of ROWID preserves the case and must always be double-quoted and use the original case variations. Due to the inherent conflict with Oracle ROWID for the table, if you specify upper-case ROWID, it is automatically stored as lower-case "rowid" and must always be double-quoted when referenced.

Notes:

- In general a column name in an external table can be referenced without double quotes.
- Unless there is an embedded blank, a leading underscore ("_") or leading numeric digit ("0" through "9") in the column name, the original case of the column name is preserved, and it must always be referenced with double quotes and using the original case (upper, lower or mixed-case) of the Avro or Parquet column name.
- After using `DBMS_CLOUD.CREATE_EXTERNAL_TABLE` to create an external table with the format specified as `avro` or `parquet`, use the `DESCRIBE` command in SQL*Plus to view the table's column names.
- When Oracle SQL Reserved Words are used in Avro or Parquet column names, they must always be double-quoted when referenced anywhere in SQL.

DBMS_CLOUD Exceptions

The following table describes exceptions for `DBMS_CLOUD`.

Exception	Code	Description
`reject_limit`	20003	The reject limit of an external table was reached.
`credential_not_exist`	20004	A credential object does not exist.
`table_not_exist`	20005	A table does not exist.
`unsupported_obj_store`	20006	An unsupported object store URI was provided.
`iden_too_long`	20008	An identifier is too long.
`invalid_format`	20009	A format argument is not valid.
`missing_credential`	20010	Mandatory credential object information was not specified.
`invalid_object_uri`	20011	An invalid object URI was provided.
`invalid_partitioning_clause`	20012	An partitioning clause is missing or was not provided.
`unsupported_feature`	20013	An unsupported feature was used that is not existent in the current database version.
`part_not_exist`	20014	A partition or subpartition does not exist, or a table is not a partitioned external table or hybrid partitioned table.
`invalid_table_name`	20016	An invalid table name was used.
`invalid_schema_name`	20017	An invalid schema name was used.
`invalid_dir_name`	20018	An invalid directory name was used.
`invalid_file_name`	20019	An invalid file name was used.
`invalid_cred_attribute`	20020	Invalid credential attributes were specified.
`table_exist`	20021	A table already exists.
`credential_exist`	20022	A credential object already exists.
`invalid_req_method`	20023	A request method is either too long or invalid.
`invalid_req_header`	20024	An invalid request header was specified.
`file_not_exist`	20025	A file does not exist.
`invalid_response`	20026	An HTTP response was not valid.

Exception	Code	Description
invalid_operation	20027	An invalid task class or ID was specified.
invalid_user_name	20028	An invalid username was specified.