# Oracle® NoSQL Database

## Utilities Guide

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# Using Oracle NoSQL Database Migrator

Learn about Oracle NoSQL Database Migrator and how to use it for data migration.

Oracle NoSQL Database Migrator is a tool that enables you to migrate Oracle NoSQL tables from one data source to another. This tool can operate on tables in Oracle NoSQL Database Cloud Service and Oracle NoSQL Database on-premises and AWS S3. The Migrator tool supports several different data formats and physical media types. Supported data formats are JSON, Parquet, MongoDB-formatted JSON, DynamoDB-formatted JSON, and CSV files. Supported physical media types are files, OCI Object Storage, Oracle NoSQL Database on-premises, Oracle NoSQL Database Cloud Service, and AWS S3.

**Topics:**



## Overview

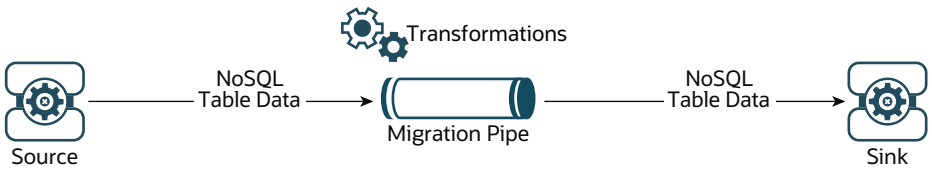
Oracle NoSQL Database Migrator lets you move Oracle NoSQL tables from one data source to another, such as Oracle NoSQL Database on-premises or cloud or even a simple JSON file.

There can be many situations that require you to migrate NoSQL tables *from* or *to* an Oracle NoSQL Database. For instance, a team of developers enhancing a NoSQL Database application may want to test their updated code in the local Oracle NoSQL Database Cloud Service (NDCS) instance using cloudsim. To verify all the possible test cases, they must set up the test data similar to the actual data. To do this, they must copy the NoSQL tables from the production environment to their local NDCS instance, the cloudsim environment. In another situation, NoSQL developers may need to move their application data from on-premise to the cloud and vice-versa, either for development or testing.

In all such cases and many more, you can use Oracle NoSQL Database Migrator to move your NoSQL tables from one data source to another, such as Oracle NoSQL Database on-premise or cloud or even a simple JSON file. You can also copy NoSQL tables from a MongoDB-formatted JSON input file, DynamoDB-formatted JSON input file (either stored in AWS S3 source or from files), or a CSV file into your NoSQL Database on-premises or cloud.

As depicted in the following figure, the NoSQL Database Migrator utility acts as a connector or pipe between the data source and the target (referred to as the sink). In essence, this utility exports data from the selected source and imports that data into the sink. This tool is table-oriented, that is, you can move the data only at the table level. A single migration task operates on a single table and supports migration of table data from source to sink in various data formats.

Oracle NoSQL Database Migrator is designed such that it can support additional sources and sinks in the future. For a list of sources and sinks supported by Oracle NoSQL Database Migrator as of the current release, see Supported Sources and Sinks.




# Terminology used with Oracle NoSQL Database Migrator

Learn about the different terms used in the above diagram, in detail.

- **Source:** An entity from where the NoSQL tables are exported for migration. Some examples of sources are Oracle NoSQL Database on-premise or cloud, JSON file, MongoDB-formatted JSON file, DynamoDB-formatted JSON file, and CSV files.
- **Sink:** An entity that imports the NoSQL tables from NoSQL Database Migrator. Some examples for sinks are Oracle NoSQL Database on-premise or cloud and JSON file.

The NoSQL Database Migrator tool supports different types of sources and sinks (that is physical media or repositories of data) and data formats (that is how the data is represented in the source or sink). Supported data formats are JSON, Parquet, MongoDB-formatted JSON, DynamoDB-formatted JSON, and CSV files. Supported source and sink types are files, OCI Object Storage, Oracle NoSQL Database on-premise, and Oracle NoSQL Database Cloud Service.

- **Migration Pipe:** The data from a source will be transferred to the sink by NoSQL Database Migrator. This can be visualized as a Migration Pipe.
- **Transformations:** You can add rules to modify the NoSQL table data in the migration pipe. These rules are called Transformations. Oracle NoSQL Database Migrator allows data transformations at the top-level fields or columns only. It does not let you transform the data in the nested fields. Some examples of permitted transformations are:
  - Drop or ignore one or more columns,
  - Rename one or more columns, or
  - Aggregate several columns into a single field, typically a JSON field.
- **Configuration File :** A configuration file is where you define all the parameters required for the migration activity in a JSON format. Later, you pass this configuration file as a single parameter to the `runMigrator` command from the CLI. A typical configuration file format looks like as shown below.

```
{
 "source": {
   "type" : <source type>,
   //source-configuration for type. See  Source Configuration Templates .
 },
 "sink": {
   "type" : <sink type>,
   //sink-configuration for type. See  Sink Configuration Templates .
 },
 "transforms" : {
   //transforms configuration. See  Transformation Configuration
Templates .
 },
 "migratorVersion" : "<migrator version>",
```

```
 "abortOnError" : <true|false>
}
```

| Group | Parameters | Mandatory (Y/N) | Purpose | Supported Values |
|---|---|---|---|---|
| `source` | `type` | Y | Represents the source from which to migrate the data. The source provides data and metadata (if any) for migration. | To know the `type` value for each source, see Supported Sources and Sinks. |
| `source` | source-configuration for type | Y | Defines the configuration for the source. These configuration parameters are specific to the type of source selected above. | See Source Configuration Templates . for the complete list of configuration parameters for each source type. |
| `sink` | `type` | Y | Represents the sink to which to migrate the data. The sink is the target or destination for the migration. | To know the `type` value for each source, see Supported Sources and Sinks. |
| `sink` | sink-configuration for type | Y | Defines the configuration for the sink. These configuration parameters are specific to the type of sink selected above. | See Sink Configuration Templates for the complete list of configuration parameters for each sink type. |
| `transforms` | transforms configuration | N | Defines the transformations to be applied to the data in the migration pipe. | See Transformation Configuration Templates for the complete list of transformations supported by the NoSQL Data Migrator. |
| - | `migratorVersion` | N | Version of the NoSQL Data Migrator | - |

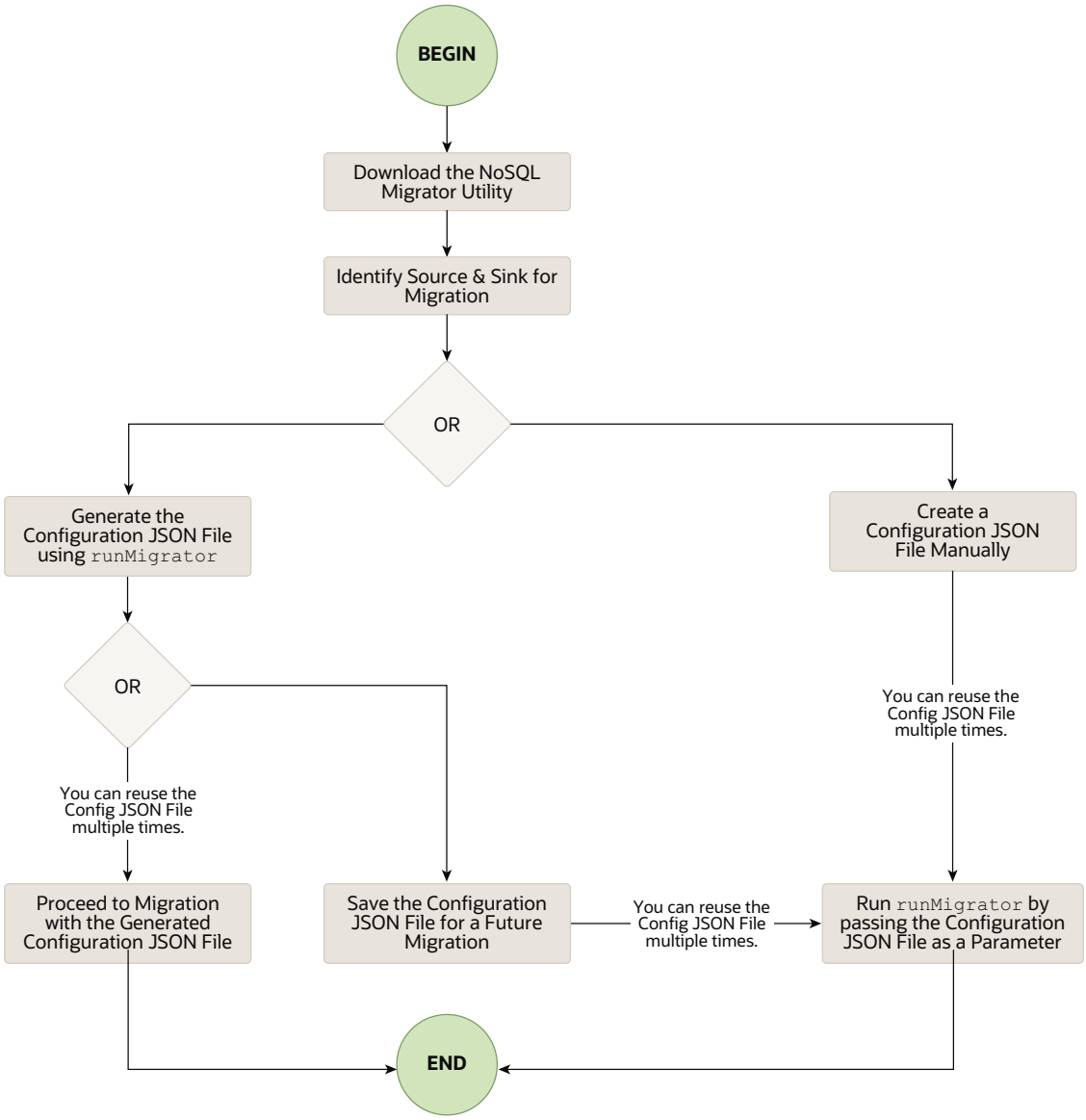
| Group | Parameters | Mandatory (Y/N) | Purpose | Supported Values |
|---|---|---|---|---|
| - | `abortOnError` | N | Specifies whether to stop the migration activity in case of any error or not.<br>The default value is *true* indicating that the migration stops whenever it encounters a migration error.<br>If you set this value to *false*, the migration continues even in case of failed records or other migration errors. The failed records and migration errors will be logged as WARNINGs on the CLI terminal. | true, false |

> **Note:**
>
> As JSON file is case-sensitive, all the parameters defined in the configuration file are case-sensitive unless specified otherwise.

# Workflow for Oracle NoSQL Database Migrator

Learn about the various steps involved in using the Oracle NoSQL Database Migrator utility for migrating your NoSQL data.

The high level flow of tasks involved in using NoSQL Database Migrator is depicted in the below figure.




### Download the NoSQL Data Migrator Utility

The Oracle NoSQL Database Migrator utility is available for download from the Oracle NoSQL Downloads page. Once you download and unzip it on your machine, you can access the `runMigrator` command from the command line interface.

> **Note:**
>
> Oracle NoSQL Database Migrator utility requires Java 11 or higher versions to run.

### Identify the Source and Sink

Before using the migrator, you must identify the data source and sink. For instance, if you want to migrate a NoSQL table from Oracle NoSQL Database on-premise to a JSON formatted file, your source will be Oracle NoSQL Database and sink will be JSON file. Ensure that the identified source and sink are supported by the Oracle NoSQL Database Migrator by referring

to Supported Sources and Sinks. This is also an appropriate phase to decide the schema for your NoSQL table in the target or sink, and create them.

- **Identify Sink Table Schema:** If the sink is Oracle NoSQL Database on-premise or cloud, you must identify the schema for the sink table and ensure that the source data matches with the target schema. If required, use transformations to map the source data to the sink table.
  - **Default Schema:** NoSQL Database Migrator provides an option to create a table with the default schema without the need to predefine the schema for the table. This is useful primarily when loading JSON source files into Oracle NoSQL Database.
    If the source is a MongoDB-formatted JSON file, the default schema for the table will be as follows:

    ```
    CREATE TABLE IF NOT EXISTS <tablename>(ID STRING, DOCUMENT JSON,PRIMARY
    KEY(SHARD(ID))
    ```

    Where:

    — tablename = value provided for the table attribute in the configuration.

    — ID = _id value from each document of the mongoDB exported JSON source file.

    — DOCUMENT = For each document in the mongoDB exported file, the contents excluding the _id field are aggregated into the DOCUMENT column.

    If the source is a DynamoDB-formatted JSON file, the default schema for the table will be as follows:

    ```
    CREATE TABLE IF NOT EXISTS <TABLE_NAME>(DDBPartitionKey_name
    DDBPartitionKey_type,
    [DDBSortKey_name DDBSortKey_type],DOCUMENT JSON,
    PRIMARY KEY(SHARD(DDBPartitionKey_name),[DDBSortKey_name]))
    ```

    Where:

    — TABLE_NAME = value provided for the sink table in the configuration

    — DDBPartitionKey_name = value provided for the partition key in the configuration

    — DDBPartitionKey_type = value provided for the data type of the partition key in the configuration

    — DDBSortKey_name = value provided for the sort key in the configuration if any

    — DDBSortKey_type = value provided for the data type of the sort key in the configuration if any

    — DOCUMENT = All attributes except the partition and sort key of a Dynamo DB table item aggregated into a NoSQL JSON column

    If the source format is a CSV file, a default schema is not supported for the target table. You can create a schema file with a table definition containing the same number of columns and data types as the source CSV file. For more details on the Schema file creation, see Providing Table Schema.

    For all the other sources, the default schema will be as follows:

    ```
    CREATE TABLE IF NOT EXISTS <tablename> (ID LONG GENERATED ALWAYS AS
    IDENTITY, DOCUMENT JSON, PRIMARY KEY(ID))
    ```

Where:

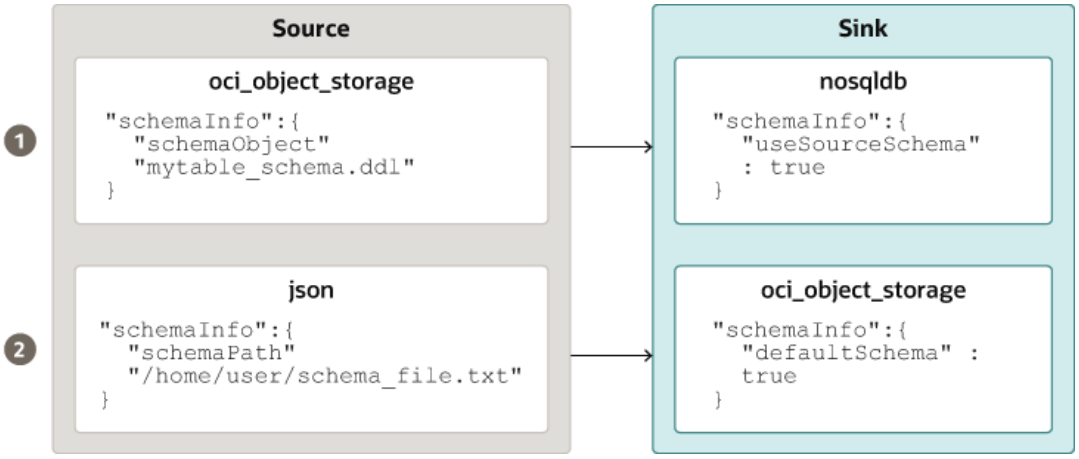
— tablename = value provided for the table attribute in the configuration.

— ID = An auto-generated LONG value.

— DOCUMENT = The JSON record provided by the source is aggregated into the DOCUMENT column.

> **Note:**
>
> If the _id value is not provided as a string in the MongoDB-formatted JSON file, NoSQL Database Migrator converts it into a string before inserting it into the default schema.

- **Providing Table Schema:** NoSQL Database Migrator allows the source to provide schema definitions for the table data using `schemaInfo` attribute. The `schemaInfo` attribute is available in all the data sources that do not have an implicit schema already defined. Sink data stores can choose any one of the following options.
  - Use the default schema defined by the NoSQL Database Migrator.
  - Use the source-provided schema.
  - Override the source-provided schema by defining its own schema. For example, if you want to transform the data from the source schema to another schema, you need to override the source-provided schema and use the transformation capability of the NoSQL Database Migrator tool.




The table schema file, for example, `mytable_schema.ddl` can include table DDL statements. The NoSQL Database Migrator tool executes this table schema file before starting the migration. The migrator tool supports no more than one DDL statement per line in the schema file. For example,

```
CREATE TABLE IF NOT EXISTS(id INTEGER, name STRING, age INTEGER, PRIMARY
KEY(SHARD(ID)))
```

> **Note:**
>
> Migration will fail if the table is present at the sink and the DDL in the `schemaPath` is different than the table.

- **Create Sink Table:** Once you identify the sink table schema, create the sink table either through the Admin CLI or using the `schemaInfo` attribute of the sink configuration file. See Sink Configuration Templates .

> **Note:**
>
> If the source is a CSV file, create a file with the DDL commands for the schema of the target table. Provide the file path in `schemaInfo.schemaPath` parameter of the sink configuration file.

### Migrating TTL Metadata for Table Rows

Time to Live (TTL) is a mechanism that allows you to automatically expire table rows. TTL is expressed as the amount of time, data is allowed to live in the store. Data that has reached its expiration timeout value can no longer be retrieved, and will not appear in any store statistics.

You can choose to include the TTL metadata for table rows along with the actual data when performing migration of Oracle NoSQL Database tables. The NoSQL Database Migrator provides configuration parameters to support the export and import of table row TTL metadata for the following source types:

**Table 1-1 Migrating TTL metadata**

| Source types | Source configuration parameter | Sink configuration parameter |
|---|---|---|
| Oracle NoSQL Database | `includeTTL` | `includeTTL` |
| Oracle NoSQL Database Cloud Service | `includeTTL` | `includeTTL` |
| DynamoDB-Formatted JSON File | `ttlAttributeName` | `includeTTL` |
| DynamoDB-Formatted JSON File stored in AWS S3 | `ttlAttributeName` | `includeTTL` |

#### Exporting TTL metadata in Oracle NoSQL Database and Oracle NoSQL Database Cloud Service

NoSQL Database Migrator provides the `includeTTL` configuration parameter to support the export of table row's TTL metadata.

When a table is exported, the TTL data is exported for the table rows that have a valid expiration time. If a row does not expire, then the `_metadata` JSON object is not included explicitly in the exported data because its expiration value is always 0. The NoSQL Database Migrator exports the expiration time for each row as the number of milliseconds since the UNIX epoch (Jan 1st, 1970). For example,

```
//Row 1
{
    "id" : 1,
    "name" : "xyz",
```

```
    "age" : 45,
    "_metadata" : {
        "expiration" : 1629709200000   //Row Expiration time in milliseconds
    }
}

//Row 2
{
    "id" : 2,
    "name" : "abc",
    "age" : 52,
    "_metadata" : {
        "expiration" : 1629709400000   //Row Expiration time in milliseconds
    }
}

//Row 3 No Metadata for below row as it will not expire
{
    "id" : 3,
    "name" : "def",
    "age" : 15
}
```

### Importing TTL metadata

You can optionally import TTL metadata using the `includeTTL` configuration parameter in the sink configuration template.

The default reference time of import operation is the current time in milliseconds, obtained from System.currentTimeMillis(), of the machine where the NoSQL Database Migrator tool is running. However, you can also set a custom reference time using the `ttlRelativeDate` configuration parameter if you want to extend the expiration time and import rows that would otherwise expire immediately. The extension is calculated as follows and added to the expiration time.

```
Extended time = expiration time - reference time
```

The import operation handles the following use cases when migrating table rows containing TTL metadata. These use cases are applicable only when the `includeTTL` configuration parameter is set to true.

- **Use-case 1**: No TTL metadata information is present in the importing table row.
  If the row you want to import does not contain TTL information, then the NoSQL Database Migrator sets the TTL=0 for the row.
- **Use-case 2**: TTL value of the source table row is expired relative to the reference time when the table row gets imported.
  The expired table row is ignored and not written into the store.
- **Use-case 3**: TTL value of the source table row is not expired relative to the reference time when the table row gets imported.
  The table row gets imported with a TTL value. However, the imported TTL value may not match the original exported TTL value because of the integer hour and day window constraints in the *TimeToLive* class. For example,

Consider an exported table row:

```
{
  "id" : 8,
  "name" : "xyz",
  "_metadata" : {
  "expiration" : 1734566400000 //Thursday, December 19, 2024 12:00:00 AM
in UTC
  }
}
```

The reference time while importing is 1734480000000, which is Wednesday, December 18, 2024 12:00:00 AM.

Imported table row

```
{
  "id" : 8,
  "name" : "xyz",
  "_metadata" : {
    "ttl" :  1734739200000 //Saturday, December 21, 2024 12:00:00 AM
  }
}
```

**Importing TTL Metadata in DynamoDB-Formatted JSON File and DynamoDB-Formatted JSON File stored in AWS S3**

NoSQL Database Migrator provides an additional configuration parameter, `ttlAttributeName` to support the import of TTL metadata from the DynamoDB-formatted JSON file items.

DynamoDB exported JSON files include a specific attribute in each item to store the TTL expiration timestamp. To optionally import the TTL values from DynamoDB exported JSON files, you must supply the specific attribute's name as a value to the `ttlAttributeName` configuration parameter in the DynamoDB-Formatted JSON File or DynamoDB-Formatted JSON File stored in AWS S3 source configuration files. Also, you must set the `includeTTL` configuration parameter in the sink configuration template. The valid sinks are Oracle NoSQL Database and Oracle NoSQL Database Cloud Service. NoSQL Database Migrator stores TTL information in the `_metadata` JSON object for the imported item.

The import operation manages the following use cases when migrating table items of the DynamoDB exported JSON files:

- **Use case 1:** The `ttlAttributeName` configuration parameter value is set to the TTL attribute name specified in the DynamoDB exported JSON file.

  NoSQL Database Migrator imports the expiration time for this item as the number of milliseconds since the UNIX epoch (Jan 1st, 1970).

  For example, consider an item in the DynamoDB exported JSON file:

```
{
    "Item": {
        "DeptId": {
            "N": "1"
        },
        "DeptName": {
            "S": "Engineering"
```

```
        },
        "ttl": {
            "N": "1734616800"
        }
    }
}
```

Here, the attribute `ttl` specifies the time-to-live value for the item. If you set the `ttlAttributeName` configuration parameter as `ttl` in the DynamoDB-formatted JSON file or DynamoDB-formatted JSON file stored in AWS S3 source configuration file, NoSQL Database Migrator imports the expiration time for the item as follows:

```
{
  "DeptId": 1,
  "document": {
      "DeptName": "Engineering"
    }
  "_metadata": {
    "expiration": 1734616800000
  }
}
```

> **Note:**
>
> You can supply the `ttlRelativeDate` configuration parameter in the sink configuration template as the reference time for calculating the expiration time.

- **Use case 2:** The `ttlAttributeName` configuration parameter value is set, however, the value does not exist as an attribute in the item of the DynamoDB exported JSON file. NoSQL Database Migrator does not import the TTL metadata information for the given item.
- **Use case 3:** The `ttlAttributeName` configuration parameter value does not match the attribute name in the item of DynamoDB exported JSON file.
  NoSQL Database Migrator handles the import in one of the following ways based on the sink configuration:
  - Copies the attribute as a normal field if configured to import using the default schema.
  - Skips the attribute if configured to import using a user-defined schema.

**Importing data to a sink with an IDENTITY column**

You can import the data from a valid source to a sink table (On-premises/Cloud Services) with an IDENTITY column. You create the IDENTITY column as either GENERATED ALWAYS AS IDENTITY or GENERATED BY DEFAULT AS IDENTITY. For more information on table creation with an IDENTITY column, see Creating Tables With an IDENTITY Column in the *SQL Reference Guide*.

Before importing the data, make sure that the Oracle NoSQL Database table at the sink is empty if it exists. If there is pre-existing data in the sink table, migration can lead to issues such as overwriting existing data in the sink table or skipping source data during the import.

**Sink table with IDENTITY column as GENERATED ALWAYS AS IDENTITY**

Consider a sink table with the IDENTITY column created as GENERATED ALWAYS AS IDENTITY. The data import is dependent on whether or not the source supplies the values to the IDENTITY column and `ignoreFields` transformation parameter in the configuration file.

For example, you want to import data from a JSON file source to the Oracle NoSQL Database table as the sink. The schema of the sink table is:

```
CREATE TABLE IF NOT EXISTS migrateID(ID INTEGER GENERATED ALWAYS AS IDENTITY,
name STRING, course STRING, PRIMARY KEY
      (ID))
```

The Migrator utility handles the data migration as described in the following cases:

| Source condition | User action | Migration outcome |
|---|---|---|
| CASE 1: Source data does not supply a value for the IDENTITY field of the sink table.<br>Example: JSON source file `sample_noID.json`<br><br>`{"name":"John", "course":"Computer Science"}`<br>`{"name":"Jane", "course":"BioTechnology"}`<br>`{"name":"Tony", "course":"Electronics"}` | Create/generate the configuration file. | Data migration is successful. IDENTITY column values are auto-generated. Migrated data in Oracle NoSQL Database sink table `migrateID`:<br><br>`{"ID":1001,"name":"Jane","course":"BioTechnology"}`<br>`{"ID":1003,"name":"John","course":"Computer Science"}`<br>`{"ID":1002,"name":"Tony","course":"Electronics"}` |
| CASE 2: Source data supplies values for the IDENTITY field of the sink table.<br>Example: JSON source file `sampleID.json`<br><br>`{"ID":1, "name":"John", "course":"Computer Science"}`<br>`{"ID":2, "name":"Jane", "course":"BioTechnology"}`<br>`{"ID":3, "name":"Tony", "course":"Electronics"}` | Create/generate the configuration file. You provide an `ignoreFields` transformation for the ID column in the sink configuration template.<br>`"transforms" : { "ignoreFields" : ["ID"] }` | Data migration is successful. The supplied ID values are skipped and the IDENTITY column values are auto-generated.<br>Migrated data in Oracle NoSQL Database sink table `migrateID`:<br><br>`{"ID":2003,"name":"John","course":"Computer Science"}`<br>`{"ID":2002,"name":"Tony","course":"Electronics"}`<br>`{"ID":2001,"name":"Jane","course":"BioTechnology"}` |
| | You create/ generate the configuration file without the `ignoreFields` transformation for the IDENTITY column. | Data migration fails with the following error message:<br>`"Cannot set value for a generated always identity column".` |

For more details on the transformation configuration parameters, see the topic Transformation Configuration Templates.

**Sink table with IDENTITY column as GENERATED BY DEFAULT AS IDENTITY**

Consider a sink table with the IDENTITY column created as GENERATED BY DEFAULT AS IDENTITY. The data import is dependent on whether or not the source supplies the values to the IDENTITY column and `ignoreFields` transformation parameter.

For example, you want to import data from a JSON file source to the Oracle NoSQL Database table as the sink. The schema of the sink table is:

```
CREATE TABLE IF NOT EXISTS migrateID(ID INTEGER GENERATED BY DEFAULT AS
IDENTITY, name STRING, course STRING, PRIMARY KEY
      (ID))
```

The Migrator utility handles the data migration as described in the following cases:

| Source condition | User action | Migration outcome |
|---|---|---|
| CASE 1: Source data does not supply a value for the IDENTITY field of the sink table.<br>Example: JSON source file `sample_noID.json`<br><br>`{"name":"John", "course":"Computer Science"}`<br>`{"name":"Jane", "course":"BioTechnology"}`<br>`{"name":"Tony", "course":"Electronics"}` | Create/generate the configuration file. | Data migration is successful. IDENTITY column values are auto-generated.<br>Migrated data in Oracle NoSQL Database sink table `migrateID`:<br><br>`{"ID":1,"name":"John","course":"Computer Science"}`<br>`{"ID":2,"name":"Jane","course":"BioTechnology"}`<br>`{"ID":3,"name":"Tony","course":"Electronics"}` |
| CASE 2: Source data supplies values for the IDENTITY field of the sink table and it is a Primary Key field.<br>Example: JSON source file `sampleID.json`<br><br>`{"ID":1, "name":"John", "course":"Computer Science"}`<br>`{"ID":2, "name":"Jane", "course":"BioTechnology"}`<br>`{"ID":3, "name":"Tony", "course":"Electronics"}` | Create/generate the configuration file. You provide an `ignoreFields` transformation for the ID column in the sink configuration template **(Recommended)**.<br>`"transforms" : { "ignoreFields" : ["ID"] }` | Data migration is successful. The supplied ID values are skipped and the IDENTITY column values are auto-generated.<br>Migrated data in Oracle NoSQL Database sink table `migrateID`:<br><br>`{"ID":1002,"name":"John","course":"Computer Science"}`<br>`{"ID":1001,"name":"Jane","course":"BioTechnology"}`<br>`{"ID":1003,"name":"Tony","course":"Electronics"}` |

| Source condition | User action | Migration outcome |
|---|---|---|
| | You create/ generate the configuration file without the `ignoreFields` transformation for the IDENTITY column. | Data migration is successful. The supplied `ID` values from the source are copied into the `ID` column in the sink table.<br>When you try to insert an additional row to the table without supplying an ID value, the sequence generator tries to auto-generate the ID value. The sequence generator's starting value is 1. As a result, the generated ID value can potentially duplicate one of the existing ID values in the sink table. Since this is a violation of the primary key constraint, an error is returned and the row does not get inserted.<br>See Sequence Generator for additional information.<br>To avoid the primary key constraint violation, the sequence generator must start the sequence with a value that does not conflict with existing ID values in the sink table. To use the START WITH attribute to make this modification, see the example below:<br>**Example**: Migrated data in Oracle NoSQL Database sink table `migrateID`:<br>`{"ID":1,"name":"John","course":"Computer Science"}`<br>`{"ID":2,"name":"Jane","course":"BioTechnology"}`<br>`{"ID":3,"name":"Tony","course":"Electronics"}`<br>To find the appropriate value for the sequence generator to insert in the ID column, fetch the maximum value of the `ID` field using the following query:<br>`SELECT max(ID) FROM migrateID`<br>Output:<br>`{"Column_1":3}`<br>The maximum value of the `ID` column in the sink table is 3. You want the sequence generator to start generating the ID values beyond 3 to avoid duplication. You update the sequence |

| Source condition | User action | Migration outcome |
|---|---|---|
| | | generator's START WITH attribute to 4 using the following statement:<br><br>`ALTER Table migrateID (MODIFY ID GENERATED BY DEFAULT AS IDENTITY (START WITH 4))`<br><br>This will start the sequence at 4.<br>Now when you insert rows to the sink table without supplying the ID values, the sequence generator auto-generates the ID values from 4 onwards averting the duplication of the IDs. |

For more details on the transformation configuration parameters, see the topic Transformation Configuration Templates.

### Run the `runMigrator` command

The `runMigrator` executable file is available in the extracted NoSQL Database Migrator files. You must install Java 11 or higher version and bash on your system to successfully run the `runMigrator` command.

You can run the `runMigrator` command in two ways:

1. By creating the configuration file using the runtime options of the `runMigrator` command as shown below.

```
[~]$ ./runMigrator
configuration file is not provided. Do you want to generate configuration?
(y/n)


[n]: y
...
...
```

   - When you invoke the `runMigrator` utility, it provides a series of runtime options and creates the configuration file based on your choices for each option.
   - After the utility creates the configuration file, you have a choice to either proceed with the migration activity in the same run or save the configuration file for a future migration.
   - Irrespective of your decision to proceed or defer the migration activity with the generated configuration file, the file will be available for edits or customization to meet your future requirements. You can use the customized configuration file for migration later.

2. By passing a manually created configuration file (in the JSON format) as a runtime parameter using the `-c` or `--config` option. You must create the configuration file manually

before running the `runMigrator` command with the `-c` or `--config` option. For any help with the source and sink configuration parameters, see Sources and Sinks.

```
[~]$ ./runMigrator -c </path/to/the/configuration/json/file>
```

### Logging Migrator Progress

NoSQL Database Migrator tool provides options, which enables trace, debugging, and progress messages to be printed to standard output or to a file. This option can be useful in tracking the progress of migration operation, particularly for very large tables or data sets.

- **Log Levels**
  To control the logging behavior through the NoSQL Database Migrator tool, pass the --log-level or -l run time parameter to the `runMigrator` command. You can specify the amount of log information to write by passing the appropriate log level value.

  ```
  $./runMigrator --log-level <loglevel>
  ```

  Example:

  ```
  $./runMigrator --log-level debug
  ```

**Table 1-2 Supported Log Levels for NoSQL Database Migrator**

| Log Level | Description |
|---|---|
| warning | Prints errors and warnings. |
| info (**default**) | Prints the progress status of data migration such as validating source, validating sink, creating tables, and count of number of data records migrated. |
| debug | Prints additional debug information. |
| all | Prints everything. This level turns on all levels of logging. |

- **Log File:**
  You can specify the name of the log file using `--log-file` or `-f` parameter. If `--log-file` is passed as run time parameter to the `runMigrator` command, the NoSQL Database Migrator writes all the log messages to the file else to the standard output.

  ```
  $./runMigrator --log-file <log file name>
  ```

  Example:

  ```
  $./runMigrator --log-file nosql_migrator.log
  ```

# Sources and Sinks

Learn about the different sources and sinks supported by the Oracle NoSQL Database Migrator utility and their configuration templates.

**Topics:**



## Supported Sources and Sinks

This topic provides the list of the sources and sinks supported by the Oracle NoSQL Database Migrator.

You can use any combination of a valid source and sink from this table for the migration activity. However, you must ensure that at least one of the ends, that is, source or sink must be an Oracle NoSQL product. You can not use the NoSQL Database Migrator to move the NoSQL table data from one file to another.

| **Type (value)** | **Format (value)** | **Valid Source** | **Valid Sink** |
|---|---|---|---|
| Oracle NoSQL Database (`nosqldb`) | NA | Y | Y |
| Oracle NoSQL Database Cloud Service (`nosqldb_cloud`) | NA | Y | Y |
| File system (`file`) | JSON (`json`) | Y | Y |
| | MongoDB JSON (`mongodb_json`) | Y | N |
| | DynamoDB JSON (`dynamodb_json`) | Y | N |

| Type (value) | Format (value) | Valid Source | Valid Sink |
|---|---|---|---|
| | Parquet(`parquet`) | N | Y |
| | CSV (`csv`) | Y | N |
| OCI Object Storage (`object_storage_oci`) | JSON (`json`) | Y | Y |
| | MongoDB JSON (`mongodb_json`) | Y | N |
| | Parquet(`parquet`) | N | Y |
| | CSV (`csv`) | Y | N |
| AWS S3 | DynamoDB JSON (`dynamodb_json`) | Y | N |

**Note:**

Many configuration parameters are common across the source and sink configuration. For ease of reference, the description for such parameters is repeated for each source and sink in the documentation sections, which explain configuration file formats for various types of sources and sinks. In all the cases, the syntax and semantics of the parameters with the same name are identical.

# Source and Sink Security

Some of the source and sink types have optional or mandatory security information for authentication purposes.

All sources and sinks that use services in the Oracle Cloud Infrastructure (OCI) can use certain parameters for providing optional security information. This information can be provided using an OCI configuration file or Instance Principal.

Oracle NoSQL Database sources and sinks require mandatory security information if the installation is secure and uses an Oracle Wallet-based authentication. This information can be provided by adding a jar file to the `<MIGRATOR_HOME>/lib` directory.

### Wallet-based Authentication

If an Oracle NoSQL Database installation uses Oracle Wallet-based authentication, you must include additional jar files that are a part of the EE installation. For more information, see Oracle Wallet.

Without the jar files, you will get the following error message:

```
Could not find kvstore-ee.jar and kvstore-ee-<version>.jar in lib
directory. Copy kvstore-ee.jar and kvstore-ee-<version>.jar to lib
directory
```

To prevent the exception shown above, you must copy `kvstore-ee.jar` and `kvstore-ee-<version>.jar` files from your EE server package to the `<MIGRATOR_HOME>/lib` directory. <*MIGRATOR_HOME*> is the `nosql-migrator-M.N.O/` directory created by extracting the Oracle NoSQL Database Migrator package and M.N.O represent the software release.major.minor numbers. For example, `nosql-migrator-1.1.0/lib`.

> **Note:**
>
> The wallet-based authentication is supported ONLY in the Enterprise Edition (EE) of Oracle NoSQL Database.

#### Authenticating with Instance Principals

Instance principals is an IAM service feature that enables instances to be authorized actors (or principals) that can perform actions on service resources. Each compute instance has its own identity, and it authenticates using the certificates added to it.

Oracle NoSQL Database Migrator provides an option to connect to a NoSQL cloud and OCI Object Storage sources and sinks using instance principal authentication. It is only supported when the NoSQL Database Migrator tool is used within an OCI compute instance, for example, the NoSQL Database Migrator tool running in a VM hosted on OCI. To enable this feature use the useInstancePrincipal attribute of the NoSQL cloud source and sink configuration file. For more information on configuration parameters for different types of sources and sinks, see Source Configuration Templates and Sink Configuration Templates .

For more information on instance principals, see Calling Services from an Instance.

## Parameters

The NoSQL Database Migrator requires a configuration file where you define all the parameters to perform the migration activity. A few parameters are common across several sources and sinks. This topic provides a list of these common parameters. For the list of other parameters that are unique to individual sources or sinks, see the corresponding configuration template sections.

#### Common Configuration Parameters

The following are the common configuration parameters. See the individual configuration template sections for examples.

#### bucket

- **Purpose:** Specifies the name of the OCI Object Storage bucket, which contains the source/sink objects.

  Ensure that the required bucket already exists in the OCI Object Storage instance and has read/write permissions.
- **Data Type:** string
- **Mandatory (Y/N):** Y

**chunkSize**

- **Purpose:** Specifies the maximum size of a `chunk` of table data to be stored at the sink. The value is in MB. During migration, a table is split into chunkSize chunks and each chunk is written as a separate file to the sink. A new file is created when the source data that is being migrated exceeds the chunkSize value.

  If not specified, defaults to 32MB. The valid value is an integer between 1 to 1024.
- **Data Type:** integer
- **Mandatory (Y/N):** N

**credentials**

- **Purpose:** Specifies the absolute path to a file containing OCI credentials. The NoSQL Database Migrator uses this file to connect to the OCI service such as Oracle NoSQL Database Cloud Service, OCI Object Storage, and so on.

  The default value is `$HOME/.oci/config`

  See Example Configuration for an example of the credentials file.

  > **Note:**
  >
  > The authentication parameters `credentials`, `useInstancePrincipal`, and `useDelegationToken` are mutually exclusive. Specify only one of these parameters in the configuration template.

- **Data Type:** string
- **Mandatory (Y/N):** N

**credentialsProfile**

- **Purpose:** Specifies the name of the configuration profile to be used to connect to the OCI service such as Oracle NoSQL Database Cloud Service, OCI Object Storage, and so on. User account credentials are referred to as a *profile*.

  If you do not specify this value, the NoSQL Database Migrator uses the `DEFAULT` profile.

  > **Note:**
  >
  > This parameter is valid only if the `credentials` parameter is specified.

- **Data Type:** string
- **Mandatory (Y/N):** N

**endpoint**

- **Purpose:** Specifies one of the following:
  - The Service endpoint URL or the Region ID for the OCI Object Storage service. For the list of OCI Object Storage service endpoints, see Object Storage Endpoints.
  - The Service endpoint URL or the Region ID for the Oracle NoSQL Database Cloud Service.

You can either specify the complete URL or the Region ID alone. For the list of data regions supported for Oracle NoSQL Database Cloud Service, see Data Regions and Associated Service URLs in the *Oracle NoSQL Database Cloud Service* document.

- **Data Type:** string
- **Mandatory (Y/N):** Y

**format**

- **Purpose:** Specifies the source/sink format.
- **Data Type:** string
- **Mandatory (Y/N):** Y

**namespace**

- **Purpose:** Specifies the namespace of the OCI Object Storage service. This is an optional parameter. If you don't specify this parameter, the default namespace of the tenancy is used.
- **Data Type:** string
- **Mandatory (Y/N):** N

**prefix**

- **Purpose:** The prefix acts as a logical container or directory for storing data in the OCI Object Storage bucket.
  - Source configuration template: If the `prefix` parameter in specified, all the objects from the directory named in the `prefix` parameter are migrated. Else, all the objects present in the bucket are migrated.
  - Sink configuration template: If the `prefix` parameter is specified, a directory with the given prefix is created in the bucket and the objects are migrated into this directory. Else, the table name from the source is used as the prefix. If any object with the same name already exists in the bucket, it is overwritten.

  For more information about prefixes, see Object Naming Using Prefixes and Hierarchies.
- **Data Type:** string
- **Mandatory (Y/N):** N

**requestTimeoutMs**

- **Purpose:** Specifies the time to wait for each read/write operation from/to the store to complete. This is provided in milliseconds. The default value is 5000. The value can be any positive integer.
- **Data Type:** integer
- **Mandatory (Y/N):** N

**security**

- **Purpose:** Specifies the absolute path to the security login file that contains your store credentials if your store is a secure store. For more information about the security login file, see Configuring Security with Remote Access in the *Administrator's Guide*.

  You can use either password file based authentication or wallet based authentication. However, the wallet based authentication is supported only in the Enterprise Edition (EE)

of Oracle NoSQL Database. For more information on wallet-based authentication, see Source and Sink Security.

The Community Edition(CE) edition supports password file based authentication only.

- **Data Type:** string
- **Mandatory (Y/N):** Y, for a secure store

**type**

- **Purpose:** Identifies the source/sink type.
- **Data Type:** string
- **Mandatory (Y/N):** Y

**useDelegationToken**

- **Purpose:** Specifies whether or not the NoSQL Database Migrator tool uses a delegation token authentication to connect to the OCI services. You must use the delegation token authentication to run the Migrator utility from the Cloud Shell. The delegation token is automatically created for the user when the Cloud Shell is invoked.

  The default value is `false`.
- **Data Type:** boolean
- **Mandatory (Y/N):** N

> **Note:**
>
> – The authentication with delegation token is supported only when the NoSQL Database Migrator tool is running from a Cloud Shell.
>
> – The authentication parameters `credentials`, `useInstancePrincipal`, and `useDelegationToken` are mutually exclusive. Specify only one of these parameters in the configuration template.
>
> – The Cloud Shell supports migration only between the following sources and sinks:

| Type | Valid source | Valid sink |
|---|---|---|
| Oracle NoSQL Database Cloud Service (`nosqldb_cloud`) | Y | Y |
| File (JSON file in the home directory) | Y | Y |
| OCI Object Storage (JSON file) (`object_storage_oci`) | Y | Y |
| OCI Object Storage (Parquet file) (`object_storage_oci`) | N | Y |

**useInstancePrincipal**

- **Purpose:** Specifies whether or not the NoSQL Database Migrator tool uses instance principal authentication to connect to the OCI service such as Oracle NoSQL Database Cloud Service, OCI Object Storage, and so on. For more information on Instance Principal authentication method, see Source and Sink Security.

  The default value is `false`.

  > **Note:**
  >
  > – The authentication with Instance Principals is supported only when the NoSQL Database Migrator tool is running within an OCI compute instance, for example, the NoSQL Database Migrator tool running in a VM hosted on OCI.
  >
  > – The authentication parameters `credentials`, `useInstancePrincipal` and `useDelegationToken` are mutually exclusive. Specify only one of these parameters in the configuration template.

- **Data Type:** boolean
- **Mandatory (Y/N):** N

# Source Configuration Templates

Learn about the source configuration file formats for each valid source and the purpose of each configuration parameter.

For the configuration file template, see **Configuration File** in Terminology used with Oracle NoSQL Database Migrator.

For details on valid sink formats for each of the source, see Sink Configuration Templates.

**Topics**

The following topics describe the source configuration templates referred by Oracle NoSQL Database Migrator to copy the data from the given source to a valid sink.

- JSON File Source
  Specified file or directory containing the JSON data.
- JSON File in OCI Object Storage Bucket
  Specified JSON file in the OCI Object Storage bucket.
- MongoDB-Formatted JSON File
  Specified file or directory containing the MongoDB formatted JSON data.
- **MongoDB-Formatted JSON File in OCI Object Storage bucket**
  Specified MongoDB exported JSON file stored in the OCI Object Storage bucket.
- **DynamoDB-Formatted JSON File stored in AWS S3**
  Specified DynamoDB exported JSON file stored in the AWS S3 storage.
- DynamoDB-Formatted JSON File
  Specified DynamoDB exported JSON file from a file system.
- Oracle NoSQL Database

Specified table in Oracle NoSQL Database.

- Oracle NoSQL Database Cloud Service
  Specified table in Oracle NoSQL Database Cloud Service.
- CSV File Source
  Specified file or directory containing the CSV data.
- CSV file in OCI Object Storage Bucket
  Specified CSV file in the OCI Object Storage bucket.

## JSON File Source

The configuration file format for JSON file as a source of NoSQL Database Migrator is shown below.

You can migrate a JSON source file by specifying the file path or a directory in the source configuration template.

A sample JSON source file is as follows:

```
{"id":6,"val_json":{"array":
["q","r","s"],"date":"2023-02-04T02:38:57.520Z","nestarray":[[1,2,3],
[10,20,30]],"nested":{"arrayofobjects":
[{"datefield":"2023-02-04T02:38:57.520Z","numfield":30,"strfield":"foo54"},
{"datefield":"2023-02-04T02:38:57.520Z","numfield":56,"strfield":"bar23"}],"ne
stNum":10,"nestString":"bar"},"num":1,"string":"foo"}}
{"id":3,"val_json":{"array":
["g","h","i"],"date":"2023-02-02T02:38:57.520Z","nestarray":[[1,2,3],
[10,20,30]],"nested":{"arrayofobjects":
[{"datefield":"2023-02-04T02:38:57.520Z","numfield":28,"strfield":"foo3"},
{"datefield":"2023-02-04T02:38:57.520Z","numfield":38,"strfield":"bar"}],"nest
Num":10,"nestString":"bar"},"num":1,"string":"foo"}}
```

### Source Configuration Template

```
"source": {
  "type": "file",
  "format": "json",
  "dataPath": "<path/to/JSON/[file|dir]>",
  "schemaInfo": {
    "schemaPath": "<path/to/schema/file>"
  }
},
```

### Source Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "file"`
- format
  Use `"format" : "json"`

#### Unique Configuration Parameters

- dataPath

- schemaInfo
- schemaInfo.schemaPath

**dataPath**

- **Purpose:** Specifies the absolute path to a file or directory containing the JSON data for migration.

  You must ensure that this data matches with the NoSQL table schema defined at the sink. If you specify a directory, the NoSQL Database Migrator identifies all the files with the `.json` extension in that directory for the migration. Sub-directories are not supported.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**
  - Specifying a JSON file

    ```
    "dataPath" : "/home/user/sample.json"
    ```
  - Specifying a directory

    ```
    "dataPath" : "/home/user"
    ```

**schemaInfo**

- **Purpose:** Specifies the schema of the source data being migrated. This schema is passed to the NoSQL sink.
- **Data Type:** Object
- **Mandatory (Y/N):** N

**schemaInfo.schemaPath**

- **Purpose:** Specifies the absolute path to the schema definition file containing DDL statements for the NoSQL table being migrated.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**

```
"schemaInfo": {
  "schemaPath": "<path to the schema file>"
}
```

## JSON File in OCI Object Storage Bucket

The configuration file format for JSON file in OCI Object Storage bucket as a source of NoSQL Database Migrator is shown below.

You can migrate a JSON file in the OCI Object Storage bucket by specifying the name of the bucket in the source configuration template.

A sample JSON source file in the OCI Object Storage bucket is as follows:

```
{"id":6,"val_json":{"array":
["q","r","s"],"date":"2023-02-04T02:38:57.520Z","nestarray":[[1,2,3],
[10,20,30]],"nested":{"arrayofobjects":
```

[{"datefield":"2023-02-04T02:38:57.520Z","numfield":30,"strfield":"foo54"},
{"datefield":"2023-02-04T02:38:57.520Z","numfield":56,"strfield":"bar23"}],"ne
stNum":10,"nestString":"bar"},"num":1,"string":"foo"}}
{"id":3,"val_json":{"array":
["g","h","i"],"date":"2023-02-04T02:38:57.520Z","nestarray":[[1,2,3],
[10,20,30]],"nested":{"arrayofobjects":
[{"datefield":"2023-02-04T02:38:57.520Z","numfield":28,"strfield":"foo3"},
{"datefield":"2023-02-04T02:38:57.520Z","numfield":38,"strfield":"bar"}],"nest
Num":10,"nestString":"bar"},"num":1,"string":"foo"}}

> **Note:**
>
> The valid sink types for OCI Object Storage source type are `nosqldb` and `nosqldb_cloud`.

### Source Configuration Template

```
"source" : {
  "type" : "object_storage_oci",
  "format" : "json",
  "endpoint" : "<OCI Object Storage service endpoint URL or region ID>",
  "namespace" : "<OCI Object Storage namespace>",
  "bucket" : "<bucket name>",
  "prefix" : "<object prefix>",
  "schemaInfo" : {
     "schemaObject" : "<object name>"
  },
  "credentials" : "</path/to/oci/config/file>",
  "credentialsProfile" : "<profile name in oci config file>",
  "useInstancePrincipal" : <true|false>,
  "useDelegationToken" : <true|false>
}
```

### Source Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "object_storage_oci"`
- format
  Use `"format" : "json"`
- endpoint
  Example:
  - Region ID: `"endpoint" : "us-ashburn-1"`
  - URL format: `"endpoint" : "https://objectstorage.us-ashburn-1.oraclecloud.com"`
- namespace
  Example: `"namespace" : "my-namespace"`
- bucket
  Example: `"bucket" : "my-bucket"`

- prefix
  Example:
  1. `"prefix" : "my_table/Data/000000.json"` (migrates only `000000.json`)
  2. `"prefix" : "my_table/Data"` (migrates all the objects with prefix `my_table/Data`)
- credentials
  Example:
  1. `"credentials" : "/home/user/.oci/config"`
  2. `"credentials" : "/home/user/security/config"`
- credentialsProfile
  Example:
  1. `"credentialsProfile" : "DEFAULT"`
  2. `"credentialsProfile" : "ADMIN_USER"`
- useInstancePrincipal
  Example: `"useInstancePrincipal" : true`
- useDelegationToken
  Example: `"useDelegationToken" : true`

> **Note:**
>
> The authentication with delegation token is supported only when the NoSQL Database Migrator is running from a Cloud Shell.

**Unique Configuration Parameters**

- schemaInfo
- schemaInfo.schemaObject

**schemaInfo**

- **Purpose:** Specifies the schema of the source data being migrated. This schema is passed to the NoSQL sink.
- **Data Type:** Object
- **Mandatory (Y/N):** N

**schemaInfo.schemaObject**

- **Purpose:** Specifies the name of the object in the bucket where NoSQL table schema definitions for the data being migrated are stored.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**

```
"schemaInfo": {
  "schemaObject": "mytable/Schema/schema.ddl"
},
```

# MongoDB-Formatted JSON File

The configuration file format for MongoDB-formatted JSON File as a source of NoSQL Database Migrator is shown below.

You can migrate a MongoDB exported JSON data by specifying the file or directory in the source configuration template.

MongoDB supports two types of extensions to the JSON format of files, *Canonical mode* and *Relaxed mode*. You can supply the MongoDB-formatted JSON file that is generated using the *mongoexport* tool in either Canonical or Relaxed mode. Both the modes are supported by the NoSQL Database Migrator for migration.

For more information on the MongoDB Extended JSON (v2) file, See mongoexport_formats.

For more information on the generation of MongoDB-formatted JSON file, see mongoexport for more information.

A sample MongoDB-formatted *Relaxed mode* JSON file is as follows:

```
{"_id":0,"name":"Aimee Zank","scores":
[{"score":1.463179736705023,"type":"exam"},
{"score":11.78273309957772,"type":"quiz"},
{"score":35.8740349954354,"type":"homework"}]}
{"_id":1,"name":"Aurelia Menendez","scores":
[{"score":60.06045071030959,"type":"exam"},
{"score":52.79790691903873,"type":"quiz"},
{"score":71.76133439165544,"type":"homework"}]}
{"_id":2,"name":"Corliss Zuk","scores":
[{"score":67.03077096065002,"type":"exam"},
{"score":6.301851677835235,"type":"quiz"},
{"score":66.28344683278382,"type":"homework"}]}
{"_id":3,"name":"Bao Ziglar","scores":
[{"score":71.64343899778332,"type":"exam"},
{"score":24.80221293650313,"type":"quiz"},
{"score":42.26147058804812,"type":"homework"}]}
{"_id":4,"name":"Zachary Langlais","scores":
[{"score":78.68385091304332,"type":"exam"},
{"score":90.2963101368042,"type":"quiz"},
{"score":34.41620148042529,"type":"homework"}]}
```

### Source Configuration Template

```
"source": {
  "type": "file",
  "format": "mongodb_json",
  "dataPath": "</path/to/json/[file|dir]>",
  "schemaInfo": {
    "schemaPath": "</path/to/schema/file>"
  }
}
```

### Source Parameters

### Common Configuration Parameters

- type
  Use `"type" : "file"`
- format
  Use `"format" : "mongodb_json"`

**Unique Configuration Parameters**

- dataPath
- schemaInfo
- schemaInfo.schemaPath

**dataPath**

- **Purpose:** Specifies the absolute path to a file or directory containing the MongoDB exported JSON data for migration.

  You can supply the MongoDB-formatted JSON file that is generated using the mongoexport tool.

  If you specify a directory, the NoSQL Database Migrator identifies all the files with the `.json` extension in that directory for the migration. Sub-directories are not supported. You must ensure that this data matches with the NoSQL table schema defined at the sink.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**
  - Specifying a MongoDB formatted JSON file

    ```
    "dataPath" : "/home/user/sample.json"
    ```
  - Specifying a directory

    ```
    "dataPath" : "/home/user"
    ```

**schemaInfo**

- **Purpose:** Specifies the schema of the source data being migrated. This schema is passed to the NoSQL sink.
- **Data Type:** Object
- **Mandatory (Y/N):** N

**schemaInfo.schemaPath**

- **Purpose:** Specifies the absolute path to the schema definition file containing DDL statements for the NoSQL table being migrated.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**

```
"schemaInfo" : {
  "schemaPath" : "/home/user/mytable/Schema/schema.ddl"
}
```

# MongoDB-Formatted JSON File in OCI Object Storage bucket

The configuration file format for MongoDB-Formatted JSON file in OCI Object Storage bucket as a source of NoSQL Database Migrator is shown below.

You can migrate the MongoDB exported JSON data in the OCI Object Storage bucket by specifying the name of the bucket in the source configuration template.

Extract the data from MongoDB using the *mongoexport* utility and upload it to the OCI Object Storage bucket. See mongoexport for more information. MongoDB supports two types of extensions to the JSON format of files, *Canonical mode* and *Relaxed mode*. Both formats are supported in the OCI Object Storage bucket.

A sample MongoDB-formatted *Relaxed mode* JSON File is as follows:

```
{"_id":0,"name":"Aimee Zank","scores":
[{"score":1.463179736705023,"type":"exam"},
{"score":11.78273309957772,"type":"quiz"},
{"score":35.8740349954354,"type":"homework"}]}
{"_id":1,"name":"Aurelia Menendez","scores":
[{"score":60.06045071030959,"type":"exam"},
{"score":52.79790691903873,"type":"quiz"},
{"score":71.76133439165544,"type":"homework"}]}
{"_id":2,"name":"Corliss Zuk","scores":
[{"score":67.03077096065002,"type":"exam"},
{"score":6.301851677835235,"type":"quiz"},
{"score":66.28344683278382,"type":"homework"}]}
{"_id":3,"name":"Bao Ziglar","scores":
[{"score":71.64343899778332,"type":"exam"},
{"score":24.80221293650313,"type":"quiz"},
{"score":42.26147058804812,"type":"homework"}]}
{"_id":4,"name":"Zachary Langlais","scores":
[{"score":78.68385091304332,"type":"exam"},
{"score":90.2963101368042,"type":"quiz"},
{"score":34.41620148042529,"type":"homework"}]}
```

> **Note:**
>
> The valid sink types for OCI Object Storage source type are `nosqldb` and `nosqldb_cloud`.

### Source Configuration Template

```
"source" : {
  "type" : "object_storage_oci",
  "format" : "mongodb_json",
  "endpoint" : "<OCI Object Storage service endpoint URL or region ID>",
  "namespace" : "<OCI Object Storage namespace>",
  "bucket" : "<bucket name>",
  "prefix" : "<object prefix>",
  "schemaInfo" : {
     "schemaObject" : "<object name>"
  },
```

```
  "credentials" : "</path/to/oci/config/file>",
  "credentialsProfile" : "<profile name in oci config file>",
  "useInstancePrincipal" : <true|false>
}
```

### Source Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "object_storage_oci"`
- format
  Use `"format" : "mongodb_json"`
- endpoint
  Example:
  - Region ID: `"endpoint" : "us-ashburn-1"`
  - URL format: `"endpoint" : "https://objectstorage.us-ashburn-1.oraclecloud.com"`
- namespace
  Example: `"namespace" : "my-namespace"`
- bucket
  Example: `"bucket" : "my-bucket"`
- prefix
  Example:
  1. `"prefix" : "mongo_export/Data/table.json"` (migrates only `table.json`)
  2. `"prefix" : "mongo_export/Data"` (migrates all the objects with prefix `mongo_export/Data`)

  > **Note:**
  >
  > If you do not provide any value, all the objects present in the bucket are migrated.

- credentials
  Example:
  1. `"credentials" : "/home/user/.oci/config"`
  2. `"credentials" : "/home/user/security/config"`
- credentialsProfile
  Example:
  1. `"credentialsProfile" : "DEFAULT"`
  2. `"credentialsProfile" : "ADMIN_USER"`
- useInstancePrincipal
  Example: `"useInstancePrincipal" : true`

#### Unique Configuration Parameters

- schemaInfo

- schemaInfo.schemaObject

**schemaInfo**

- **Purpose:** Specifies the schema of the source data being migrated. This schema is passed to the NoSQL sink.
- **Data Type:** Object
- **Mandatory (Y/N):** N

**schemaInfo.schemaObject**

- **Purpose:** Specifies the name of the object in the bucket where NoSQL table schema definitions for the data being migrated are stored.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**

```
"schemaInfo": {
  "schemaObject": "mytable/Schema/schema.ddl"
}
```

## DynamoDB-Formatted JSON File stored in AWS S3

The configuration file format for DynamoDB-formatted JSON File in AWS S3 as a source of NoSQL Database Migrator is shown below.

You can migrate a file containing the DynamoDB exported JSON data from the AWS S3 storage by specifying the path in the source configuration template.

A sample DynamoDB-formatted JSON File is as follows:

```
{"Item":{"Id":{"N":"101"},"Phones":{"L":[{"L":[{"S":"555-222"},
{"S":"123-567"}]}]},"PremierCustomer":{"BOOL":false},"Address":{"M":{"Zip":
{"N":"570004"},"Street":{"S":"21 main"},"DoorNum":{"N":"201"},"City":
{"S":"London"}}},"FirstName":{"S":"Fred"},"FavNumbers":{"NS":
["10"]},"LastName":{"S":"Smith"},"FavColors":{"SS":["Red","Green"]},"Age":
{"N":"22"},"ttl": {"N": "1734616800"}}}
{"Item":{"Id":{"N":"102"},"Phones":{"L":[{"L":
[{"S":"222-222"}]}]},"PremierCustomer":{"BOOL":false},"Address":{"M":{"Zip":
{"N":"560014"},"Street":{"S":"32 main"},"DoorNum":{"N":"1024"},"City":
{"S":"Wales"}}},"FirstName":{"S":"John"},"FavNumbers":{"NS":
["10"]},"LastName":{"S":"White"},"FavColors":{"SS":["Blue"]},"Age":
{"N":"48"},"ttl": {"N": "1734616800"}}}
```

You must export the DynamoDB table to AWS S3 storage as specified in Exporting DynamoDB table data to Amazon S3.

The valid sink types for DynamoDB-formatted JSON stored in AWS S3 are `nosqldb` and `nosqldb_cloud`.

**Source Configuration Template**

```
"source" : {
  "type" : "aws_s3",
```

```
  "format" : "dynamodb_json",
  "ttlAttributeName" : <DynamoDB exported TTL attribute name>,
  "s3URL" : "<S3 object url>",
  "credentials" : "</path/to/aws/credentials/file>",
  "credentialsProfile" : <"profile name in aws credentials file">
}
```

### Source Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "aws_s3"`
- format
  Use `"format" : "dynamodb_json"`

> **Note:**
>
> If the value of the `type` parameter is `aws_s3`, then the format must be `dynamodb_json`.

#### Unique Configuration Parameters

- s3URL
- credentials
- credentialsProfile
- ttlAttributeName

#### s3URL

- **Purpose:** Specifies the URL of an exported DynamoDB table stored in AWS S3. You can obtain this URL from the AWS S3 console. The valid URL format is `https://<bucket-name>.<s3_endpoint>/<prefix>`. The NoSQL Database Migrator will look for `json.gz` files in the prefix during import.

> **Note:**
>
> You must export DynamoDB table as specified in Exporting DynamoDB table data to Amazon S3.

- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:** `https://my-bucket.s3.ap-south-1.amazonaws.com/AWSDynamoDB/01649660790057-14f642be`

#### credentials

- **Purpose:** Specifies the absolute path to a file containing the AWS credentials. If not specified, it defaults to `$HOME/.aws/credentials`. For more details on the credentials file, see Configuration and credential file settings .
- **Data Type:** string

- **Mandatory (Y/N):** N
- **Example:**
  ```
  "credentials" : "/home/user/.aws/credentials"
  ```
  ```
  "credentials" : "/home/user/security/credentials
  ```

> **Note:**
>
> The NoSQL Database Migrator does not log any of the credentials information. You must properly protect the credentials file from unauthorized access.

**credentialsProfile**

- **Purpose:** Name of the profile in the AWS credentials file to be used to connect to AWS S3. User account credentials are referred to as a *profile*. If you do not specify this value, NoSQL Database Migrator uses the `default` profile. For more details on the credentials file, see Configuration and credential file settings .
- **Data Type:** string
- **Mandatory (Y/N):** N
- **Example:**
  ```
  "credentialsProfile" : "default"
  ```
  ```
  "credentialsProfile" : "test"
  ```

**ttlAttributeName**

- **Purpose:** Specifies the name of TTL attribute present in the exported DynamoDB table data. You include this parameter only if the DynamoDB table data has a TTL attribute and you want to set the TTL value on imported data while importing to NoSQL Database.

> **Note:**
>
> To import with the TTL metadata, you must set the `includeTTL` configuration parameter to true in the sink configuration template (`nosqldb` and `nosqldb_cloud`).

- **Data Type:** string
- **Mandatory (Y/N):** N
- **Example:** `"ttlAttributeName" : "ttl"`

## DynamoDB-Formatted JSON File

The configuration file format for DynamoDB-formatted JSON File as a source of NoSQL Database Migrator is shown below.

You can migrate a file or directory containing the DynamoDB exported JSON data from a file system by specifying the path in the source configuration template.

A sample DynamoDB-formatted JSON File is as follows:

```
{"Item":{"Id":{"N":"101"},"Phones":{"L":[{"L":[{"S":"555-222"},
{"S":"123-567"}]}]},"PremierCustomer":{"BOOL":false},"Address":{"M":{"Zip":
```

{"N":"570004"},"Street":{"S":"21 main"},"DoorNum":{"N":"201"},"City":
{"S":"London"}}},"FirstName":{"S":"Fred"},"FavNumbers":{"NS":
["10"]},"LastName":{"S":"Smith"},"FavColors":{"SS":["Red","Green"]},"Age":
{"N":"22"},"ttl": {"N": "1734616800"}}}
{"Item":{"Id":{"N":"102"},"Phones":{"L":[{"L":
[{"S":"222-222"}]}]},"PremierCustomer":{"BOOL":false},"Address":{"M":{"Zip":
{"N":"560014"},"Street":{"S":"32 main"},"DoorNum":{"N":"1024"},"City":
{"S":"Wales"}}},"FirstName":{"S":"John"},"FavNumbers":{"NS":
["10"]},"LastName":{"S":"White"},"FavColors":{"SS":["Blue"]},"Age":
{"N":"48"},"ttl": {"N": "1734616800"}}}

You must copy the exported DynamoDB table data from AWS S3 storage to a local mounted file system.

The valid sink types for DynamoDB JSON file are `nosqldb` and `nosqldb_cloud`.

**Source Configuration Template**

```
"source" : {
  "type" : "file",
  "format" : "dynamodb_json",
  "ttlAttributeName" : <DynamoDB exported TTL attribute name>,
  "dataPath" : "<path/to/[file|dir]/containing/exported/DDB/tabledata>"
}
```

**Source Parameters**

**Common Configuration Parameters**

- type
  Use `"type" : "file"`
- format
  Use `"format" : "dynamodb_json"`

**Unique Configuration Parameter**

- dataPath
- ttlAttributeName

**dataPath**

- **Purpose:** Specifies the absolute path to a file or directory containing the exported DynamoDB table data. You must copy exported DynamoDB table data from AWS S3 to a local mounted file system. You must ensure that this data matches with the NoSQL table schema defined at the sink. If you specify a directory, the NoSQL Database Migrator identifies all the files with the `.json.gz` extension in that directory and the `data` sub-directory.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**

- Specifying a file

```
"dataPath" : "/home/user/AWSDynamoDB/01639372501551-bb4dd8c3/data/
zclclwucjy6v5mkefvckxzhfvq.json.gz"
```

- Specifying a directory

```
"dataPath" : "/home/user/AWSDynamoDB/01639372501551-bb4dd8c3"
```

**ttlAttributeName**

- **Purpose:** Specifies the name of TTL attribute present in the exported DynamoDB table data. You include this parameter only if the DynamoDB table data has a TTL attribute and you want to set the TTL value on imported data while importing to NoSQL Database.

> **Note:**
>
> To import with the TTL metadata, you must set the `includeTTL` configuration parameter to true in the sink configuration template (`nosqldb` and `nosqldb_cloud`).

- **Data Type:** string
- **Mandatory (Y/N):** N
- **Example:** `"ttlAttributeName" : "ttl"`

## Oracle NoSQL Database

The configuration file format for Oracle NoSQL Database as a source of NoSQL Database Migrator is shown below.

You can migrate a table from Oracle NoSQL Database by specifying the table name in the source configuration template.

A sample Oracle NoSQL Database table is as follows:

```
{"id":20,"firstName":"Jane","lastName":"Smith","otherNames":
[{"first":"Jane","last":"teacher"}],"age":25,"income":55000,"address":
{"city":"San Jose","number":201,"phones":
[{"area":608,"kind":"work","number":6538955},
{"area":931,"kind":"home","number":9533341},
{"area":931,"kind":"mobile","number":9533382}],"state":"CA","street":"Atlantic
 Ave","zip":95005},"connections":[40,75,63],"expenses":null}
{"id":10,"firstName":"John","lastName":"Smith","otherNames":
[{"first":"Johny","last":"chef"}],"age":22,"income":45000,"address":
{"city":"Santa Cruz","number":101,"phones":
[{"area":408,"kind":"work","number":4538955},
{"area":831,"kind":"home","number":7533341},
{"area":831,"kind":"mobile","number":7533382}],"state":"CA","street":"Pacific
Ave","zip":95008},"connections":[30,55,43],"expenses":null}
{"id":30,"firstName":"Adam","lastName":"Smith","otherNames":
[{"first":"Adam","last":"handyman"}],"age":45,"income":75000,"address":
{"city":"Houston","number":301,"phones":
[{"area":618,"kind":"work","number":6618955},
```

```
{"area":951,"kind":"home","number":9613341},
{"area":981,"kind":"mobile","number":9613382}],"state":"TX","street":"Indian
Ave","zip":95075},"connections":[60,45,73],"expenses":null}
```

### Source Configuration Template

```
"source" : {
  "type": "nosqldb",
  "storeName" : "<store name>",
  "helperHosts" : ["hostname1:port1","hostname2:port2,..."],
  "table" : "<fully qualified table name>",
  "includeTTL": <true|false>,
  "security" : "</path/to/store/security/file>",
  "requestTimeoutMs" : 5000
}
```

### Source Parameters

#### Common Configuration Parameter

- type
  Use `"type" : "nosqldb"`
- security
  Example:

  ```
  "security" : "/home/user/client.credentials"
  ```

  Example security file content for password file based authentication:

  ```
  oracle.kv.password.noPrompt=true
  oracle.kv.auth.username=admin
  oracle.kv.auth.pwdfile.file=/home/nosql/login.passwd
  oracle.kv.transport=ssl
  oracle.kv.ssl.trustStore=/home/nosql/client.trust
  oracle.kv.ssl.protocols=TLSv1.2
  oracle.kv.ssl.hostnameVerifier=dnmatch(CN\=NoSQL)
  ```

  Example security file content for wallet based authentication:

  ```
  oracle.kv.password.noPrompt=true
  oracle.kv.auth.username=admin
  oracle.kv.auth.wallet.dir=/home/nosql/login.wallet
  oracle.kv.transport=ssl
  oracle.kv.ssl.trustStore=/home/nosql/client.trust
  oracle.kv.ssl.protocols=TLSv1.2
  oracle.kv.ssl.hostnameVerifier=dnmatch(CN\=NoSQL)
  ```

- requestTimeoutMs
  Example: `"requestTimeoutMs" : 5000`

#### Unique Configuration Parameters

- storeName
- helperHosts
- table

- includeTTL

**storeName**

- **Purpose:** Name of the Oracle NoSQL Database store.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:** `"storeName" : "kvstore"`

**helperHosts**

- **Purpose:** A list of host and registry port pairs in the `hostname:port` format. Delimit each item in the list using a comma. You must specify at least one helper host.
- **Data Type:** array of strings
- **Mandatory (Y/N):** Y
- **Example:** `"helperHosts" : ["localhost:5000","localhost:6000"]`

**table**

- **Purpose:** Fully qualified table name from which to migrate the data.

  Format: `[namespace_name:]<table_name>`

  If the table is in the DEFAULT namespace, you can omit the `namespace_name`. The table must exist in the store.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**
  - With the DEFAULT namespace `"table" :"mytable"`
  - With a non-default namespace `"table" : "mynamespace:mytable"`
  - To specify a child table `"table" : "mytable.child"`

**includeTTL**

- **Purpose:** Specifies whether or not to include TTL metadata for table rows when exporting Oracle NoSQL Database tables. If set to true, the TTL data for rows also gets included in the data provided by the source. TTL is present in the `_metadata` JSON object associated with each row. The expiration time for each row gets exported as the number of milliseconds since the UNIX epoch (Jan 1st, 1970).

  If you do not specify this parameter, it defaults to `false`.

  Only the rows having a positive expiration value for TTL get included as part of the exported rows. If a row does not expire, which means TTL=0, then its TTL metadata is not included explicitly. For example, if ROW1 expires at 2021-10-19 00:00:00 and ROW2 does not expire, the exported data looks like as follows:

```
//ROW1
{
  "id" : 1,
  "name" : "abc",
  "_metadata" : {
    "expiration" : 1634601600000
```

```
    }
  }

  //ROW2
  {
    "id" : 2,
    "name" : "xyz"
  }
```

- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"includeTTL" : true`

## Oracle NoSQL Database Cloud Service

The configuration file format for Oracle NoSQL Database Cloud Service as a source of NoSQL Database Migrator is shown below.

You can migrate a table from Oracle NoSQL Database Cloud Service by specifying the name or OCID of the compartment in which the table resides in the source configuration template.

A sample Oracle NoSQL Database Cloud Service table is as follows:

```
{"id":20,"firstName":"Jane","lastName":"Smith","otherNames":
[{"first":"Jane","last":"teacher"}],"age":25,"income":55000,"address":
{"city":"San Jose","number":201,"phones":
[{"area":608,"kind":"work","number":6538955},
{"area":931,"kind":"home","number":9533341},
{"area":931,"kind":"mobile","number":9533382}],"state":"CA","street":"Atlantic
 Ave","zip":95005},"connections":[40,75,63],"expenses":null}
{"id":10,"firstName":"John","lastName":"Smith","otherNames":
[{"first":"Johny","last":"chef"}],"age":22,"income":45000,"address":
{"city":"Santa Cruz","number":101,"phones":
[{"area":408,"kind":"work","number":4538955},
{"area":831,"kind":"home","number":7533341},
{"area":831,"kind":"mobile","number":7533382}],"state":"CA","street":"Pacific
Ave","zip":95008},"connections":[30,55,43],"expenses":null}
{"id":30,"firstName":"Adam","lastName":"Smith","otherNames":
[{"first":"Adam","last":"handyman"}],"age":45,"income":75000,"address":
{"city":"Houston","number":301,"phones":
[{"area":618,"kind":"work","number":6618955},
{"area":951,"kind":"home","number":9613341},
{"area":981,"kind":"mobile","number":9613382}],"state":"TX","street":"Indian
Ave","zip":95075},"connections":[60,45,73],"expenses":null}
```

### Source Configuration Template

```
"source" : {
  "type" : "nosqldb_cloud",
  "endpoint" : "<Oracle NoSQL Cloud Service endpoint URL or region ID>",
  "table" : "<table name>",
  "compartment" : "<OCI compartment name or id>",
  "credentials" : "<path/to/oci/credential/file>",
  "credentialsProfile" : "<profile name in oci config file>",
  "useInstancePrincipal" : <true|false>,
```

```
  "useDelegationToken" : <true|false>,
  "readUnitsPercent" : <table readunits percent>,
  "includeTTL": <true|false>,
  "requestTimeoutMs" : <timeout in milli seconds>
}
```

### Source Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "nosqldb_cloud"`
- endpoint
  Example:
  - Region ID: `"endpoint" : "us-ashburn-1"`
  - URL format: `"endpoint" : "https://objectstorage.us-ashburn-1.oraclecloud.com"`
- credentials
  Example:
  1. `"credentials" : "/home/user/.oci/config"`
  2. `"credentials" : "/home/user/security/config"`
- credentialsProfile
  Example:
  1. `"credentialsProfile" : "DEFAULT"`
  2. `"credentialsProfile" : "ADMIN_USER"`
- useInstancePrincipal
  Example: `"useInstancePrincipal" : true`
- useDelegationToken
  Example: `"useDelegationToken" : true`

> **Note:**
>
> The authentication with delegation token is supported only when the NoSQL Database Migrator is running from a Cloud Shell.

- requestTimeoutMs
  Example: `"requestTimeoutMs" : 5000`

#### Unique Configuration Parameters

- table
- compartment
- readUnitsPercent
- includeTTL

#### table

- **Purpose:** Name of the table from which to migrate the data.

- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**
  - To specify a table `"table" : "myTable"`
  - To specify a child table `"table" : "mytable.child"`

**compartment**

- **Purpose:** Specifies the name or OCID of the compartment in which the table resides.

  If you do not provide any value, it defaults to the *root* compartment.

  You can find your compartment's OCID from the Compartment Explorer window under Governance in the OCI Cloud Console.
- **Data Type:** string
- **Mandatory (Y/N):** Y, if the table is not in the root compartment of the tenancy OR when the `useInstancePrincipal` parameter is set to true.

> **Note:**
>
> If the `useInstancePrincipal` parameter is set to true, the compartment must specify the compartment OCID and not the name.

- **Example:**
  - Compartment name

    `"compartment" : "mycompartment"`
  - Compartment name qualified with its parent compartment

    `"compartment" : "parent.childcompartment"`
  - No value provided. Defaults to the root compartment.

    `"compartment": ""`
  - Compartment OCID

    `"compartment" : "ocid1.tenancy.oc1...4ksd"`

**readUnitsPercent**

- **Purpose:** Percentage of table read units to be used while migrating the NoSQL table.

  The default value is 90. The valid range is any integer between 1 to 100. The amount of time required to migrate data is directly proportional to this attribute. It is better to increase the read throughput of the table for the migration activity. You can reduce the read throughput after the migration process completes.

  To learn the daily limits on throughput changes, see Cloud Limits in the *Oracle NoSQL Database Cloud Service* document.

  See Troubleshooting the Oracle NoSQL Database Migrator to learn how to use this attribute to improve the data migration speed.
- **Data Type:** integer
- **Mandatory (Y/N):** N

- **Example:** `"readUnitsPercent" : 90`

**includeTTL**

- **Purpose:** Specifies whether or not to include TTL metadata for table rows when exporting Oracle NoSQL Database tables. If set to true, the TTL data for rows also gets included in the data provided by the source. TTL is present in the `_metadata` JSON object associated with each row. The expiration time for each row gets exported as the number of milliseconds since the UNIX epoch (Jan 1st, 1970).

  If you do not specify this parameter, it defaults to `false`.

  Only the rows having a positive expiration value for TTL get included as part of the exported rows. If a row does not expire, which means TTL=0, then its TTL metadata is not included explicitly. For example, if ROW1 expires at 2021-10-19 00:00:00 and ROW2 does not expire, the exported data looks like as follows:

```
//ROW1
{
  "id" : 1,
  "name" : "abc",
  "_metadata" : {
    "expiration" : 1634601600000
  }
}

//ROW2
{
  "id" : 2,
  "name" : "xyz"
}
```

- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"includeTTL" : true`

## CSV File Source

The configuration file format for the CSV file as a source of NoSQL Database Migrator is shown below. The CSV file must conform to the `RFC4180` format.

You can migrate a CSV file or a directory containing the CSV data by specifying the file name or directory in the source configuration template.

A sample CSV file is as follows:

```
1,"Computer Science","San Francisco","2500"
2,"Bio-Technology","Los Angeles","1200"
3,"Journalism","Las Vegas","1500"
4,"Telecommunication","San Francisco","2500"
```

**Source Configuration Template**

```
"source" : {
  "type" : "file",
  "format" : "csv",
```

```
  "dataPath": "</path/to/a/csv/[file|dir]>",
  "hasHeader" : <true | false>,
  "columns" : ["column1", "column2", ....],
  "csvOptions": {
    "encoding": "<character set encoding>",
    "trim": "<true | false>"
 }
}
```

### Source Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "file"`
- format
  Use `"format" : "csv"`

#### Unique Configuration Parameters

- dataPath
- hasHeader
- columns
- csvOptions
- csvOptions.encoding
- csvOptions.trim

#### datapath

- **Purpose:** Specifies the absolute path to a file or directory containing the CSV data for migration. If you specify a directory, NoSQL Database Migrator imports all the files with the `.csv` or `.CSV` extension in that directory. All the CSV files are copied into a single table, but not in any particular order.

  CSV files must conform to the `RFC4180` standard. You must ensure that the data in each CSV file matches with the NoSQL Database table schema defined in the sink table. Sub-directories are not supported.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**
  - Specifying a CSV file

    ```
    "dataPath" : "/home/user/sample.csv"
    ```
  - Specifying a directory

    ```
    "dataPath" : "/home/user"
    ```

> **Note:**
>
> The CSV files must contain only scalar values. Importing CSV files containing complex types such as MAP, RECORD, ARRAY, and JSON is not supported. The NoSQL Database Migrator tool does not check for the correctness of the data in the input CSV file. The NoSQL Database Migrator tool supports the importing of CSV data that conforms to the `RFC4180` format. CSV files containing data that does not conform to the `RFC4180` standard may not get copied correctly or may result in an error. If the input data is corrupted, the NoSQL Database Migrator tool will not parse the CSV records. If any errors are encountered during migration, the NoSQL Database Migrator tool logs the information about the failed input records for debugging and informative purposes. For more details, see *Logging Migrator Progress* in Using Oracle NoSQL Data Migrator.

**hasHeader**

- **Purpose:** Specifies if the CSV file has a header or not. If this is set to `true`, the first line is ignored. If it is set to `false`, the first line is considered a CSV record. The default value is `false`.
- **Data Type:** Boolean
- **Mandatory (Y/N):** N
- **Example:** `"hasHeader" : "false"`

**columns**

- **Purpose:** Specifies the list of NoSQL Database table column names. The order of the column names indicates the mapping of the CSV file fields with corresponding NoSQL Database table columns. If the order of the input CSV file columns does not match the existing or newly created NoSQL Database table columns, you can map the ordering using this parameter. Also, when importing into a table that has an Identity Column, you can skip the Identity column name in the `columns` parameter.

  > **Note:**
  >
  > – If the NoSQL Database table has additional columns that are not available in the CSV file, the values of the missing columns are updated with the default value as defined in the NoSQL Database table. If a default value is not provided, a Null value is inserted during migration. For more information on default values, see Data Type Definitions section in the *SQL Reference Guide*.
  >
  > – If the CSV file has additional columns that are not defined in the NoSQL Database table, the additional column information is ignored.
  >
  > – If any value in the CSV record is empty, it is set to the default value of the corresponding columns in the NoSQL Database table. If a default value is not provided, a Null value is inserted during migration.

- **Data Type:** Array of Strings
- **Mandatory (Y/N):** N

- **Example:** `"columns" : ["table_column_1", "table_column_2"]`

**csvOptions**

- **Purpose:** Specifies the formatting options for a CSV file. Provide the character set encoding format of the CSV file and choose whether or not to trim the blank spaces.
- **Data Type:** Object
- **Mandatory (Y/N):** N

**csvOptions.encoding**

- **Purpose:** Specifies the character set to decode the CSV file. The default value is `UTF-8`. The supported character sets are `US-ASCII`, `ISO-8859-1`, `UTF-8`, and `UTF-16`.
- **Data Type:** String
- **Mandatory (Y/N):** N
- **Example:** `"encoding" : "UTF-8"`

**csvOptions.trim**

- **Purpose:** Specifies if the leading and trailing blanks of a CSV field value must be trimmed. The default value is `false`.
- **Data Type:** Boolean
- **Mandatory (Y/N):** N
- **Example:** `"trim" : "true"`

## CSV file in OCI Object Storage Bucket

The configuration file format for the CSV file in OCI Object Storage bucket as a source of NoSQL Database Migrator is shown below. The CSV file must conform to the `RFC4180` format.

You can migrate a CSV file in the OCI Object Storage bucket by specifying the name of the bucket in the source configuration template.

A sample CSV file in the OCI Object Storage bucket is as follows:

```
1,"Computer Science","San Francisco","2500"
2,"Bio-Technology","Los Angeles","1200"
3,"Journalism","Las Vegas","1500"
4,"Telecommunication","San Francisco","2500"
```

> **Note:**
>
> The valid sink types for OCI Object Storage source type are `nosqldb` and `nosqldb_cloud`.

**Source Configuration Template**

```
"source" : {
  "type" : "object_storage_oci",
  "format" : "csv",
```

```
"endpoint" : "<OCI Object Storage service endpoint URL or region ID>",
"namespace" : "<OCI Object Storage namespace>",
"bucket" : "<bucket name>",
"prefix" : "<object prefix>",
"credentials" : "</path/to/oci/config/file>",
"credentialsProfile" : "<profile name in oci config file>",
"useInstancePrincipal" : <true|false>,
 "hasHeader" : <true | false>,
 "columns" : ["column1", "column2", ....],
 "csvOptions" : {
   "encoding" : "<character set encoding>",
   "trim" : <true | false>
 }
}
```

### Source Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "object_storage_oci"`
- format
  Use `"format" : "csv"`
- endpoint
  Example:
  - Region ID: `"endpoint" : "us-ashburn-1"`
  - URL format: `"endpoint" : "https://objectstorage.us-ashburn-1.oraclecloud.com"`
- namespace
  Example: `"namespace" : "my-namespace"`
- bucket
  Example: `"bucket" : "my-bucket"`

> **Note:**
>
> - The NoSQL Database Migrator imports all the files with the `.csv` or `.CSV` extension object-wise and copies them into a single table in the same order.
> - The CSV files must contain only scalar values. Importing CSV files containing complex types such as MAP, RECORD, ARRAY, and JSON is not supported. The NoSQL Database Migrator tool does not check for the correctness of the data in the input CSV file. The NoSQL Database Migrator tool supports the importing of CSV data that conforms to the `RFC4180` format. CSV files containing data that does not conform to the `RFC4180` standard may not get copied correctly or may result in an error. If the input data is corrupted, the NoSQL Database Migrator tool will not parse the CSV records. If any errors are encountered during migration, the NoSQL Database Migrator tool logs the information about the failed input records for debugging and informative purposes. For more details, see *Logging Migrator Progress* in Using Oracle NoSQL Data Migrator.

- prefix
  Example:
  1. `"prefix" : "my_table/Data/000000.csv"` (migrates only `000000.csv`)
  2. `"prefix" : "my_table/Data"` (migrates all the objects with prefix `my_table/Data`)
- credentials
  Example:
  1. `"credentials" : "/home/user/.oci/config"`
  2. `"credentials" : "/home/user/security/config"`
- credentialsProfile
  Example:
  1. `"credentialsProfile" : "DEFAULT"`
  2. `"credentialsProfile" : "ADMIN_USER"`
- useInstancePrincipal
  Example: `"useInstancePrincipal" : true`

**Unique Configuration Parameters**

- hasHeader
- columns
- csvOptions
- csvOptions.encoding
- csvOptions.trim

**hasHeader**

- **Purpose:** Specifies if the CSV file has a header or not. If this is set to `true`, the first line is ignored. If it is set to `false`, the first line is considered a CSV record. The default value is `false`.
- **Data Type:** Boolean
- **Mandatory (Y/N):** N
- **Example:** `"hasHeader" : "false"`

**columns**

- **Purpose:** Specifies the list of NoSQL Database table column names. The order of the column names indicates the mapping of the CSV file fields with corresponding NoSQL Database table columns. If the order of the input CSV file columns does not match the existing or newly created NoSQL Database table columns, you can map the ordering using this parameter. Also, when importing into a table that has an Identity Column, you can skip the Identity column name in the `columns` parameter.

> **Note:**
>
> - If the NoSQL Database table has additional columns that are not available in the CSV file, the values of the missing columns are updated with the default value as defined in the NoSQL Database table. If a default value is not provided, a Null value is inserted during migration. For more information on default values, see Data Type Definitions section in the *SQL Reference Guide*.
> - If the CSV file has additional columns that are not defined in the NoSQL Database table, the additional column information is ignored.
> - If any value in the CSV record is empty, it is set to the default value of the corresponding columns in the NoSQL Database table. If a default value is not provided, a Null value is inserted during migration.

- **Data Type:** Array of Strings
- **Mandatory (Y/N):** N
- **Example:** `"columns" : ["table_column_1", "table_column_2"]`

**csvOptions**

- **Purpose:** Specifies the formatting options for a CSV file. Provide the character set encoding format of the CSV file and choose whether or not to trim the blank spaces.
- **Data Type:** Object
- **Mandatory (Y/N):** N

**csvOptions.encoding**

- **Purpose:** Specifies the character set to decode the CSV file. The default value is `UTF-8`. The supported character sets are `US-ASCII`, `ISO-8859-1`, `UTF-8`, and `UTF-16`.
- **Data Type:** String
- **Mandatory (Y/N):** N
- **Example:** `"encoding" : "UTF-8"`

**csvOptions.trim**

- **Purpose:** Specifies if the leading and trailing blanks of a CSV field value must be trimmed. The default value is `false`.
- **Data Type:** Boolean
- **Mandatory (Y/N):** N
- **Example:** `"trim" : "true"`

# Sink Configuration Templates

Learn about the sink configuration file formats for each valid sink and the purpose of each configuration parameter.

For the configuration file template, see **Configuration File** in Terminology used with Oracle NoSQL Database Migrator.
For details on valid source formats for each of the sinks, see Source Configuration Templates.

### Topics

The following topics describe the sink configuration templates referred by Oracle NoSQL Database Migrator to copy the data from a valid source to the given sink.

- JSON File Sink
  Specified JSON file.
- Parquet File
  Parquet file in the specified directory.
- JSON File in OCI Object Storage Bucket
  JSON file in the specified OCI Object Storage bucket.
- Parquet File in OCI Object Storage Bucket
  Parquet file in the specified OCI Object Storage bucket.
- Oracle NoSQL Database
  Specified table in Oracle NoSQL Database.
- Oracle NoSQL Database Cloud Service
  Specified table in Oracle NoSQL Database Cloud Service.

## JSON File Sink

The configuration file format for JSON File as a sink of NoSQL Database Migrator is shown below.

### Sink Configuration Template

```
"sink" : {
  "type" : "file",
  "format" : "json",
  "dataPath": "</path/to/a/directory>",
  "schemaPath" : "<path/to/a/file>",
  "pretty" : <true|false>,
  "useMultiFiles" : <true|false>,
  "chunkSize" : <size in MB>
}
```

### Sink Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "file"`
- format
  Use `"format" : "json"`
- chunkSize
  Example: `"chunkSize" : 40`

> **Note:**
>
> This parameter is applicable ONLY when the `useMultiFiles` parameter is set to true.

### Unique Configuration Parameters

- dataPath
- schemaPath
- pretty
- useMultiFiles

#### dataPath

- **Purpose:** Specifies the path to a directory where NoSQL Database Migrator copies the source data in the JSON format.

  NoSQL Database Migrator creates JSON files in the specified directory. If the files exist, NoSQL Database Migrator overwrites their content with source data.

  Ensure that the directory already exists and has read and write permissions.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:** `"dataPath" : "/home/user/data"`

  After successful migration, the directory specified in the `dataPath` parameter will include exported files as shown in the following sample:

```
|--<Table_name>_1_5.json
|--<Table_name>_6_10.json
...
```

#### schemaPath

- **Purpose:** Specifies the absolute path to a file to write table schema information provided by the source.

  If this value is not defined, the source schema information will not be migrated to the sink. If this value is specified, the migrator utility writes the schema of the source table into the file specified here.

  The schema information is written as one DDL command per line in this file. If the file does not exist in the specified data path, NoSQL Database Migrator creates it. If it exists already, NoSQL Database Migrator will overwrite its contents with the source data. You must ensure that the parent directory in the data path is valid for the specified file.
- **Data Type:** string
- **Mandatory (Y/N):** N
- **Example:** `"schemaPath" : "/home/user/schema_file"`

#### pretty

- **Purpose:** Specifies whether or not to beautify the JSON output to increase readability.

  If not specified, it defaults to false.
- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"pretty" : true`

#### useMultiFiles

- **Purpose:** Specifies whether or not to further split the exported files (created under the directory specified in the `dataPath` parameter) into multiple sub-files of a specific size while migrating NoSQL Database table data to a directory.

  NoSQL Database Migrator splits the NoSQL Database table data into multiple files while exporting data. If `useMultiFiles` parameter is set to true, each exported file is further split into sub-files of size specified in the `chunkSize` parameter.
  The `useMultiFiles` parameter defaults to false.

  Example: After successful migration, the directory specified in the `dataPath` parameter will include exported files as shown in the following sample:

  ```
  |--<Table_name>_1_5_0.json
  |--<Table_name>_1_5_1.json
  |--<Table_name>_6_10_0.json
  |--<Table_name>_6_10_1.json
  |--<Table_name>_6_10_2.json
  ...
  ```

- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"useMultiFiles" : true`

## Parquet File

The configuration file format for Parquet File as a sink of NoSQL Database Migrator is shown below.

#### Sink Configuration Template

```
"sink" : {
  "type" : "file",
  "format" : "parquet",
  "dataPath": "</path/to/a/dir>",
  "chunkSize" : <size in MB>,
  "compression": "<SNAPPY|GZIP|NONE>",
  "parquetOptions": {
    "useLogicalJson": <true|false>,
    "useLogicalEnum": <true|false>,
    "useLogicalUUID": <true|false>,
    "truncateDoubleSpecials": <true|false>
  }
}
```

#### Sink Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "file"`
- format
  Use `"format" : "parquet"`

- chunkSize
  Example: `"chunkSize" : 40`

**Unique Configuration Parameters**

- dataPath
- compression
- parquetOptions
- parquetOptions.useLogicalJson
- parquetOptions.useLogicalEnum
- parquetOptions.useLogicalUUID
- parquetOptions.truncateDoubleSpecials

**dataPath**

- **Purpose:** Specifies the path to a directory for storing the migrated NoSQL table data. Ensure that the directory already exists and has read and write permissions.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:** `"dataPath" : "/home/user/migrator/my_table"`

**compression**

- **Purpose:** Specifies the compression type to use to compress the Parquet data. Valid values are `SNAPPY`, `GZIP`, and `NONE`.

  If not specified, it defaults to `SNAPPY`.
- **Data Type:** string
- **Mandatory (Y/N):** N
- **Example:** `"compression" : "GZIP"`

**parquetOptions**

- **Purpose:** Specifies the options to select Parquet logical types for NoSQL ENUM, JSON, and UUID columns.

  If you do not specify this parameter, the NoSQL Database Migrator writes the data of ENUM, JSON, and UUID columns as String.
- **Data Type:** object
- **Mandatory (Y/N):** N

**parquetOptions.useLogicalJson**

- **Purpose:** Specifies whether or not to write NoSQL JSON column data as Parquet logical JSON type. For more information, see Parquet Logical Type Definitions.

  If not specified or set to false, NoSQL Database Migrator writes the NoSQL JSON column data as String.
- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"useLogicalJson" : true`

**parquetOptions.useLogicalEnum**

- **Purpose:** Specifies whether or not to write NoSQL ENUM column data as Parquet logical ENUM type. For more information, see Parquet Logical Type Definitions.

  If not specified or set to false, NoSQL Database Migrator writes the NoSQL ENUM column data as String.
- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"useLogicalEnum" : true`

**parquetOptions.useLogicalUUID**

- **Purpose:** Specifies whether or not to write NoSQL UUID column data as Parquet logical UUID type. For more information, see Parquet Logical Type Definitions.

  If not specified or set to false, NoSQL Database Migrator writes the NoSQL UUID column data as String.
- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"useLogicalUUID" : true`

**parquetOptions.truncateDoubleSpecials**

- **Purpose:** Specifies whether or not to truncate the double +Infinity, -Infinity, and NaN values.

  By default, it is set to `false`. If set to `true`,
  - Positive_Infinity is truncated to Double.MAX_VALUE.
  - NEGATIVE_INFINITY is truncated to -Double.MAX_VALUE.
  - NaN is truncated to 9.9999999999999990E307.
- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"truncateDoubleSpecials" : true`

## JSON File in OCI Object Storage Bucket

The configuration file format for JSON file in OCI Object Storage bucket as a sink of NoSQL Database Migrator is shown below.

> **Note:**
>
> The valid source types for OCI Object Storage as the sink are `nosqldb` and `nosqldb_cloud`.

**Sink Configuration Template**

```
"sink" : {
  "type" : "object_storage_oci",
```

```
  "format" : "json",
  "endpoint" : "<OCI Object Storage service endpoint URL or region ID>",
  "namespace" : "<OCI Object Storage namespace>",
  "bucket" : "<bucket name>",
  "prefix" : "<object prefix>",
  "chunkSize" : <size in MB>,
  "pretty" : <true|false>,
  "credentials" : "</path/to/oci/config/file>",
  "credentialsProfile" : "<profile name in oci config file>",
  "useInstancePrincipal" : <true|false>,
  "useDelegationToken" : <true|false>
}
```

### Sink Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "object_storage_oci"`
- format
  Use `"format" : "json"`
- endpoint
  Example:
  - Region ID: `"endpoint" : "us-ashburn-1"`
  - URL format: `"endpoint" : "https://objectstorage.us-ashburn-1.oraclecloud.com"`
- namespace
  Example: `"namespace" : "my-namespace"`
- bucket
  Example: `"bucket" : "my-bucket"`
- prefix
  Schema is migrated to the *<prefix>*`/Schema/schema.ddl` file and source data is migrated to the *<prefix>*`/Data/`*<chunk>*`.json` files, where chunk=000000.json, 000001.json, and so forth.

  Example:

  1. `"prefix" : "my_export"`
  2. `"prefix" : "my_export/2021-04-05/"`
- chunkSize
  Example: `"chunkSize" : 40`
- credentials
  Example:

  1. `"credentials" : "/home/user/.oci/config"`
  2. `"credentials" : "/home/user/security/config"`
- credentialsProfile
  Example:

  1. `"credentialsProfile" : "DEFAULT"`
  2. `"credentialsProfile" : "ADMIN_USER"`

- useInstancePrincipal
  Example: `"useInstancePrincipal" : true`
- useDelegationToken
  Example: `"useDelegationToken" : true`

> **Note:**
>
> The authentication with delegation token is supported only when the NoSQL Database Migrator is running from a Cloud Shell.

**Unique Configuration Parameter**

**pretty**

- **Purpose:** Specifies whether or not to beautify the JSON output to increase readability.

  If not specified, it defaults to false.
- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"pretty" : true`

## Parquet File in OCI Object Storage Bucket

The configuration file format for Parquet file in OCI Object Storage bucket as a sink of NoSQL Database Migrator is shown below.

> **Note:**
>
> The valid source types for OCI Object Storage source type are `nosqldb` and `nosqldb_cloud`.

**Sink Configuration Template**

```
"sink" : {
  "type" : "object_storage_oci",
  "format" : "parquet",
  "endpoint" : "<OCI Object Storage service endpoint URL or region ID>",
  "namespace" : "<OCI Object Storage namespace>",
  "bucket" : "<bucket name>",
  "prefix" : "<object prefix>",
  "chunkSize" : <size in MB>,
  "compression": "<SNAPPY|GZIP|NONE>",
  "parquetOptions": {
    "useLogicalJson": <true|false>,
    "useLogicalEnum": <true|false>,
    "useLogicalUUID": <true|false>,
    "truncateDoubleSpecials": <true|false>
  },
  "credentials" : "</path/to/oci/config/file>",
  "credentialsProfile" : "<profile name in oci config file>",
  "useInstancePrincipal" : <true|false>,
```

```
  "useDelegationToken" : <true|false>
}
```

### Sink Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "object_storage_oci"`
- format
  Use `"format" : "parquet"`
- endpoint
  Example:
  - Region ID: `"endpoint" : "us-ashburn-1"`
  - URL format: `"endpoint" : "https://objectstorage.us-ashburn-1.oraclecloud.com"`
- namespace
  Example: `"namespace" : "my-namespace"`
- bucket
  Example: `"bucket" : "my-bucket"`
- prefix
  Source data is migrated to the `<prefix>/Data/<chunk>.parquet` files, where chunk=000000.parquet, 000001.parquet, and so forth.

  Example:

  1. `"prefix" : "my_export"`
  2. `"prefix" : "my_export/2021-04-05/"`
- chunkSize
  Example: `"chunkSize" : 40`
- credentials
  Example:

  1. `"credentials" : "/home/user/.oci/config"`
  2. `"credentials" : "/home/user/security/config"`
- credentialsProfile
  Example:

  1. `"credentialsProfile" : "DEFAULT"`
  2. `"credentialsProfile" : "ADMIN_USER"`
- useInstancePrincipal
  Example: `"useInstancePrincipal" : true`
- useDelegationToken
  Example: `"useDelegationToken" : true`

> **Note:**
>
> The authentication with delegation token is supported only when the NoSQL Database Migrator is running from a Cloud Shell.

**Unique Configuration Parameter**

- compression
- parquetOptions
- parquetOptions.useLogicalJson
- parquetOptions.useLogicalEnum
- parquetOptions.useLogicalUUID
- parquetOptions.truncateDoubleSpecials

**compression**

- **Purpose:** Specifies the compression type to use to compress the Parquet data. Valid values are `SNAPPY`, `GZIP`, and `NONE`.

  If not specified, it defaults to `SNAPPY`.
- **Data Type:** string
- **Mandatory (Y/N):** N
- **Example:** `"compression" : "GZIP"`

**parquetOptions**

- **Purpose:** Specifies the options to select Parquet logical types for NoSQL ENUM, JSON, and UUID columns.

  If you do not specify this parameter, the NoSQL Database Migrator writes the data of ENUM, JSON, and UUID columns as String.
- **Data Type:** object
- **Mandatory (Y/N):** N

**parquetOptions.useLogicalJson**

- **Purpose:** Specifies whether or not to write NoSQL JSON column data as Parquet logical JSON type. For more information, see Parquet Logical Type Definitions.

  If not specified or set to false, NoSQL Database Migrator writes the NoSQL JSON column data as String.
- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"useLogicalJson" : true`

**parquetOptions.useLogicalEnum**

- **Purpose:** Specifies whether or not to write NoSQL ENUM column data as Parquet logical ENUM type. For more information, see Parquet Logical Type Definitions.

  If not specified or set to false, NoSQL Database Migrator writes the NoSQL ENUM column data as String.

- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"useLogicalEnum" : true`

**parquetOptions.useLogicalUUID**

- **Purpose:** Specifies whether or not to write NoSQL UUID column data as Parquet logical UUID type. For more information, see Parquet Logical Type Definitions.

  If not specified or set to false, NoSQL Database Migrator writes the NoSQL UUID column data as String.
- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"useLogicalUUID" : true`

**parquetOptions.truncateDoubleSpecials**

- **Purpose:** Specifies whether or not to truncate the double +Infinity, -Infinity, and NaN values.

  By default, it is set to `false`. If set to `true`,
  - Positive_Infinity is truncated to Double.MAX_VALUE.
  - NEGATIVE_INFINITY is truncated to -Double.MAX_VALUE.
  - NaN is truncated to 9.9999999999999990E307.
- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"truncateDoubleSpecials" : true`

## Oracle NoSQL Database

The configuration file format for Oracle NoSQL Database as a sink of NoSQL Database Migrator is shown below.

**Sink Configuration Template**

```
"sink" : {
  "type": "nosqldb",
  "storeName" : "<store name>",
  "helperHosts" : ["hostname1:port1","hostname2:port2,..."],
  "security" : "</path/to/store/credentials/file>",
  "table" : "<fully qualified table name>",
  "includeTTL": <true|false>,
  "ttlRelativeDate": "<date-to-use in UTC>",
  "schemaInfo" : {
    "schemaPath" : "</path/to/a/schema/file>",
    "defaultSchema" : <true|false>,
    "useSourceSchema" : <true|false>,
    "DDBPartitionKey" : <"name:type">,
    "DDBSortKey" : "<name:type>"
  },
  "overwrite" : <true|false>,
```

```
  "requestTimeoutMs" : <timeout in milli seconds>
}
```

### Sink Parameters

#### Common Configuration Parameter

- type
  Use `"type" : "nosqldb"`
- security
  Example:

  ```
  "security" : "/home/user/client.credentials"
  ```

  Example security file content for password file based authentication:

  ```
  oracle.kv.password.noPrompt=true
  oracle.kv.auth.username=admin
  oracle.kv.auth.pwdfile.file=/home/nosql/login.passwd
  oracle.kv.transport=ssl
  oracle.kv.ssl.trustStore=/home/nosql/client.trust
  oracle.kv.ssl.protocols=TLSv1.2
  oracle.kv.ssl.hostnameVerifier=dnmatch(CN\=NoSQL)
  ```

  Example security file content for wallet based authentication:

  ```
  oracle.kv.password.noPrompt=true
  oracle.kv.auth.username=admin
  oracle.kv.auth.wallet.dir=/home/nosql/login.wallet
  oracle.kv.transport=ssl
  oracle.kv.ssl.trustStore=/home/nosql/client.trust
  oracle.kv.ssl.protocols=TLSv1.2
  oracle.kv.ssl.hostnameVerifier=dnmatch(CN\=NoSQL)
  ```

- requestTimeoutMs
  Example: `"requestTimeoutMs" : 5000`

#### Unique Configuration Parameter

- storeName
- helperHosts
- table
- includeTTL
- ttlRelativeDate
- schemaInfo
- schemaInfo.schemaPath
- schemaInfo.defaultSchema
- schemaInfo.useSourceSchema
- schemaInfo.DDBPartitionKey
- schemaInfo.DDBSortKey
- overwrite

**storeName**

- **Purpose:** Name of the Oracle NoSQL Database store.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:** `"storeName" : "kvstore"`

**helperHosts**

- **Purpose:** A list of host and registry port pairs in the `hostname:port` format. Delimit each item in the list using a comma. You must specify at least one helper host.
- **Data Type:** array of strings
- **Mandatory (Y/N):** Y
- **Example:** `"helperHosts" : ["localhost:5000","localhost:6000"]`

**table**

- **Purpose:** Specifies the table name to store the migrated data.

  Format: `[namespace_name:]<table_name>`

  If the table is in the DEFAULT namespace, you can omit the `namespace_name`. The table must exist in the store during the migration, and its schema must match with the source data.

  If the table is not available in the sink, you can use the `schemaInfo` parameter to instruct the NoSQL Database Migrator to create the table in the sink.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**
  - With the DEFAULT namespace `"table" :"mytable"`
  - With a non-default namespace `"table" : "mynamespace:mytable"`
  - To specify a child table `"table" : "mytable.child"`

> **Note:**
>
> You can migrate the child tables from a valid data source to Oracle NoSQL Database. The NoSQL Database Migrator copies only a single table in each execution. Ensure that the parent table is migrated before the child table.

**includeTTL**

- **Purpose:** Specifies whether or not to include TTL metadata for table rows provided by the source when importing Oracle NoSQL Database tables.

  If you do not specify this parameter, it defaults to `false`. In that case, the NoSQL Database Migrator does not include TTL metadata for table rows provided by the source when importing Oracle NoSQL Database tables.

  If set to true, the NoSQL Database Migrator tool performs the following checks on the TTL metadata when importing a table row:

- If you import a row that does not have `_metadata` definition, the NoSQL Database Migrator tool sets the TTL to 0, which means the row never expires.
- If you import a row that has `_metadata` definition, the NoSQL Database Migrator tool compares the TTL value against a Reference Time when a row gets imported. If the row has already expired relative to the Reference Time, then it is skipped. If the row has not expired, then it is imported along with the TTL value. By default, the Reference Time of import operation is the current time in milliseconds, obtained from System.currentTimeMillis(), of the machine where the NoSQL Database Migrator tool is running. But you can also set a custom Reference Time using the `ttlRelativeDate` configuration parameter if you want to extend the expiration time and import rows that would otherwise expire immediately.
  The formula to calculate the expiration time of a row is as follows:

  ```
  expiration = (TTL value of source row in milliseconds - Reference Time
  in milliseconds)
  if (expiration <= 0) then it indicates that row has expired.
  ```

  > **Note:**
  >
  > Since Oracle NoSQL TTL boundaries are in hours and days, in some cases, the TTL of the imported row might get adjusted to the nearest hour or day. For example, consider a row that has expiration value of `1629709200000 (2021-08-23 09:00:00)` and Reference Time value is `1629707962582 (2021-08-23 08:39:22)`. Here, even though the row is not expired relative to the Reference Time when this data gets imported, the new TTL for the row is `1629712800000 (2021-08-23 10:00:00)`.

- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"includeTTL" : true`

**ttlRelativeDate**

- **Purpose:** Specify a UTC date in the YYYY-MM-DD hh:mm:ss format used to set the TTL expiry of table rows during importing into the Oracle NoSQL Database.

  If a table row in the data you are exporting has expired, you can set the `ttlRelativeDate` parameter to a date before the expiration time of the table row in the exported data.

  If you do not specify this parameter, it defaults to the current time in milliseconds, obtained from System.currentTimeMillis(), of the machine where the NoSQL Database Migrator tool is running.
- **Data Type:** date
- **Mandatory (Y/N):** N
- **Example:** `"ttlRelativeDate" : "2021-01-03 04:31:17"`
  Let us consider a scenario where table rows expire after seven days from 1-Jan-2021. After exporting this table, on 7-Jan-2021, you run into an issue with your table and decide to import the data. The table rows are going to expire in one day (data expiration date minus the default value of `ttlRelativedate` configuration parameter, which is the current date). But if you want to extend the expiration date of table rows to five days instead of one day, use the `ttlRelativeDate` parameter and choose an earlier date.

Therefore, in this scenario if you want to extend expiration time of the table rows by five days, set the value of `ttlRelativeDate` configuration parameters to 3-Jan-2021, which is used as Reference Time when table rows get imported.

**schemainfo**

- **Purpose:** Specifies the schema for the data being migrated. If this is not specified, the NoSQL Database Migrator assumes that the table already exists in the sink's store.
- **Data Type:** Object
- **Mandatory (Y/N):** N

**schemaInfo.schemaPath**

- **Purpose:** Specifies the absolute path to a file containing DDL statements for the NoSQL table.

  The NoSQL Database Migrator executes the DDL commands listed in this file before migrating the data.

  The NoSQL Database Migrator does not support more than one DDL statement per line in the `schemaPath` file.
- **Data Type:** string
- **Mandatory (Y/N):** N

> **Note:**
>
> `defaultSchema` and `schemaPath` are mutually exclusive.

- **Example:** `"schemaPath" : "/home/user/schema_file"`

**schemaInfo.defaultSchema**

- **Purpose:** Setting this parameter to *true* instructs the NoSQL Database Migrator to create a table with default schema. The default schema is defined by the migrator itself. For more information about default schema definitions, see *Default Schema* in Using Oracle NoSQL Data Migrator.
- **Data Type:** boolean
- **Mandatory (Y/N):** N

> **Note:**
>
> `defaultSchema` and `schemaPath` are mutually exclusive.

**schemaInfo.useSourceSchema**

- **Purpose:** Specifies whether or not the sink uses the table schema definition provided by the source when migrating NoSQL tables.
- **Data Type:** boolean
- **Mandatory (Y/N):** N

> **Note:**
>
> `defaultSchema`, `schemaPath`, and `useSourceSchema` parameters are mutually exclusive. Specify only one of these parameters.

- **Example:**
  - With Default Schema:

```
"schemaInfo" : {
  "defaultSchema" : true
}
```

  - With a pre-defined schema:

```
"schemaInfo" : {
 "schemaPath" : "<complete/path/to/the/schema/definition/file>"
}
```

  - With source schema:

```
"schemaInfo" : {
  "useSourceSchema" : true
}
```

**schemaInfo.DDBPartitionKey**

- **Purpose:** Specifies the DynamoDB partition key and the corresponding Oracle NoSQL Database type to be used in the sink Oracle NoSQL Database table. This key will be used as a NoSQL DB table shard key. This is applicable only when `defaultSchema` is set to true and the source format is `dynamodb_json`. See Mapping of DynamoDB types to Oracle NoSQL types for more details.
- **Mandatory (Y/N):** Y, if `defaultSchema` is true and the source is `dynamodb_json`.
- **Example:** `"DDBPartitionKey" : "PersonID:INTEGER"`

> **Note:**
>
> If the partition key contains dash(-) or dot(.), Migrator will replace it with underscore(_) as NoSQL column name does not support dot and dash.

**schemaInfo.DDBSortKey**

- **Purpose:** Specifies the DynamoDB sort key and its corresponding Oracle NoSQL Database type to be used in the target Oracle NoSQL Database table. If the importing DynamoDB table does not have a sort key, this attribute must not be set. This key will be used as a non-shard portion of the primary key in the NoSQL DB table. This is applicable only when `defaultSchema` is set to true and the source is `dynamodb_json`. See Mapping of DynamoDB types to Oracle NoSQL types for more details.
- **Mandatory (Y/N):** N
- **Example:** `"DDBSortKey" : "Skey:STRING"`

> **Note:**
>
> If the sort key contains dash(-) or dot(.), Migrator will replace it with underscore(_) as NoSQL column name does not support dot and dash.

**overwrite**

- **Purpose:** Indicates the behavior of NoSQL Database Migrator when the record being migrated from the source is already present in the sink.

  If the value is set to false, when migrating tables the NoSQL Database Migrator skips those records for which the same primary key already exists in the sink.

  If the value is set to true, when migrating tables the NoSQL Database Migrator overwrites those records for which the same primary key already exists in the sink.

  If not specified, it defaults to true.
- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"overwrite" : false`

## Oracle NoSQL Database Cloud Service

The configuration file format for Oracle NoSQL Database Cloud Service as a sink of NoSQL Database Migrator is shown below.

**Sink Configuration Template**

```
"sink" : {
  "type" : "nosqldb_cloud",
  "endpoint" : "<Oracle NoSQL Cloud Service Endpoint>",
  "table" : "<table name>",
  "compartment" : "<OCI compartment name or id>",
  "includeTTL": <true|false>,
  "ttlRelativeDate" : "<date-to-use in UTC>",
  "schemaInfo" : {
    "schemaPath" : "</path/to/a/schema/file>",
    "defaultSchema" : <true|false>,
    "useSourceSchema" : <true|false>,
    "DDBPartitionKey" : <"name:type">,
    "DDBSortKey" : "<name:type>",
    "onDemandThroughput" : <true|false>,
    "readUnits" : <table read units>,
    "writeUnits" : <table write units>,
    "storageSize" : <storage size in GB>
   },
  "credentials" : "</path/to/oci/credential/file>",
  "credentialsProfile" : "<profile name in oci config file>",
  "useInstancePrincipal" : <true|false>,
  "useDelegationToken" : <true|false>,
  "writeUnitsPercent" : <table writeunits percent>,
  "requestTimeoutMs" : <timeout in milli seconds>,
  "overwrite" : <true|false>
}
```

### Sink Parameters

#### Common Configuration Parameters

- type
  Use `"type" : "nosqldb_cloud"`
- endpoint
  Example:
  - Region ID: `"endpoint" : "us-ashburn-1"`
  - URL format: `"endpoint" : "https://objectstorage.us-ashburn-1.oraclecloud.com"`
- credentials
  Example:
  1. `"credentials" : "/home/user/.oci/config"`
  2. `"credentials" : "/home/user/security/config"`
- credentialsProfile
  Example:
  1. `"credentialsProfile" : "DEFAULT"`
  2. `"credentialsProfile" : "ADMIN_USER"`
- useInstancePrincipal
  Example: `"useInstancePrincipal" : true`
- useDelegationToken
  Example: `"useDelegationToken" : true`

> **Note:**
>
> The authentication with delegation token is supported only when the NoSQL Database Migrator is running from a Cloud Shell.

- requestTimeoutMs
  Example: `"requestTimeoutMs" : 5000`

#### Unique Configuration Parameter

- table
- compartment
- includeTTL
- ttlRelativeDate
- schemaInfo
- schemaInfo.schemaPath
- schemaInfo.defaultSchema
- schemaInfo.useSourceSchema
- schemaInfo.DDBPartitionKey
- schemaInfo.DDBSortKey

- schemaInfo.onDemandThroughput
- schemaInfo.readUnits
- schemaInfo.writeUnits
- schemaInfo.storageSize
- writeUnitsPercent
- overwrite

**table**

- **Purpose:** Specifies the table name to store the migrated data.

  You must ensure that this table exists in your Oracle NoSQL Database Cloud Service. Otherwise, you have to use the `schemaInfo` object in the sink configuration to instruct the NoSQL Database Migrator to create the table.

  The schema of this table must match the source data.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:**
  - To specify a table `"table" : "mytable"`
  - To specify a child table `"table" : "mytable.child"`

> **Note:**
>
> You can migrate the child tables from a valid data source to Oracle NoSQL Database Cloud Service. The NoSQL Database Migrator copies only a single table in each execution. Ensure that the parent table is migrated before the child table.

**compartment**

- **Purpose:** Specifies the name or OCID of the compartment in which the table resides.

  If you do not provide any value, it defaults to the *root* compartment.

  You can find your compartment's OCID from the Compartment Explorer window under Governance in the OCI Cloud Console.
- **Data Type:** string
- **Mandatory (Y/N):** Y, if the table is not in the root compartment of the tenancy OR when the `useInstancePrincipal` parameter is set to true.

> **Note:**
>
> If the `useInstancePrincipal` parameter is set to true, the compartment must specify the compartment OCID and not the name.

- **Example:**
  - Compartment name

```
"compartment" : "mycompartment"
```

- Compartment name qualified with its parent compartment

  ```
  "compartment" : "parent.childcompartment"
  ```

- No value provided. Defaults to the root compartment.

  ```
  "compartment": ""
  ```

- Compartment OCID

  ```
  "compartment" : "ocid1.tenancy.oc1...4ksd"
  ```

**includeTTL**

- **Purpose:** Specifies whether or not to include TTL metadata for table rows provided by the source when importing Oracle NoSQL Database tables.

  If you do not specify this parameter, it defaults to `false`. In that case, the NoSQL Database Migrator does not include TTL metadata for table rows provided by the source when importing Oracle NoSQL Database tables.

  If set to true, the NoSQL Database Migrator tool performs the following checks on the TTL metadata when importing a table row:

  - If you import a row that does not have `_metadata` definition, the NoSQL Database Migrator tool sets the TTL to 0, which means the row never expires.
  - If you import a row that has `_metadata` definition, the NoSQL Database Migrator tool compares the TTL value against a Reference Time when a row gets imported. If the row has already expired relative to the Reference Time, then it is skipped. If the row has not expired, then it is imported along with the TTL value. By default, the Reference Time of import operation is the current time in milliseconds, obtained from System.currentTimeMillis(), of the machine where the NoSQL Database Migrator tool is running. But you can also set a custom Reference Time using the `ttlRelativeDate` configuration parameter if you want to extend the expiration time and import rows that would otherwise expire immediately.
    The formula to calculate the expiration time of a row is as follows:

    ```
    expiration = (TTL value of source row in milliseconds - Reference Time
    in milliseconds)
    if (expiration <= 0) then it indicates that row has expired.
    ```

    > **Note:**
    >
    > Since Oracle NoSQL TTL boundaries are in hours and days, in some cases, the TTL of the imported row might get adjusted to the nearest hour or day. For example, consider a row that has expiration value of `1629709200000 (2021-08-23 09:00:00)` and Reference Time value is `1629707962582 (2021-08-23 08:39:22)`. Here, even though the row is not expired relative to the Reference Time when this data gets imported, the new TTL for the row is `1629712800000 (2021-08-23 10:00:00)`.

- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"includeTTL" : true`

**ttlRelativeDate**

- **Purpose:** Specify a UTC date in the YYYY-MM-DD hh:mm:ss format used to set the TTL expiry of table rows during importing into the Oracle NoSQL Database.

  If a table row in the data you are exporting has expired, you can set the `ttlRelativeDate` parameter to a date before the expiration time of the table row in the exported data.

  If you do not specify this parameter, it defaults to the current time in milliseconds, obtained from System.currentTimeMillis(), of the machine where the NoSQL Database Migrator tool is running.
- **Data Type:** date
- **Mandatory (Y/N):** N
- **Example:** `"ttlRelativeDate" : "2021-01-03 04:31:17"`
  Let us consider a scenario where table rows expire after seven days from 1-Jan-2021. After exporting this table, on 7-Jan-2021, you run into an issue with your table and decide to import the data. The table rows are going to expire in one day (data expiration date minus the default value of `ttlRelativedate` configuration parameter, which is the current date). But if you want to extend the expiration date of table rows to five days instead of one day, use the `ttlRelativeDate` parameter and choose an earlier date. Therefore, in this scenario if you want to extend expiration time of the table rows by five days, set the value of `ttlRelativeDate` configuration parameters to 3-Jan-2021, which is used as Reference Time when table rows get imported.

**schemaInfo**

- **Purpose:** Specifies the schema for the data being migrated.

  If you do not specify this parameter, the NoSQL Database Migrator assumes that the table already exists in your Oracle NoSQL Database Cloud Service.

  If this parameter is not specified and the table does not exist in the sink, the migration fails.
- **Data Type:** Object
- **Mandatory (Y/N):** N

**schemaInfo.schemaPath**

- **Purpose:** Specifies the absolute path to a file containing DDL statements for the NoSQL table.

  The NoSQL Database Migrator executes the DDL commands listed in this file before migrating the data.

  The NoSQL Database Migrator does not support more than one DDL statement per line in the `schemaPath` file.
- **Data Type:** string
- **Mandatory (Y/N):** N

  > **Note:**
  >
  > `defaultSchema` and `schemaPath` are mutually exclusive.

- **Example:** `"schemaPath" : "/home/user/schema_file"`

**schemaInfo.defaultSchema**

- **Purpose:** Setting this parameter to *Yes* instructs the NoSQL Database Migrator to create a table with default schema. The default schema is defined by the migrator itself. For more information about default schema definitions, see *Default Schema* in Using Oracle NoSQL Data Migrator.
- **Data Type:** boolean
- **Mandatory (Y/N):** N

> **Note:**
>
> `defaultSchema` and `schemaPath` are mutually exclusive.

**schemaInfo.useSourceSchema**

- **Purpose:** Specifies whether or not the sink uses the table schema definition provided by the source when migrating NoSQL tables.
- **Data Type:** boolean
- **Mandatory (Y/N):** N

> **Note:**
>
> `defaultSchema`, `schemaPath`, and `useSourceSchema` parameters are mutually exclusive. Specify only one of these parameters.

- **Example:**
  - With Default Schema:

```
"schemaInfo": {
  "defaultSchema": true,
  "readUnits": 100,
  "writeUnits": 60,
  "storageSize": 1
}
```

  - With a pre-defined schema:

```
"schemaInfo": {
  "schemaPath": "<complete/path/to/the/schema/definition/file>",
  "readUnits": 100,
  "writeUnits": 100,
  "storageSize": 1
}
```

  - With source schema:

```
"schemaInfo": {
  "useSourceSchema": true,
  "readUnits": 100,
  "writeUnits": 60,
```

```
    "storageSize": 1
  }
```

**schemaInfo.DDBPartitionKey**

- **Purpose:** Specifies the DynamoDB partition key and the corresponding Oracle NoSQL Database type to be used in the sink Oracle NoSQL Database table. This key will be used as a NoSQL DB table shard key. This is applicable only when `defaultSchema` is set to true and the source format is `dynamodb_json`. See Mapping of DynamoDB types to Oracle NoSQL types for more details.
- **Mandatory (Y/N):** Y, if `defaultSchema` is true and the source is `dynamodb_json`.
- **Example:** `"DDBPartitionKey" : "PersonID:INTEGER"`

> **Note:**
>
> If the partition key contains dash(-) or dot(.), Migrator will replace it with underscore(_) as NoSQL column name does not support dot and dash.

**schemaInfo.DDBSortKey**

- **Purpose:** Specifies the DynamoDB sort key and its corresponding Oracle NoSQL Database type to be used in the target Oracle NoSQL Database table. If the importing DynamoDB table does not have a sort key, this attribute must not be set. This key will be used as a non-shard portion of the primary key in the NoSQL DB table. This is applicable only when `defaultSchema` is set to true and the source is `dynamodb_json`. See Mapping of DynamoDB types to Oracle NoSQL types for more details.
- **Mandatory (Y/N):** N
- **Example:** `"DDBSortKey" : "Skey:STRING"`

> **Note:**
>
> If the sort key contains dash(-) or dot(.), Migrator will replace it with underscore(_) as NoSQL column name does not support dot and dash.

**schemaInfo.onDemandThroughput**

- **Purpose:** Specifies to create the table with on-demand read and write throughput. If this parameter is not set, the table is created with provisioned capacity.
  The default value is `false`.

> **Note:**
>
> This parameter is not applicable for child tables as they share the throughput of the top-level parent table.

- **Data Type:** Boolean
- **Mandatory (Y/N):** N
- **Example:** `"onDemandThroughput" : "true"`

**schemaInfo.readUnits**

- **Purpose:** Specifies the read throughput of the new table.

  > **Note:**
  >
  > – This parameter is not applicable for tables provisioned with on-demand capacity.
  >
  > – This parameter is not applicable for child tables as they share the read throughput of the top-level parent table.

- **Data Type:** integer
- **Mandatory (Y/N):** Y, if the table is not a child table or if `schemaInfo.onDemandThroughput` parameter is set to `false`, else N.
- **Example:** `"readUnits" : 100`

**schemaInfo.writeUnits**

- **Purpose:** Specifies the write throughput of the new table.

  > **Note:**
  >
  > – This parameter is not applicable for tables provisioned with on-demand capacity.
  >
  > – This parameter is not applicable for child tables as they share the write throughput of the top-level parent table.

- **Data Type:** integer
- **Mandatory (Y/N):** Y, if the table is not a child table or if `schemaInfo.onDemandThroughput` parameter is set to `false`, else N.
- **Example:** `"writeUnits" : 100`

**schemaInfo.storageSize**

- **Purpose:** Specifies the storage size of the new table in GB.

  > **Note:**
  >
  > This parameter is not applicable for child tables as they share the storage size of the top-level parent table.

- **Data Type:** integer
- **Mandatory (Y/N):** Y, if the table is not a child table, else N.
- **Example:**

- With `schemaPath`

```
"schemaInfo" : {
  "schemaPath" : "</path/to/a/schema/file>",
  "readUnits" : 500,
  "writeUnits" : 1000,
  "storageSize" : 5 }
```

- With `defaultSchema`

```
"schemaInfo" : {
  "defaultSchema" :Yes,
  "readUnits" : 500,
  "writeUnits" : 1000,
  "storageSize" : 5
}
```

**writeUnitsPercent**

- **Purpose:** Specifies the Percentage of table write units to be used during the migration activity. The amount of time required to migrate data is directly proportional to this attribute.

  The default value is 90. The valid range is any integer between 1 to 100.

  See Troubleshooting the Oracle NoSQL Database Migrator to learn how to use this attribute to improve the data migration speed.
- **Data Type:** integer
- **Mandatory (Y/N):** N
- **Example:** `"writeUnitsPercent" : 90`

**overwrite**

- **Purpose:** Indicates the behavior of NoSQL Database Migrator when the record being migrated from the source is already present in the sink.

  If the value is set to false, when migrating tables the NoSQL Database Migrator skips those records for which the same primary key already exists in the sink.

  If the value is set to true, when migrating tables the NoSQL Database Migrator overwrites those records for which the same primary key already exists in the sink.

  If not specified, it defaults to true.
- **Data Type:** boolean
- **Mandatory (Y/N):** N
- **Example:** `"overwrite" : false`

# Transformation Configuration Templates

This topic explains the configuration parameters for the different transformations supported by the Oracle NoSQL Database Migrator. For the complete configuration file template, see **Configuration File** in Terminology used with Oracle NoSQL Database Migrator.

Oracle NoSQL Database Migrator lets you modify the data, that is, add data transformations as part of the migration activity. You can define multiple transformations in a single migration. In such a case, the order of transformations is vital because the source data undergoes each

transformation in the given order. The output of one transformation becomes the input to the next one in the migrator pipeline.

The different transformations supported by the NoSQL Data Migrator are:

**Table 1-3 Transformations**

| Transformation Config Attribute | You can use this transformation to ... |
|---|---|
| `ignoreFields` | Ignore the identified columns from the source row before writing to the sink. |
| `includeFields` | Include the identified columns from the source row before writing to the sink. |
| `renameFields` | Rename the identified columns from the source row before writing to the sink. |
| `aggregateFields` | Aggregate multiple columns from the source into a single column in the sink. As part of this transformation, you can also identify the columns that you want to exclude in the aggregation. Those fields will be skipped from the aggregated column. |

You can find the configuration template for each supported transformation below.

## ignoreFields

The configuration file format for the `ignoreFields` transformation is shown below.

### Transformation Configuration Template

```
"transforms" : {
  "ignoreFields" : ["<field1>","<field2>",...]
}
```

### Transformation Parameter

#### ignoreFields

- **Purpose:** An array of the column names to be ignored from the source records.

  > **Note:**
  >
  > You can supply only top-level fields. Transformations can not be applied on the data in the nested fields.

- **Data Type:** array of strings
- **Mandatory (Y/N):** Y
- **Example:** To ignore the columns named "name" and "address" from the source record:

  ```
  "ignoreFields" : ["name","address"]
  ```

## includeFields

The configuration file format for the `includeFields` transformation is shown below.

**Transformation Configuration Template**

```
"transforms" : {
  "includeFields" : ["<field1>","<field2>",...]
}
```

**Transformation Parameter**

**includeFields**

- **Purpose:** An array of the column names to be included from the source records. It *only* includes the fields specified in the array, the rest of the fields are ignored.

  > **Note:**
  >
  > The NoSQL Database Migrator tool throws an error if you specify an empty array. Additionally, you can specify only the top-level fields. The NoSQL Database Migrator tool does not apply transformations to the data in the nested fields.

- **Data Type:** array of strings
- **Mandatory (Y/N):** Y
- **Example:** To include the columns named "age" and "gender" from the source record:

  ```
  "includeFields" : ["age","gender"]
  ```

## renameFields

The configuration file format for the `renameFields` transformation is shown below.

**Transformation Configuration Template**

```
"transforms" : {
  "renameFields" : {
    "<old_name>" : "<new_name>",
    "<old_name>" : "<new_name>,"
    .....
  }
}
```

**Transformation Parameter**

**renameFields**

- **Purpose:** Key-Value pairs of the old and new names of the columns to be renamed.

> **Note:**
>
> You can supply only top-level fields. Transformations can not be applied on the data in the nested fields.

- **Data Type:** JSON object
- **Mandatory (Y/N):** Y
- **Example:** To rename the column named "residence" to "address" and the column named "_id" to "id":

```
"renameFields" : { "residence" : "address", "_id" : "id" }
```

## aggregateFields

The configuration file format for the `aggregateFields` transformation is shown below.

**Transformation Configuration Template**

```
"transforms" : {
  "aggregateFields" : {
    "fieldName" : "name of the new aggregate field",
    "skipFields" : ["<field1>","<field2">,...]
  }
}
```

**Transformation Parameter**

**aggregateFields**

- **Purpose:** Name of the aggregated field in the sink.
- **Data Type:** string
- **Mandatory (Y/N):** Y
- **Example:** If the given record is:

```
{
  "id" : 100,
  "name" : "john",
  "address" : "USA",
  "age" : 20
}
```

If the aggregate transformation is:

```
"aggregateFields" : {
  "fieldName" : "document",
  "skipFields" : ["id"]
}
```

The aggregated column in the sink looks like:

```
{
  "id": 100,
  "document": {
    "name": "john",
    "address": "USA",
    "age": 20
  }
}
```

# Mapping of DynamoDB table to Oracle NoSQL table

In DynamoDB, a table is a collection of items, and each item is a collection of attributes. Each item in the table has a unique identifier, or a primary key. Other than the primary key, the table is schema-less. Each item can have its own distinct attributes.

DynamoDB supports two different kinds of primary keys:

- **Partition key** – A simple primary key, composed of one attribute known as the *partition key*. DynamoDB uses the partition key's value as input to an internal hash function. The output from the hash function determines the partition in which the item will be stored.
- **Partition key and sort key** – As a *composite primary key*, this type of key is composed of two attributes. The first attribute is the *partition key*, and the second attribute is the *sort key*. DynamoDB uses the partition key value as input to an internal hash function. The output from the hash function determines the partition in which the item will be stored. All items with the same partition key value are stored together, in sorted order by sort key value.

In contrast, Oracle NoSQL tables support flexible data models with both schema and schema-less design.

There are two different ways of modelling a DynamoDB table:

1. **Modeling DynamoDB table as a JSON document(Recommended)**: In this modeling, you map all the attributes of the Dynamo DB tables into a JSON column of the NoSQL table except partition key and sort key. You will model partition key and sort key as the Primary Key columns of the NoSQL table. You will use `AggregateFields` transform in order to aggregate non-primary key data into a JSON column.

   > **Note:**
   >
   > The Migrator provides a user-friendly configuration `defaultSchema` to automatically create a schema-less DDL table which also aggregates attributes into a JSON column.

2. **Modeling DynamoDB table as fixed columns in NoSQL table:** In this modeling, for each attribute of the DynamoDB table, you will create a column in the NoSQL table as specified in the Mapping of DynamoDB types to Oracle NoSQL types. You will model partition key and sort key attributes as Primary key(s). This should be used only when you are certain that importing DynamoDB table schema is fixed and each item has values for the most of the attributes. If DynamoDB items do not have common attributes, this can result in lot of NoSQL columns with empty values.

> **Note:**
>
> We highly recommend using schema-less tables when migrating data from DynamoDB to Oracle NoSQL Database due to the nature of DynamoDB tables being schema-less. This is especially for large tables where the content of each record may not be uniform across the table.

# Oracle NoSQL to Parquet Data Type Mapping

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

| NoSQL Type | Parquet Type |
|---|---|
| BOOLEAN | BOOLEAN |
| INTEGER | INT32 |
| LONG | INT64 |
| FLOAT | DOUBLE |
| DOUBLE | DOUBLE |
| BINARY | BINARY |
| FIXED_BINARY | BINARY |
| STRING | BINARY(STRING) |
| ENUM | BINARY(STRING)<br>or<br>BINARY(ENUM), if the logical ENUM is configured |
| UUID | BINARY(STRING)<br>or<br>FIXED_BINARY(16), if the logical UUID is configured |
| TIMESTAMP(p) | INT64(TIMESTAMP(p)) |
| NUMBER | DOUBLE |
| field_name ARRAY(T) | `group field_name(LIST) {`<br>`  repeated group list {`<br>`  required T element`<br>`  }`<br>`}` |
| field_name MAP(T) | `group field_name (MAP) {`<br>`  repeated group key_value (MAP_KEY_VALUE) {`<br>`  required binary key (STRING);`<br>`  required T value;`<br>`  }`<br>`}` |

| NoSQL Type | Parquet Type |
|---|---|
| field_name RECORD(K T N , K T N , ....)<br>where:<br>K = Key name<br>T = Type<br>N = Nullable or not | `group field_name {`<br>`ni == true ? optional Ti ki :`<br>`required Ti ki`<br>`}` |
| JSON | BINARY(STRING)<br>or<br>BINARY(JSON), if logical JSON is configured |

> **Note:**
>
> When the NoSQL Number type is converted to Parquet Double type, there may be some loss of precision in case the value cannot be represented in Double. If the number is too big to represent as Double, it is converted to Double.NEGATIVE_INFINITY or Double.POSITIVE_INFINITY.

# Mapping of DynamoDB types to Oracle NoSQL types

The table below shows the mapping of DynamoDB types to Oracle NoSQL types.

**Table 1-4 Mapping DynamoDB type to Oracle NoSQL type**

| # | DynamoDB type | JSON type for NoSQL JSON column | Oracle NoSQL type |
|---|---|---|---|
| 1 | String (S) | JSON String | STRING |
| 2 | Number Type (N) | JSON Number | INTEGER/LONG/ FLOAT/DOUBLE/ NUMBER |
| 3 | Boolean (BOOL) | JSON Boolean | BOOLEAN |
| 4 | Binary type (B) - Byte buffer | BASE-64 encoded JSON String | BINARY |
| 5 | NULL | JSON null | NULL |
| 6 | String Set (SS) | JSON Array of Strings | ARRAY(STRING) |
| 7 | Number Set (NS) | JSON Array of Numbers | ARRAY(INTEGER/ LONG/FLOAT/DOUBLE/ NUMBER) |
| 8 | Binary Set (BS) | JSON Array of Base-64 encoded Strings | ARRAY(BINARY) |
| 9 | LIST (L) | Array of JSON | ARRAY(JSON) |
| 10 | MAP (M) | JSON Object | JSON |
| 11 | PARTITION KEY | NA | PRIMARY KEY and SHARD KEY |
| 12 | SORT KEY | NA | PRIMARY KEY |
| 13 | Attribute names with dash and dot | JSON field names with a underscore | Column names with underscore |

Few additional points to consider while mapping DynamoDB types to Oracle NoSQL types:

- DynamoDB Supports only one data type for Numbers and can have up to 38 digits of precision,on contrast Oracle NoSQL supports many types to choose from based on the range and precision of the data.You can select the appropriate Number type that fits the range of your input data. If you are not sure of the nature of the data, NoSQL NUMBER type can be used.
- DynamoDB Supports only one data type for Numbers and can have up to 38 digits of precision,on contrast Oracle NoSQL supports many types to choose from based on the range and precision of the data.You can select the appropriate Number type that fits the range of your input data. If you are not sure of the nature of the data, NoSQL NUMBER type can be used.
- Partition key in DynamoDB has a limit of 2048 bytes but Oracle NoSQL Cloud Service has a limit of 64 bytes for the Primary key/Shard key.
- Sort key in DynamoDB has a limit of 1024 bytes but Oracle NoSQL Cloud Service has a limit of 64 bytes for the Primary key.
- Attribute names in DynamoDB can be 64KB long but Oracle NoSQL Cloud service column names have a limit of 64 characters.

# Use Case Demonstrations

Learn how to perform data migration using the Oracle NoSQL Database Migrator for specific use cases. You can find detailed systematic instructions with code examples to perform migration in each of the use cases listed below.

**Topics:**



## Migrate from Oracle NoSQL Database Cloud Service to a JSON file

This example shows how to use the Oracle NoSQL Database Migrator to copy data and the schema definition of a NoSQL table from Oracle NoSQL Database Cloud Service (NDCS) to a JSON file.

### Use Case

An organization decides to train a model using the Oracle NoSQL Database Cloud Service (NDCS) data to predict future behaviors and provide personalized recommendations. They can take a periodic copy of the NDCS tables' data to a JSON file and apply it to the analytic engine to analyze and train the model. Doing this helps them separate the analytical queries from the low-latency critical paths.

### Example

For the demonstration, let us look at how to migrate the data and schema definition of a NoSQL table called `myTable` from NDCS to a JSON file.

**Prerequisites**

- Identify the source and sink for the migration.
  - Source: Oracle NoSQL Database Cloud Service
  - Sink: JSON file
- Identify your OCI cloud credentials and capture them in the OCI config file. Save the config file in `/home/.oci/config`. See Acquiring Credentials.

```
[DEFAULT]
tenancy=ocid1.tenancy.oc1....
user=ocid1.user.oc1....
fingerprint= 43:d1:....
key_file=</fully/qualified/path/to/the/private/key/>
pass_phrase=<passphrase>
```

- Identify the region endpoint and compartment name for your Oracle NoSQL Database Cloud Service.
  - endpoint: `us-phoenix-1`
  - compartment: `developers`

**Procedure**

To migrate the data and schema definition of `myTable` from Oracle NoSQL Database Cloud Service to a JSON file:

1. Open the command prompt and navigate to the directory where you extracted the NoSQL Database Migrator utility.
2. To generate the configuration file using the NoSQL Database Migrator, run the `runMigrator` command without any runtime parameters.

```
[~/nosqlMigrator]$./runMigrator
```

3. As you did not provide the configuration file as a runtime parameter, the utility prompts if you want to generate the configuration now. Type **`y`**.

```
Configuration file is not provided. Do you want to generate
configuration? (y/n) [n]: y

Generating a configuration file interactively.
```

4. Based on the prompts from the utility, choose your options for the Source configuration.

```
Enter a location for your config [./migrator-config.json]: /home/<user>/
nosqlMigrator/NDCS2JSON
Select the source:
1) nosqldb
2) nosqldb_cloud
3) file
```

```
4) object_storage_oci
5) aws_s3
#? 2

Configuration for source type=nosqldb_cloud
Enter endpoint URL or region ID of the Oracle NoSQL Database Cloud: us-
phoenix-1
Select the authentication type:
1) credentials_file
2) instance_principal
3) delegation_token
#? 1
Enter path to the file containing OCI credentials [/home/<user>/.oci/
config]:
Enter the profile name in OCI credentials file [DEFAULT]:
Enter the compartment name or id of the table []: developers
Enter table name: myTable
Include TTL data? If you select 'yes' TTL of rows will also
be included in the exported data.(y/n) [n]:
Enter percentage of table read units to be used for migration operation.
(1-100) [90]:
Enter store operation timeout in milliseconds. (1-30000) [5000]:
```

5. Based on the prompts from the utility, choose your options for the Sink configuration.

```
Select the sink:
1) nosqldb
2) nosqldb_cloud
3) file
#? 3
Configuration for sink type=file
Enter path to a directory to store JSON data: /home/<user>/nosqlMigrator
would you like to export data to multiple files for each source?(y/n) [y]:
n
Would you like to store JSON in pretty format? (y/n) [n]: y
Would you like to migrate the table schema also? (y/n) [y]: y
Enter path to a file to store table schema: /home/<user>/nosqlMigrator/
myTableSchema
```

6. Based on the prompts from the utility, choose your options for the source data transformations. The default value is `n`.

```
Would you like to add transformations to source data? (y/n) [n]:
```

7. Enter your choice to determine whether to proceed with the migration in case any record fails to migrate.

```
Would you like to continue migration in case of any record/row is failed
to migrate?: (y/n) [n]:
```

8. The utility displays the generated configuration on the screen.

```
generated configuration is:
{
  "source": {
```

```
    "type": "nosqldb_cloud",
    "endpoint": "us-phoenix-1",
    "table": "myTable",
    "compartment": "developers",
    "credentials": "/home/<user>/.oci/config",
    "credentialsProfile": "DEFAULT",
    "readUnitsPercent": 90,
    "requestTimeoutMs": 5000
  },
  "sink": {
    "type": "file",
    "format": "json",
    "useMultiFiles" : false,
    "schemaPath": "/home/<user>/nosqlMigrator/myTableSchema",
    "pretty": true,
    "dataPath": "/home/<user>/nosqlMigrator"
  },
  "abortOnError": true,
  "migratorVersion": "1.6.5"
}
```

9. Finally, the utility prompts for your choice to decide whether to proceed with the migration with the generated configuration file or not. The default option is `y`.

> **Note:**
>
> If you select `n`, you can use the generated configuration file to run the migration using the `./runMigrator -c` or the `./runMigrator --config` option.

```
would you like to run the migration with above configuration?
If you select no, you can use the generated configuration file to run the
migration using
./runMigrator --config /home/<user>/nosqlMigrator/NDCS2JSON
(y/n) [y]:
```

10. The NoSQL Database Migrator migrates your data and schema from NDCS to the JSON file.

```
Records provided by source=10,Records written to sink=10,Records
failed=0,Records skipped=0.
Elapsed time: 0min 1sec 277ms
Migration completed.
```

**Validation**
To validate the migration, you can navigate to the specified sink directory and view the schema and data.

```
-- Exported myTable Data. JSON files are created in the supplied data path

[~/nosqlMigrator]$cat myTable_1_5.json
{
  "id" : 10,
  "document" : {
```

```
    "course" : "Computer Science",
    "name" : "Neena",
    "studentid" : 105
  }
}
{
  "id" : 3,
  "document" : {
  "course" : "Computer Science",
    "name" : "John",
    "studentid" : 107
  }
}
{
  "id" : 4,
  "document" : {
    "course" : "Computer Science",
    "name" : "Ruby",
    "studentid" : 100
  }
}
{
  "id" : 6,
  "document" : {
    "course" : "Bio-Technology",
    "name" : "Rekha",
    "studentid" : 104
  }
}
{
  "id" : 7,
  "document" : {
    "course" : "Computer Science",
    "name" : "Ruby",
    "studentid" : 100
  }
}
{
  "id" : 5,
  "document" : {
    "course" : "Journalism",
    "name" : "Rani",
    "studentid" : 106
  }
}
{
  "id" : 8,
  "document" : {
    "course" : "Computer Science",
    "name" : "Tom",
    "studentid" : 103
  }
}
{
  "id" : 9,
  "document" : {
```

```
    "course" : "Computer Science",
    "name" : "Peter",
    "studentid" : 109
  }
}
{
  "id" : 1,
  "document" : {
    "course" : "Journalism",
    "name" : "Tracy",
    "studentid" : 110
  }
}
{
  "id" : 2,
  "document" : {
    "course" : "Bio-Technology",
    "name" : "Raja",
    "studentid" : 108
  }
}


-- Exported myTable Schema

[~/nosqlMigrator]$cat myTableSchema
CREATE TABLE IF NOT EXISTS myTable (id INTEGER, document JSON, PRIMARY
KEY(SHARD(id)))
```

# Migrate from Oracle NoSQL Database On-Premise to Oracle NoSQL Database Cloud Service

This example shows how to use the Oracle NoSQL Database Migrator to copy data and the schema definition of a NoSQL table from Oracle NoSQL Database to Oracle NoSQL Database Cloud Service (NDCS).

### Use Case

As a developer, you are exploring options to avoid the overhead of managing the resources, clusters, and garbage collection for your existing NoSQL Database KVStore workloads. As a solution, you decide to migrate your existing on-premise KVStore workloads to Oracle NoSQL Database Cloud Service because NDCS manages them automatically.

### Example

For the demonstration, let us look at how to migrate the data and schema definition of a NoSQL table called `myTable` from the NoSQL Database KVStore to NDCS. We will also use this use case to show how to run the `runMigrator` utility by passing a precreated configuration file.

### Prerequisites

- Identify the source and sink for the migration.
  - Source: Oracle NoSQL Database
  - Sink: Oracle NoSQL Database Cloud Service

- Identify your OCI cloud credentials and capture them in the OCI config file. Save the config file in `/home/.oci/config`. See Acquiring Credentials in *Using Oracle NoSQL Database Cloud Service*.

```
[DEFAULT]
tenancy=ocid1.tenancy.oc1....
user=ocid1.user.oc1....
fingerprint= 43:d1:....
key_file=</fully/qualified/path/to/the/private/key/>
pass_phrase=<passphrase>
```

- Identify the region endpoint and compartment name for your Oracle NoSQL Database Cloud Service.
  - endpoint: `us-phoenix-1`
  - compartment: `developers`
- Identify the following details for the on-premise KVStore:
  - storeName: `kvstore`
  - helperHosts: `<hostname>:5000`
  - table: `myTable`

**Procedure**

To migrate the data and schema definition of `myTable` from NoSQL Database KVStore to NDCS:

1. Prepare the configuration file (in JSON format) with the identified Source and Sink details. See Source Configuration Templates and Sink Configuration Templates.

```
{
  "source" : {
    "type" : "nosqldb",
    "storeName" : "kvstore",
    "helperHosts" : ["<hostname>:5000"],
    "table" : "myTable",
    "requestTimeoutMs" : 5000
  },
  "sink" : {
    "type" : "nosqldb_cloud",
    "endpoint" : "us-phoenix-1",
    "table" : "myTable",
    "compartment" : "developers",
    "schemaInfo" : {
      "schemaPath" : "<complete/path/to/the/JSON/file/with/DDL/
commands/for/the/schema/definition>",
      "readUnits" : 100,
      "writeUnits" : 100,
      "storageSize" : 1
    },
    "credentials" : "<complete/path/to/oci/config/file>",
    "credentialsProfile" : "DEFAULT",
    "writeUnitsPercent" : 90,
    "requestTimeoutMs" : 5000
  },
  "abortOnError" : true,
```

```
  "migratorVersion" : "1.0.0"
}
```

2. Open the command prompt and navigate to the directory where you extracted the NoSQL Database Migrator utility.
3. Run the `runMigrator` command by passing the configuration file using the `--config` or `-c` option.

```
[~/nosqlMigrator/nosql-migrator-1.0.0]$./runMigrator --config <complete/
path/to/the/JSON/config/file>
```

4. The utility proceeds with the data migration, as shown below.

```
Records provided by source=10, Records written to sink=10, Records
failed=0.
Elapsed time: 0min 10sec 426ms
Migration completed.
```

**Validation**
To validate the migration, you can login to your NDCS console and verify that `myTable` is created with the source data.

# Migrate from JSON file source to Oracle NoSQL Database Cloud Service

This example shows the usage of Oracle NoSQL Database Migrator to copy data from a JSON file source to Oracle NoSQL Database Cloud Service.

After evaluating multiple options, an organization finalizes Oracle NoSQL Database Cloud Service as its NoSQL Database platform. As its source contents are in JSON file format, they are looking for a way to migrate them to Oracle NoSQL Database Cloud Service.

In this example, you will learn to migrate the data from a JSON file called `SampleData.json`. You run the `runMigrator` utility by passing a pre-created configuration file. If the configuration file is not provided as a run time parameter, the `runMigrator` utility prompts you to generate the configuration through an interactive procedure.

**Prerequisites**

- Identify the source and sink for the migration.
  - Source: JSON source file.
    `SampleData.json` is the source file. It contains multiple JSON documents with one document per line, delimited by a new line character.

```
{"id":6,"val_json":{"array":
["q","r","s"],"date":"2023-02-04T02:38:57.520Z","nestarray":[[1,2,3],
[10,20,30]],"nested":{"arrayofobjects":
[{"datefield":"2023-03-04T02:38:57.520Z","numfield":30,"strfield":"foo54
"},
{"datefield":"2023-02-04T02:38:57.520Z","numfield":56,"strfield":"bar23"
}],"nestNum":10,"nestString":"bar"},"num":1,"string":"foo"}}
{"id":3,"val_json":{"array":
["g","h","i"],"date":"2023-02-02T02:38:57.520Z","nestarray":[[1,2,3],
[10,20,30]],"nested":{"arrayofobjects":
[{"datefield":"2023-02-02T02:38:57.520Z","numfield":28,"strfield":"foo3"
},
```

```
{"datefield":"2023-02-02T02:38:57.520Z","numfield":38,"strfield":"bar"}]
,"nestNum":10,"nestString":"bar"},"num":1,"string":"foo"}}
{"id":7,"val_json":{"array":
["a","b","c"],"date":"2023-02-20T02:38:57.520Z","nestarray":[[1,2,3],
[10,20,30]],"nested":{"arrayofobjects":
[{"datefield":"2023-01-20T02:38:57.520Z","numfield":28,"strfield":"foo"}
,
{"datefield":"2023-01-22T02:38:57.520Z","numfield":38,"strfield":"bar"}]
,"nestNum":10,"nestString":"bar"},"num":1,"string":"foo"}}
{"id":4,"val_json":{"array":
["j","k","l"],"date":"2023-02-03T02:38:57.520Z","nestarray":[[1,2,3],
[10,20,30]],"nested":{"arrayofobjects":
[{"datefield":"2023-02-03T02:38:57.520Z","numfield":28,"strfield":"foo"}
,
{"datefield":"2023-02-03T02:38:57.520Z","numfield":38,"strfield":"bar"}]
,"nestNum":10,"nestString":"bar"},"num":1,"string":"foo"}}
```

  - Sink: Oracle NoSQL Database Cloud Service.

- Identify your OCI cloud credentials and capture them in the configuration file. Save the config file in `/home/user/.oci/config`. For more details, see Acquiring Credentials in *Using Oracle NoSQL Database Cloud Service*.

```
[DEFAULT]
tenancy=ocid1.tenancy.oc1....
user=ocid1.user.oc1....
fingerprint= 43:d1:....
region=us-ashburn-1
key_file=</fully/qualified/path/to/the/private/key/>
pass_phrase=<passphrase>
```

- Identify the region endpoint and compartment name for your Oracle NoSQL Database Cloud Service.
  - endpoint: `us-ashburn-1`
  - compartment: `Training-NoSQL`
- Identify the following details for the JSON source file:
  - schemaPath: `<absolute path to the schema definition file containing DDL statements for the NoSQL table at the sink>`.

    In this example, the DDL file is `schema_json.ddl`.

```
create table Migrate_JSON (id INTEGER, val_json JSON, PRIMARY
    KEY(id));
```

    The Oracle NoSQL Database Migrator provides an option to create a table with the default schema if the `schemaPath` is not provided. For more details, see *Identify the Source and Sink* topic in the Workflow for Oracle NoSQL Database Migrator.
  - Datapath: `<absolute path to a file or directory containing the JSON data for migration>`.

**Procedure**

To migrate the JSON source file from `SampleData.json` to Oracle NoSQL Database Cloud Service, perform the following:

1. Prepare the configuration file (in JSON format) with the identified source and sink details. See Source Configuration Templates and Sink Configuration Templates .

```
{
  "source" : {
    "type" : "file",
    "format" : "json",
    "schemaInfo" : {
      "schemaPath" : "[~/nosql-migrator-1.5.0]/schema_json.ddl"
    },
    "dataPath" : "[~/nosql-migrator-1.5.0]/SampleData.json"
  },
  "sink" : {
    "type" : "nosqldb_cloud",
    "endpoint" : "us-ashburn-1",
    "table" : "Migrate_JSON",
    "compartment" : "Training-NoSQL",
    "includeTTL" : false,
    "schemaInfo" : {
      "readUnits" : 100,
      "writeUnits" : 60,
      "storageSize" : 1,
      "useSourceSchema" : true
    },
    "credentials" : "/home/user/.oci/config",
    "credentialsProfile" : "DEFAULT",
    "writeUnitsPercent" : 90,
    "overwrite" : true,
    "requestTimeoutMs" : 5000
  },
  "abortOnError" : true,
  "migratorVersion" : "1.5.0"
}
```

2. Open the command prompt and navigate to the directory where you extracted the Oracle NoSQL Database Migrator utility.
3. Run the `runMigrator` command by passing the configuration file using the `--config` or `-c` option.

```
[~/nosql-migrator-1.5.0]$./runMigrator --config <complete/path/to/the/
config/file>
```

4. The utility proceeds with the data migration, as shown below. The `Migrate_JSON` table is created at the sink with the schema provided in the `schemaPath`.

```
creating source from given configuration:
source creation completed
creating sink from given configuration:
sink creation completed
creating migrator pipeline
migration started
[cloud sink] : start loading DDLs
[cloud sink] : executing DDL: create table Migrate_JSON (id INTEGER,
val_json JSON, PRIMARY KEY(id)),limits: [100, 60, 1]
[cloud sink] : completed loading DDLs
```

```
[cloud sink] : start loading records
[json file source] : start parsing JSON records from file: SampleData.json
[INFO] migration completed.
Records provided by source=4, Records written to sink=4, Records failed=0,
Records skipped=0.
Elapsed time: 0min 5sec 778ms
Migration completed.
```

### Validation

To validate the migration, you can log in to your Oracle NoSQL Database Cloud Service console and verify that the `Migrate_JSON` table is created with the source data. For the procedure to access the console, see Accessing the Service from the Infrastructure Console article in the *Oracle NoSQL Database Cloud Service* document.

**Figure 1-1 Oracle NoSQL Database Cloud Service Console Tables**

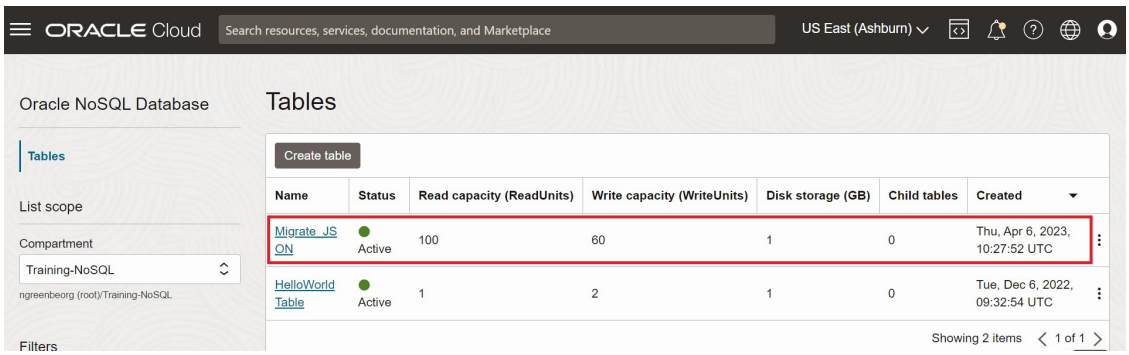
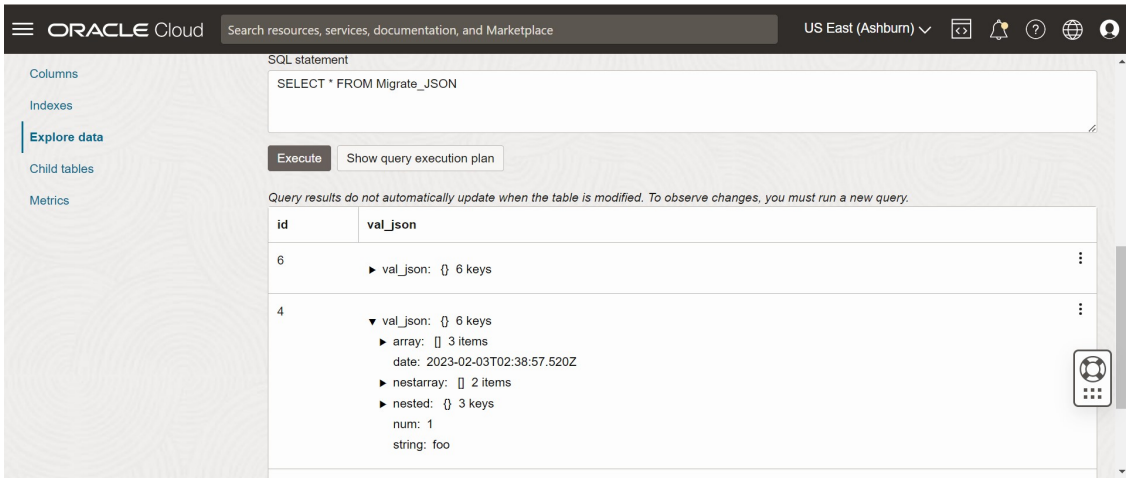



**Figure 1-2 Oracle NoSQL Database Cloud Service Console Table Data**



# Migrate from MongoDB JSON file to an Oracle NoSQL Database Cloud Service

This example shows how to use the Oracle NoSQL Database Migrator to copy Mongo-DB Formatted Data to the Oracle NoSQL Database (NDCS).

### Use Case

After evaluating multiple options, an organization finalizes Oracle NoSQL Database as its NoSQL Database platform. As its NoSQL tables and data are in MongoDB, they are looking for a way to migrate those tables and data to Oracle NDCS.

You can copy a file or directory containing the MongoDB exported JSON data for migration by specifying the file or directory in the source configuration template.

A sample MongoDB-formatted JSON File is as follows:

```
{"_id":0,"name":"Aimee Zank","scores":
[{"score":1.463179736705023,"type":"exam"},
{"score":11.78273309957772,"type":"quiz"},
{"score":35.8740349954354,"type":"homework"}]}
{"_id":1,"name":"Aurelia Menendez","scores":
[{"score":60.06045071030959,"type":"exam"},
{"score":52.79790691903873,"type":"quiz"},
{"score":71.76133439165544,"type":"homework"}]}
{"_id":2,"name":"Corliss Zuk","scores":
[{"score":67.03077096065002,"type":"exam"},
{"score":6.301851677835235,"type":"quiz"},
{"score":66.28344683278382,"type":"homework"}]}
{"_id":3,"name":"Bao Ziglar","scores":
[{"score":71.64343899778332,"type":"exam"},
{"score":24.80221293650313,"type":"quiz"},
{"score":42.26147058804812,"type":"homework"}]}
{"_id":4,"name":"Zachary Langlais","scores":
[{"score":78.68385091304332,"type":"exam"},
{"score":90.2963101368042,"type":"quiz"},
{"score":34.41620148042529,"type":"homework"}]}
```

MongoDB supports two types of extensions to the JSON format of files, *Canonical mode* and *Relaxed mode*. You can supply the MongoDB-formatted JSON file that is generated using the *mongoexport* tool in either Canonical or Relaxed mode. Both the modes are supported by the NoSQL Database Migrator for migration.

For more information on the MongoDB Extended JSON (v2) file, See mongoexport_formats.

For more information on the generation of MongoDB-formatted JSON file, See mongoexport.

### Example

For the demonstration, let us look at how to migrate a MongoDB-formatted JSON file to NDCS. We will use a manually created configuration file for this example.

#### Prerequisites

- Identify the source and sink for the migration.
  - Source: MongoDB-Formatted JSON File

  - Sink: Oracle NoSQL Database

- Extract the data from Mongo DB using the *mongoexport* utility. See mongoexport for more information.
- Create a NoSQL table in the sink with a table schema that matches the data in the Mongo-DB-formatted JSON file. As an alternative, you can instruct the NoSQL Database Migratorto create a table with the default schema structure by setting the `defaultSchema` attribute to true.

> **Note:**
>
> For a *MongoDB-Formatted JSON* source, the default schema for the table will be as:
>
> ```
> CREATE TABLE IF NOT EXISTS <tablename>(ID STRING, DOCUMENT
> JSON,PRIMARY KEY(SHARD(ID))
> ```
>
> Where:
>
> - `tablename` = value of the table config.
> - `ID` = `_id` value from the mongoDB exported JSON source file.
> - `DOCUMENT` = The entire contents of the mongoDB exported JSON source file is aggregated into the `DOCUMENT` column excluding the `_id` field.

- Identify your OCI cloud credentials and capture them in the OCI config file. Save the config file in `/home/.oci/config`.See Acquiring Credentials in *Using Oracle NoSQL Database Cloud Service*.

```
[DEFAULT]
tenancy=ocid1.tenancy.oc1....
user=ocid1.user.oc1....
fingerprint= 43:d1:....
key_file=</fully/qualified/path/to/the/private/key/>
pass_phrase=<passphrase>
```

- Identify the region endpoint and compartment name for your Oracle NoSQL Database.
  - endpoint: `us-phoenix-1`
  - compartment: `developers`

**Procedure**
To migrate the MongoDB-formatted JSON data to the Oracle NoSQL Database:

1. Prepare the configuration file (in JSON format) with the identified Source and Sink details. See Source Configuration Templates and Sink Configuration Templates .

```
{
  "source" : {
    "type" : "file",
    "format" : "mongodb_json",
    "dataPath" : "<complete/path/to/the/MongoDB/Formatted/JSON/file>"
  },
  "sink" : {
```

```
    "type" : "nosqldb_cloud",
    "endpoint" : "us-phoenix-1",
    "table" : "mongoImport",
    "compartment" : "developers",
    "schemaInfo" : {
      "defaultSchema" : true,
      "readUnits" : 100,
      "writeUnits" : 60,
      "storageSize" : 1
    },
    "credentials" : "<complete/path/to/the/oci/config/file>",
    "credentialsProfile" : "DEFAULT",
    "writeUnitsPercent" : 90,
    "requestTimeoutMs" : 5000
  },
  "abortOnError" : true,
  "migratorVersion" : "1.0.0"
}
```

2. Open the command prompt and navigate to the directory where you extracted the NoSQL Database Migrator utility.
3. Run the `runMigrator` command by passing the configuration file using the `--config` or `-c` option.

```
[~/nosqlMigrator/nosql-migrator-1.0.0]$./runMigrator --config <complete/
path/to/the/JSON/config/file>
```

4. The utility proceeds with the data migration, as shown below.

```
Records provided by source=29,353, Records written to sink=29,353, Records
failed=0.
Elapsed time: 9min 9sec 630ms
Migration completed.
```

**Validation**
To validate the migration, you can login to your NDCS console and verify that `myTable` is created with the source data.

# Migrate from DynamoDB JSON file to Oracle NoSQL Database

This example shows how to use Oracle NoSQL Database Migrator to copy DynamoDB JSON file to NoSQL Database.

**Use Case:**

After evaluating multiple options, an organization finalizes Oracle NoSQL Database over DynamoDB database. The organization wants to migrate their tables and data from DynamoDB to Oracle NoSQL Database (on-premises).

See Mapping of DynamoDB table to Oracle NoSQL table for more details.

You can migrate a file or directory containing the DynamoDB exported JSON data from a file system by specifying the path in the source configuration template.

A sample DynamoDB-formatted JSON File is as follows:

```
{"Item":{"Id":{"N":"101"},"Phones":{"L":[{"L":[{"S":"555-222"},
{"S":"123-567"}]}]},"PremierCustomer":{"BOOL":false},"Address":{"M":{"Zip":
{"N":"570004"},"Street":{"S":"21 main"},"DoorNum":{"N":"201"},"City":
{"S":"London"}}},"FirstName":{"S":"Fred"},"FavNumbers":{"NS":
["10"]},"LastName":{"S":"Smith"},"FavColors":{"SS":["Red","Green"]},"Age":
{"N":"22"},"ttl": {"N": "1734616800"}}}
{"Item":{"Id":{"N":"102"},"Phones":{"L":[{"L":
[{"S":"222-222"}]}]},"PremierCustomer":{"BOOL":false},"Address":{"M":{"Zip":
{"N":"560014"},"Street":{"S":"32 main"},"DoorNum":{"N":"1024"},"City":
{"S":"Wales"}}},"FirstName":{"S":"John"},"FavNumbers":{"NS":
["10"]},"LastName":{"S":"White"},"FavColors":{"SS":["Blue"]},"Age":
{"N":"48"},"ttl": {"N": "1734616800"}}}
```

You copy the exported DynamoDB table data from AWS S3 storage to a local mounted file system.

**Example:**

For this demonstration, you will learn how to migrate a DynamoDB JSON file to Oracle NoSQL Database (on-premises). You will use a manually created configuration file for this example.

**Prerequisites**

- Identify the source and sink for the migration.
  - **Source:** DynamoDB JSON File
  - **Sink:** Oracle NoSQL Database (on-premises)
- In order to import DynamoDB table data to Oracle NoSQL Database, you must first export the DynamoDB table to S3. See the steps provided in Exporting DynamoDB table data to Amazon S3 to export your table. While exporting, you select the format as **DynamoDB JSON**. The exported data contains DynamoDB table data in multiple `gzip` files as shown below.

  ```
  / 01639372501551-bb4dd8c3
  |-- 01639372501551-bb4dd8c3 ==> exported data prefix
  |----data
  |------sxz3hjr3re2dzn2ymgd2gi4iku.json.gz  ==>table data
  |----manifest-files.json
  |----manifest-files.md5
  |----manifest-summary.json
  |----manifest-summary.md5
  |----_started
  ```

- You must download the files from AWS S3. The structure of the files after the download will be as shown below.

  ```
  download-dir/01639372501551-bb4dd8c3
  |----data
  |------sxz3hjr3re2dzn2ymgd2gi4iku.json.gz  ==>table data
  |----manifest-files.json
  |----manifest-files.md5
  |----manifest-summary.json
  ```

```
|----manifest-summary.md5
|----_started
```

### Procedure

To migrate the DynamoDB JSON data to the Oracle NoSQL Database:

1. Prepare the configuration file (in JSON format) with the identified source and sink details. For details, see Source Configuration Templates and Sink Configuration Templates.

> **Note:**
>
> If your DynamoDB exported JSON table items contain TTL attribute, to optionally import the TTL values, specify the attribute in the `ttlAttributeName` configuration parameter of the source configuration template and set the `includeTTL` configuration parameter to true in the sink configuration template.

You can choose one of the following two options.

- **Option 1:** Importing DynamoDB table as a JSON document using default schema config.
  Here, you set the `defaultSchema` configuration parameter to true. Therefore, the NoSQL Database Migrator creates the default schema at the sink. You must specify the `DDBPartitionKey` and the corresponding NoSQL column type. Otherwise, an error is displayed.

  For details on the default schema for a DynamoDB exported JSON source, see *Identify the Source and Sink* topic in Workflow for Oracle NoSQL Database Migrator.

```
{
  "source" : {
    "type" : "file",
    "format" : "dynamodb_json",
    "ttlAttributeName" : "ttl",
    "dataPath" : "<complete/path/to/the/DynamoDB/Formatted/JSON/file>"
  },
  "sink" : {
    "type" : "nosqldb",
    "storeName" : "kvstore",
    "helperHosts" : ["<hostname>:5000"],
    "table" : "sampledynDBImp",
    "includeTTL" : true,
    "schemaInfo" : {
      "DDBPartitionKey" : "Id:INTEGER",
      "defaultSchema" : true
    },
    "overwrite" : true,
    "requestTimeoutMs" : 5000
  },
  "abortOnError" : true,
  "migratorVersion" : "1.6.5"
}
```

The following default schema is used in this example:

```
CREATE TABLE IF NOT EXISTS sampledynDBImp (Id INTEGER, document JSON,
PRIMARY KEY(SHARD(Id)))
```

- **Option 2:** Importing DynamoDB table as fixed columns using a user-supplied schema file.
  Here, you set the `defaultSchema` configuration parameter to false. Therefore, you specify the file containing the sink table's DDL statement in the `schemaPath` parameter. See Mapping of DynamoDB types to Oracle NoSQL types for more details.

  The following user-defined schema is used in this example:

  ```
  CREATE TABLE IF NOT EXISTS sampledynDBImp (Id INTEGER, document JSON,
  PRIMARY KEY(SHARD(Id)))
  ```

  NoSQL Database Migrator uses the schema file to create the table at the sink as part of the migration. As long as the primary key data is provided, the input JSON record will be inserted. Otherwise, an error is displayed.

  > **Note:**
  >
  > – If the Dynamo DB table has a data type that is not supported in NoSQL Database, the migration fails.
  >
  > – If the input data does not contain a value for a particular column (other than the primary key) then the column default value will be used. The default value must be a part of the column definition while creating the table. For example `id INTEGER not null default 0`. If the column does not have a default definition, SQL NULL is inserted if values are not provided for the column.
  >
  > – If you are modeling DynamoDB table as a JSON document, ensure that you use `AggregateFields` transform in order to aggregate non-primary key data into a JSON column. For details, see aggregateFields.

  ```
  {
    "source" : {
      "type" : "file",
      "format" : "dynamodb_json",
      "ttlAttributeName" : "ttl",
      "dataPath" : "<complete/path/to/the/DynamoDB/Formatted/JSON/file>"
    },
    "sink" : {
      "type" : "nosqldb",
      "storeName" : "kvstore",
      "helperHosts" : ["<hostname>:5000"],
      "table" : "sampledynDBImp",
      "includeTTL" : true,
      "schemaInfo" : {
        "schemaPath" : "<full path of the schema file with the DDL
  statement>"
      },
  ```

```
      "overwrite" : true,
      "requestTimeoutMs" : 5000
    },
    "transforms": {
      "aggregateFields" : {
        "fieldName" : "document",
        "skipFields" : ["Id"]
      }
    },
    "abortOnError" : true,
    "migratorVersion" : "1.6.5"
  }
```

2. Open the command prompt and navigate to the directory where you extracted the NoSQL Database Migrator utility.
3. Run the `runMigrator` command by passing separate configuration files for options 1 and 2. Use the `--config` or `-c` option.

```
./runMigrator --config <complete/path/to/the/JSON/config/file>
```

4. The utility proceeds with the data migration as illustrated in the following sample:

```
[INFO] creating source from given configuration:
[INFO] source creation completed
[INFO] creating sink from given configuration:
[INFO] sink creation completed
[INFO] creating migrator pipeline
[INFO] [nosqldb sink] : start loading DDLs
[INFO] [nosqldb sink] : executing DDL: CREATE TABLE IF NOT EXISTS
sampledynDBImp (Id INTEGER, document JSON, PRIMARY KEY(SHARD(Id)))
[INFO] [nosqldb sink] : completed loading DDLs
[INFO] migration started
[INFO] Start writing data to OnDB Sink
[INFO] executing for source:DynamoSample
[INFO] [DDB file source] : start parsing JSON records from file:
DynamoSample.json.gz
[INFO] Writing data to OnDB Sink completed.
[INFO] migration completed.
Records provided by source=2, Records written to sink=2, Records
failed=0,Records skipped=0.
Elapsed time: 0min 0sec 45ms
Migration completed.
```

**Validation**

Start the SQL prompt in your data store.

```
java -jar lib/sql.jar -helper-hosts localhost:5000 -store kvstore
```

Verify that the new table is created with the source data:

```
SELECT * FROM sampledynDBImp
```

**Output**

Notice that the TTL information is included in the `_metadata` JSON object for each imported item.

```
{"Id":102,"document":{"Address":{"City":"Wales","DoorNum":1024,"Street":"32
main","Zip":560014},"Age":48,"FavColors":["Blue"],"FavNumbers":
[10],"FirstName":"John","LastName":"White","Phones":
[["222-222"]],"PremierCustomer":false,"_metadata":
{"expiration":1734616196000}}}
{"Id":101,"document":{"Address":{"City":"London","DoorNum":201,"Street":"21
main","Zip":570004},"Age":22,"FavColors":["Red","Green"],"FavNumbers":
[10],"FirstName":"Fred","LastName":"Smith","Phones":
[["555-222","123-567"]],"PremierCustomer":false,"_metadata":
{"expiration":1734616196000}}}
```

# Migrate from DynamoDB JSON file in AWS S3 to an Oracle NoSQL Database Cloud Service

This example shows how to use the Oracle NoSQL Database Migrator to copy DynamoDB JSON file stored in an AWS S3 store to the Oracle NoSQL Database Cloud Service (NDCS).

**Use Case:**

After evaluating multiple options, an organization finalizes Oracle NoSQL Database Cloud Service over DynamoDB database. The organization wants to migrate their tables and data from DynamoDB to Oracle NoSQL Database Cloud Service.

See Mapping of DynamoDB table to Oracle NoSQL table for more details.

You can migrate a file containing the DynamoDB exported JSON data from the AWS S3 storage by specifying the path in the source configuration template.

A sample DynamoDB-formatted JSON File is as follows:

```
{"Item":{"Id":{"N":"101"},"Phones":{"L":[{"L":[{"S":"555-222"},
{"S":"123-567"}]}]},"PremierCustomer":{"BOOL":false},"Address":{"M":{"Zip":
{"N":"570004"},"Street":{"S":"21 main"},"DoorNum":{"N":"201"},"City":
{"S":"London"}}},"FirstName":{"S":"Fred"},"FavNumbers":{"NS":
["10"]},"LastName":{"S":"Smith"},"FavColors":{"SS":["Red","Green"]},"Age":
{"N":"22"}}}
{"Item":{"Id":{"N":"102"},"Phones":{"L":[{"L":
[{"S":"222-222"}]}]},"PremierCustomer":{"BOOL":false},"Address":{"M":{"Zip":
{"N":"560014"},"Street":{"S":"32 main"},"DoorNum":{"N":"1024"},"City":
{"S":"Wales"}}},"FirstName":{"S":"John"},"FavNumbers":{"NS":
["10"]},"LastName":{"S":"White"},"FavColors":{"SS":["Blue"]},"Age":
{"N":"48"}}}
```

You export the DynamoDB table to AWS S3 storage as specified in Exporting DynamoDB table data to Amazon S3.

**Example:**

For this demonstration, you will learn how to migrate a DynamoDB JSON file in an AWS S3 source to NDCS. You will use a manually created configuration file for this example.

### Prerequisites

- Identify the source and sink for the migration.
  - **Source:** DynamoDB JSON File in AWS S3
  - **Sink:** Oracle NoSQL Database Cloud Service
- Identify the table in AWS DynamoDB that needs to be migrated to NDCS. Login to your AWS console using your credentials. Go to **DynamoDB**. Under **Tables**, choose the table to be migrated.
- Create an object bucket and export the table to S3. From your AWS console, go to **S3**. Under buckets, create a new object bucket. Go back to DynamoDB and click **Exports to S3**. Provide the source table and the destination S3 bucket and click **Export**.
  Refer to steps provided in Exporting DynamoDB table data to Amazon S3 to export your table. While exporting, you select the format as **DynamoDB JSON**. The exported data contains DynamoDB table data in multiple `gzip` files as shown below.

  ```
  / 01639372501551-bb4dd8c3
  |-- 01639372501551-bb4dd8c3 ==> exported data prefix
  |----data
  |------sxz3hjr3re2dzn2ymgd2gi4iku.json.gz  ==>table data
  |----manifest-files.json
  |----manifest-files.md5
  |----manifest-summary.json
  |----manifest-summary.md5
  |----_started
  ```

- You need aws credentials (including access key ID and secret access key) and config files (credentials and optionally config) to access AWS S3 from the migrator. See Set and view configuration settings for more details on the configuration files. See Creating a key pair for more details on creating access keys.
- Identify your OCI cloud credentials and capture them in the OCI config file. Save the config file in a directory `.oci` under your home directory (`~/.oci/config`). See Acquiring Credentials for more details.

  ```
  [DEFAULT]
  tenancy=ocid1.tenancy.oc1....
  user=ocid1.user.oc1....
  fingerprint= 43:d1:....
  key_file=</fully/qualified/path/to/the/private/key/>
  pass_phrase=<passphrase>
  ```

- Identify the region endpoint and compartment name for your Oracle NoSQL Database. For example,
  - **endpoint:** us-phoenix-1
  - **compartment:** developers

### Procedure

To migrate the DynamoDB JSON data to the Oracle NoSQL Database:

1. Prepare the configuration file (in JSON format) with the identified source and sink details. For details, see Source Configuration Templates and Sink Configuration Templates.

> **Note:**
>
> If the items in your DynamoDB JSON File in AWS S3 contain TTL attribute, to optionally import the TTL values, specify the attribute in the `ttlAttributeName` configuration parameter of the source configuration template and set the `includeTTL` configuration parameter to true in the sink configuration template. For more details, see Migrating TTL Metadata for Table Rows.

You can choose one of the following two options.

- **Option 1:** Importing DynamoDB table as a JSON document using default schema config.
  Here, the `defaultSchema` is `TRUE` and so the migrator creates the default schema at the sink. You need to specify the `DDBPartitionKey` and the corresponding NoSQL column type. Otherwise, an error is thrown.

```
{
 "source" : {
   "type" : "aws_s3",
   "format" : "dynamodb_json",
   "s3URL" : "<https://<bucket-name>.<s3_endpoint>/export_path>",
   "credentials" : "</path/to/aws/credentials/file>",
   "credentialsProfile" : <"profile name in aws credentials file">
 },
 "sink" : {
   "type" : "nosqldb_cloud",
   "endpoint" : "<region_name>",
   "table" : "<table_name>",
   "compartment" : "<compartment_name>",
   "schemaInfo" : {
      "defaultSchema" : true,
      "readUnits" : 100,
      "writeUnits" : 60,
      "DDBPartitionKey" : "<PrimaryKey:Datatype>",
      "storageSize" : 1
   },
   "credentials" : "<complete/path/to/the/oci/config/file>",
   "credentialsProfile" : "DEFAULT",
   "writeUnitsPercent" : 90,
   "requestTimeoutMs" : 5000
 },
 "abortOnError" : true,
 "migratorVersion" : "1.6.5"
}
```

  For a DynamoDB JSON source, the default schema for the table will be as shown below:

```
CREATE TABLE IF NOT EXISTS <TABLE_NAME>(DDBPartitionKey_name
DDBPartitionKey_type,
[DDBSortKey_name DDBSortKey_type], DOCUMENT JSON,
PRIMARY KEY(SHARD(DDBPartitionKey_name),[DDBSortKey_name]))
```

Where

TABLE_NAME = value provided for the sink 'table' in the configuration

DDBPartitionKey_name = value provided for the partition key in the configuration

DDBPartitionKey_type = value provided for the data type of the partition key in the configuration

DDBSortKey_name = value provided for the sort key in the configuration if any

DDBSortKey_type = value provided for the data type of the sort key in the configuration if any

DOCUMENT = All attributes except the partition and sort key of a Dynamo DB table item aggregated into a NoSQL JSON column

- **Option 2:** Importing DynamoDB table as fixed columns using a user-supplied schema file.
  Here, the `defaultSchema` is `FALSE` and you specify the `schemaPath` as a file containing your DDL statement. For details, see Mapping of DynamoDB types to Oracle NoSQL types for more details.

> **Note:**
>
> If the Dynamo DB table has a data type that is not supported in NoSQL, the migration fails.

A sample schema file is shown below.

```
CREATE TABLE IF NOT EXISTS sampledynDBImp (AccountId INTEGER,document
JSON,
PRIMARY KEY(SHARD(AccountId)));
```

The schema file is used to create the table at the sink as part of the migration. As long as the primary key data is provided, the input JSON record will be inserted, otherwise it throws an error.

> **Note:**
>
> – If the input data does not contain a value for a particular column(other than the primary key) then the column default value will be used. The default value should be part of the column definition while creating the table. For example `id INTEGER not null default 0`. If the column does not have a default definition then SQL NULL is inserted if no values are provided for the column.
>
> – If you are modeling DynamoDB table as a JSON document, ensure that you use `AggregateFields` transform in order to aggregate non-primary key data into a JSON column. For details, see aggregateFields.

```
{
 "source" : {
   "type" : "aws_s3",
```

```
    "format" : "dynamodb_json",
    "s3URL" : "<https://<bucket-name>.<s3_endpoint>/export_path>",
    "credentials" : "</path/to/aws/credentials/file>",
    "credentialsProfile" : <"profile name in aws credentials file">
  },
  "sink" : {
    "type" : "nosqldb_cloud",
    "endpoint" : "<region_name>",
    "table" : "<table_name>",
    "compartment" : "<compartment_name>",
    "schemaInfo" : {
       "defaultSchema" : false,
       "readUnits" : 100,
       "writeUnits" : 60,
       "schemaPath" : "<full path of the schema file with the DDL
statement>",
       "storageSize" : 1
    },
    "credentials" : "<complete/path/to/the/oci/config/file>",
    "credentialsProfile" : "DEFAULT",
    "writeUnitsPercent" : 90,
    "requestTimeoutMs" : 5000
  },
   "transforms": {
     "aggregateFields" : {
       "fieldName" : "document",
       "skipFields" : ["AccountId"]
     }
   },
  "abortOnError" : true,
  "migratorVersion" : "1.6.5"
}
```

2. Open the command prompt and navigate to the directory where you extracted the NoSQL Database Migrator utility.
3. Run the `runMigrator` command by passing the configuration file using the `--config` or `-c` option.

```
[~/nosqlMigrator]$./runMigrator
--config <complete/path/to/the/JSON/config/file>
```

4. The utility proceeds with the data migration, as shown below.

```
Records provided by source=7..,
Records written to sink=7,
Records failed=0,
Records skipped=0.
Elapsed time: 0 min 2sec 50ms
Migration completed.
```

**Validation**

You can log in to your NDCS console and verify that the new table is created with the source data.

# Migrate from CSV file to Oracle NoSQL Database

This example shows the usage of Oracle NoSQL Database Migrator to copy data from a CSV file to Oracle NoSQL Database.

### Example

After evaluating multiple options, an organization finalizes Oracle NoSQL Database as its NoSQL Database platform. As its source contents are in CSV file format, they are looking for a way to migrate them to Oracle NoSQL Database.

In this example, you will learn to migrate the data from a CSV file called `course.csv`, which contains information about various courses offered by a university. You generate the configuration file from the `runMigrator` utility.

You can also prepare the configuration file with the identified source and sink details. See Sources and Sinks.

### Prerequisites

- Identify the source and sink for the migration.
  - Source: CSV file
    In this example, the source file is `course.csv`

```
cat [~/nosql-migrator-1.5.0]/course.csv
1,"Computer Science", "San Francisco", "2500"
2,"Bio-Technology", "Los Angeles", "1200"
3,"Journalism", "Las Vegas", "1500"
4,"Telecommunication", "San Francisco", "2500"
```

  - Sink: Oracle NoSQL Database
- The CSV file must conform to the `RFC4180` format.
- Create a file containing the DDL commands for the schema of the target table, `course`. The table definition must match the CSV data file concerning the number of columns and their types.
  In this example, the DDL file is `mytable_schema.ddl`

```
cat [~/nosql-migrator-1.5.0]/mytable_schema.ddl
create table course (id INTEGER, name STRING, location STRING, fees
INTEGER, PRIMARY KEY(id));
```

### Procedure

To migrate the CSV file data from `course.csv` to Oracle NoSQL Database Service, perform the following steps:

1. Open the command prompt and navigate to the directory where you extracted the Oracle NoSQL Database Migrator utility.
2. To generate the configuration file using Oracle NoSQL Database Migrator, execute the `runMigrator` command without any runtime parameters.

```
[~/nosql-migrator-1.5.0]$./runMigrator
```

3. As you did not provide the configuration file as a runtime parameter, the utility prompts if you want to generate the configuration now. Type `y`.

   You can choose a location for the configuration file or retain the default location by pressing the `Enter key`.

```
Configuration file is not provided. Do you want to generate
configuration? (y/n) [n]: y
Generating a configuration file interactively.

Enter a location for your config [./migrator-config.json]:
./migrator-config.json already exist. Do you want to overwrite?(y/n) [n]: y
```

4. Based on the prompts from the utility, choose your options for the Source configuration.

```
Select the source:
1) nosqldb
2) nosqldb_cloud
3) file
4) object_storage_oci
5) aws_s3
#? 3

Configuration for source type=file
Select the source file format:
1) json
2) mongodb_json
3) dynamodb_json
4) csv
#? 4
```

5. Provide the path to the source CSV file. Further, based on the prompts from the utility, you can choose to reorder the column names, select the encoding method, and trim the tailing spaces from the target table.

```
Enter path to a file or directory containing csv data: [~/nosql-
migrator-1.5.0]/course.csv
Does the CSV file contain a headerLine? (y/n) [n]: n
Do you want to reorder the column names of NoSQL table with respect to
CSV file columns? (y/n) [n]: n
Provide the CSV file encoding. The supported encodings are:
UTF-8,UTF-16,US-ASCII,ISO-8859-1. [UTF-8]:
Do you want to trim the tailing spaces? (y/n) [n]: n
```

6. Based on the prompts from the utility, choose your options for the Sink configuration.

```
Select the sink:
1) nosqldb
2) nosqldb_cloud
#? 1
Configuration for sink type=nosqldb
Enter store name of the Oracle NoSQL Database: mystore
```

```
Enter comma separated list of host:port of Oracle NoSQL Database:
<hostname>:5000
```

7. Based on the prompts from the utility, provide the name of the target table.

```
Enter fully qualified table name: course
```

8. Enter your choice to set the TTL value. The default value is `n`.

```
Include TTL data? If you select 'yes' TTL value provided by the
source will be set on imported rows. (y/n) [n]: n
```

9. Based on the prompts from the utility, specify whether or not the target table must be created through the Oracle NoSQL Database Migrator tool. If the table is already created, it is suggested to provide `n`. If the table is not created, the utility will request the path for the file containing the DDL commands for the schema of the target table.

```
Would you like to create table as part of migration process?
Use this option if you want to create table through the migration tool.
If you select yes, you will be asked to provide a file that contains
table DDL or to use schema provided by the source or default schema.
(y/n) [n]: y
Enter path to a file containing table DDL: [~/nosql-migrator-1.5.0]/
mytable_schema.ddl
Is the store secured? (y/n) [y]: n
would you like to overwrite records which are already present?
If you select 'no' records with same primary key will be skipped [y/n]
[y]: y
Enter store operation timeout in milliseconds. [5000]:
Would you like to add transformations to source data? (y/n) [n]: n
```

10. Enter your choice to determine whether to proceed with the migration in case any record fails to migrate.

```
Would you like to continue migration if any data fails to be migrated?
(y/n) [n]: n
```

11. The utility displays the generated configuration on the screen.

```
Generated configuration is:
{
  "source" : {
    "type" : "file",
    "format" : "csv",
    "dataPath" : "[~/nosql-migrator-1.5.0]/course.csv",
    "hasHeader" : false,
    "csvOptions" : {
      "encoding" : "UTF-8",
      "trim" : false
    }
```

```
  },
  "sink" : {
    "type" : "nosqldb",
    "storeName" : "mystore",
    "helperHosts" : ["<hostname>:5000"],
    "table" : "migrated_table",
    "query" : "",
    "includeTTL" : false,
    "schemaInfo" : {
      "schemaPath" : "[~/nosql-migrator-1.5.0]/mytable_schema.ddl"
    },
    "overwrite" : true,
    "requestTimeoutMs" : 5000
  },
  "abortOnError" : true,
  "migratorVersion" : "1.5.0"
}
```

12. Finally, the utility prompts you to specify whether or not to proceed with the migration using the generated configuration file. The default option is `y`.

    **Note**: If you select `n`, you can use the generated configuration file to perform the migration. Specify the `./runMigrator -c` or the `./runMigrator --config` option.

```
Would you like to run the migration with above configuration?
If you select no, you can use the generated configuration file to
run the migration using:
./runMigrator --config ./migrator-config.json
(y/n) [y]: y
```

13. The NoSQL Database Migrator copies your data from the CSV file to Oracle NoSQL Database.

```
creating source from given configuration:
source creation completed
creating sink from given configuration:
sink creation completed
creating migrator pipeline
migration started
[nosqldb sink] : start loading DDLs
[nosqldb sink] : executing DDL: create table course (id INTEGER, name
STRING, location STRING, fees INTEGER, PRIMARY KEY(id))
[nosqldb sink] : completed loading DDLs
[nosqldb sink] : start loading records
[csv file source] : start parsing CSV records from file: course.csv
migration completed. Records provided by source=4, Records written to
sink=4, Records failed=0,Records skipped=0.
Elapsed time: 0min 0sec 559ms
Migration completed.
```

**Validation**

Start the SQL prompt in your KVStore.

```
java -jar lib/sql.jar -helper-hosts localhost:5000 -store kvstore
```

Verify that the new table is created with the source data:

```
sql-> select * from course;
{"id":4,"name":"Telecommunication","location":"San Francisco","fees":2500}
{"id":1,"name":"Computer Science","location":"San Francisco","fees":2500}
{"id":2,"name":"Bio-Technology","location":"Los Angeles","fees":1200}
{"id":3,"name":"Journalism","location":"Las Vegas","fees":1500}

4 rows returned
```

# Troubleshooting the Oracle NoSQL Database Migrator

Learn about the general challenges that you may face while using the , and how to resolve them.

**Migration has failed. How can I resolve this?**

A failure of the data migration can be because of multiple underlying reasons. The important causes are listed below:

**Table 1-5 Migration Failure Causes**

| Error Message | Meaning | Resolution |
|---|---|---|
| `Failed to connect to Oracle NoSQL Database` | The migrator could not establish a connection with the NoSQL Database. | • Check if the values of the `storeName` and `helperHosts` attributes in the configuration JSON file are valid and that the hosts are reachable.<br>• For a secured store, verify if the security file is valid with correct user name and password values. |
| `Failed to connect to Oracle NoSQL Database Cloud Service` | The migrator could not establish a connection with the Oracle NoSQL Database Cloud Service. | • Verify if the endpoint URL or region name specified in the configuration JSON file is correct.<br>• Check if the OCI credentials file is available in the path specified in the configuration JSON file.<br>• Ensure that the OCI credentials provided in the OCI credentials are valid. |

**Table 1-5 (Cont.) Migration Failure Causes**

| Error Message | Meaning | Resolution |
|---|---|---|
| `Table not found` | The table identified for the migration could not be located by the NoSQL Database Migrator. | **For the Source:**<br>• Verify if the table is present in the source database.<br>• Ensure that the table is qualified with its namespace in the configuration JSON file, if the table is created in a non-default namespace.<br>• Verify if you have the required read/write authorization to access the table.<br>• If the source is Oracle NoSQL Database Cloud Service, verify if the valid compartment name is specified in the configuration JSON file, and ensure that you have the required authorization to access the table.<br>**For the Sink:**<br>• Verify if the table is present in the Sink. If it does not exist, you must either create the table manually or use the `schemaInfo` config to create it through the migration. |
| `DDL Execution failed` | The DDL commands provided in the input schema definition file is invalid. | • Check the syntax of the DDL commands in the `schemaPath` file.<br>• Ensure that there is only one DDL statement per line in the `schemaPath` file. |
| `failed to write record to the sink table with java.lang.IllegalArgumentException` | The input record is not matching with the table schema of the sink. | • Check if the data types and column names specified in the target sink table are matching with sink table schema.<br>• If you applied any transformation, check if the transformed records are matching with the sink table schema. |
| `Request timeout` | The source or sink's operation did not complete within the expected time. | • Verify the network connection.<br>• Check if the NoSQL Database is up and running.<br>• Try to increase `requestTimeout` value in the configuration JSON file. |

### What should I consider before restarting a failed migration?

When a data migration task fails, the sink will be at an intermediate state containing the imported data until the point of failure. You can identify the error and failure details from the logs and restart the migration after diagnosing and correcting the error. A restarted migration starts over, processing all data from the beginning. There is no way to checkpoint and restart the migration from the point of failure. Therefore, NoSQL Database Migrator overwrites any record that was migrated to the sink already.

### Migration is too slow. How can I speed it up?

The time taken for the data migration depends on multiple factors such as volume of data being migrated, network speed, current load on the database. In case of a cloud service, the speed of migration also depends on the read throughput and the write throughput provisioned. So, to improve the migration speed, you can:

- Try to reduce the current workload on your Oracle NoSQL Database while migrating the data.
- Ensure that the machine that is running the migration, source, and sink all are located in the same data center and the network latencies are minimal.
- In case of Oracle NoSQL Database Cloud Service, provision high read/write throughput and verify if the storage allocated for table is sufficient or not. If the NoSQL Database Migrator is not creating the table, you can increase the write throughput. If the migrator is creating the table, consider specifying a higher value for the `schemaInfo.writeUnits` parameter in the sink configuration. Once the data migration completes, you can lower this value. Be aware of daily limits on throughput changes. see Cloud Limits and Sink Configuration Templates .

### I have a long running migration involving huge datasets. How can I track the progress of the migration?

You can enable additional logging to track the progress of a long-running migration. To control the logging behavior of Oracle NoSQL Database Migrator, you must set the desired level of logging in the `logging.properties` file. This file is provided with the NoSQL Database Migrator package and available in the directory where the Oracle NoSQL Database Migrator was unpacked. The different levels of logging are `OFF`, `SEVERE`, `WARNING`, `INFO`, `FINE`, and `ALL` in the order of increasing verbosity. Setting the log level to `OFF` turns off all the logging information, whereas setting the log level to `ALL` provides the full log information. The default log level is `WARNING`. All the logging output is configured to go to the console by default. You can see comments in the `logging.properties` file to know about each log level.

# Glossary

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