ODS – Operational Data Store.

Replicate data to Azure SQL Database using ODS.

**Contributors**

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1.0

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**Revision and Signoff Sheet**

Change Record

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| --- | --- | --- | --- |
| **Date** | **Commented by** | **Version** | **Change reference** |
| 01/20/2023 | Chetan Hiran | 1.0 | Draft |
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**Approvers**

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| **Name** | **Version approved** | **Position** | **Date** |
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# Overview

The ODS is a framework developed using Azure Service to replicate data from Microsoft Dataverse to an Azure SQL Database store in a user owned Azure Subscription. The supported target destination is Azure SQL Database, but the framework can be easily extended to support SQL Server on Azure virtual machines or on-Premises SQL server. The Data Export Service intelligently synchronizes the entire data initially and thereafter synchronizes on a continuous basis as changes occur (delta changes) in the system.

# Prerequisites

Azure SQL database Service

A SQL database and a service account with the Database permissions.

| **Permission type code** | **Permission name** |
| --- | --- |
| CRTB | CREATE TABLE |
| CRTY | CREATE TYPE |
| CRVW | CREATE VIEW |
| CRPR | CREATE PROCEDURE |

Schema permissions required.

| **Permission type code** | **Permission name** |
| --- | --- |
| AL | ALTER |
| IN | INSERT |
| DL | DELETE |
| SL | SELECT |
| UP | UPDATE |
| EX | EXECUTE |
| RF | REFERENCES |

**Azure Data Factory**

**Azure Key Vault service**

Key Vault Secrets User Role for Data Factory.

**Azure Blob Storage**

Storage Blob Data Contributor role for Data factory.

**Microsoft Dataverse**

Service account user with System Administrator security role.

# Architecture



## Type of Columns

The following table includes the corresponding sink type.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Power Apps data type** | **Solution Explorer type** | **API type** | **Sink Data Type** | **Additional Sink Columns** |
| Big Integer | Time Stamp | BigIntType | bigint |  |
| Yes/No | Two Options | BooleanType | bit | <<attributename>>name : String |
| Customer | Customer | CustomerType | uniqueidentifier | <<attributename>>name : String  <<attributename>>Type : String |
| Date and Time | Date and Time Date and Time Format | DateTimeType | datetime |  |
| Date Only | Date and Time Date Only Format | DateTimeType | datetime |  |
| Decimal Number | Decimal Number | DecimalType | decimal |  |
| Floating Point Number | Floating Point Number | DoubleType | decimal |  |
| File | File | FileType | uniqueidentifier |  |
| Image | Image | ImageType | varchar(MAX) |  |
| Duration | Whole Number Duration Format | IntegerType | int |  |
| Language | Whole Number Language Format | IntegerType | int |  |
| Timezone | Whole Number Time Zone Format | IntegerType | int |  |
| Whole Number | Whole Number None Format | IntegerType | int |  |
| Lookup | Lookup | LookupType | uniqueidentifier | <<attributename>>name : String |
| Multiline Text | Multiple Lines of Text | MemoType | nvarchar(MAX) |  |
| Currency | Currency | MoneyType | decimal |  |
| Choices | MultiSelect Field | MultiSelectPicklistType | nvarchar(MAX) |  |
| Owner | Owner | OwnerType | uniqueidentifier | <<attributename>>name : String  <<attributename>>Type : String |
| Choice | Option Set | PicklistType | int | <<attributename>>name : String |
| Status | Status | StateType | int | <<attributename>>name : String |
| Status Reason | Status Reason | StatusType | int | <<attributename>>name : String |
| Email | Single Line of Text Email Format | StringType | nvarchar |  |
| Phone | Single Line of Text Phone Format | StringType | nvarchar |  |
| Text | Single Line of Text Text Format | StringType | nvarchar |  |
| Text Area | Single Line of Text Text Area Format | StringType | nvarchar |  |
| Ticker Symbol | Single Line of Text Ticker Symbol Format | StringType | nvarchar |  |
| URL | Single Line of Text URL Format | StringType | nvarchar |  |
| Unique Identifier | Unique Identifier Primary Key | UniqueidentifierType | uniqueidentifier |  |

## Process Workflow

Data Sync Pipeline



Schema Sync Pipeline



## Solution Design

Database Model

Tables

* ODS.EntitySync

|  |  |  |
| --- | --- | --- |
| **COLUMN\_NAME** | **DATA\_TYPE** | **IS\_NULLABLE** |
| ID | int | NO |
| DisplayName | nvarchar(500) | NO |
| EntityName | varchar(500) | NO |
| RelativeURL | varchar(500) | NO |
| DeltaToken | varchar(500) | YES |
| LastSyncTimeStamp | datetime | YES |
| AttributeSchemaURL | varchar(500) | YES |
| Mapping | varchar(MAX) | YES |
| FirstInsertMapping | varchar(MAX) | YES |
| SyncReady | bit | YES |
| ChangeTrackingEnabled | bit | YES |
| IsNNRelationShip | bit | YES |
| SyncFrequency | varchar(100) | YES |
| PrimaryIdAttribute | nvarchar(500) | YES |
| IsBPFEntity | bit | YES |
| IsActivity | bit | YES |
| IsSystemVersioningEnabled | bit | NO |

* ODS. EntityAttributeSchemaMapping

|  |  |  |
| --- | --- | --- |
| **COLUMN\_NAME** | **DATA\_TYPE** | **IS\_NULLABLE** |
| SourceSchema | varchar(500) | YES |
| DestinationSchema | varchar(500) | YES |
| PrimaryColumnMapping | varchar(MAX) | YES |
| SecondaryColumnMapping | varchar(MAX) | YES |
| AttributeTypeName | nvarchar(500) | YES |
| SecondaryColumnMappingJson | varchar(MAX) | YES |

* ODS.EntityAttributeSchema

|  |  |  |
| --- | --- | --- |
| **COLUMN\_NAME** | **DATA\_TYPE** | **IS\_NULLABLE** |
| ID | int | NO |
| AttributeOf | varchar(500) | YES |
| AttributeType | varchar(500) | YES |
| EntityLogicalName | varchar(500) | YES |
| IsPrimaryId | bit | YES |
| IsValidODataAttribute | bit | YES |
| IsPrimaryName | bit | YES |
| AttributeLogicalName | varchar(500) | YES |
| AttributeSchemaName | varchar(500) | YES |
| MaxLength | int | YES |
| DatabaseLength | int | YES |
| Precision | int | YES |
| IsRetrievable | bit | YES |
| IsValid | bit | YES |
| AttributeTypeName | nvarchar(500) | YES |

* ODS. ExecutionLog

|  |  |  |
| --- | --- | --- |
| **COLUMN\_NAME** | **DATA\_TYPE** | **IS\_NULLABLE** |
| ID | int | NO |
| ExecutionId | uniqueidentifier | YES |
| PackageName | varchar(500) | YES |
| RunStatus | varchar(100) | YES |
| StartDate | datetime | YES |
| EndDate | datetime | YES |
| Message | nvarchar(500) | YES |

* ODS. ExecutionLogDetail

|  |  |  |
| --- | --- | --- |
| **COLUMN\_NAME** | **DATA\_TYPE** | **IS\_NULLABLE** |
| ID | int | NO |
| ExecutionId | uniqueidentifier | YES |
| PipelineRunID | uniqueidentifier | YES |
| StepName | varchar(500) | YES |
| StartDate | datetime | YES |
| Message | nvarchar(500) | YES |
| LogType | varchar(100) | YES |
| EntityName | varchar(500) | YES |

* ODS. EntityDataSyncLog

|  |  |  |
| --- | --- | --- |
| **COLUMN\_NAME** | **DATA\_TYPE** | **IS\_NULLABLE** |
| ID | int | NO |
| EntityName | nvarchar(500) | NO |
| ExecutionId | uniqueidentifier | NO |
| PipelineRunID | uniqueidentifier | NO |
| InsertCount | int | YES |
| UpdateCount | int | YES |
| DeleteCount | int | YES |
| SyncDate | datetime | NO |
| SkippedRows | int | NO |
| LogFilePath | nvarchar(500) | YES |

* ODS. EntityDeltaTokenLog

|  |  |  |
| --- | --- | --- |
| **COLUMN\_NAME** | **DATA\_TYPE** | **IS\_NULLABLE** |
| ID | bigint | NO |
| ExecutionId | uniqueidentifier | NO |
| PipelineRunId | uniqueidentifier | NO |
| EntityName | nvarchar(500) | NO |
| DeltaToken | varchar(500) | NO |
| LogDate | datetime | NO |

* ODS. EntitySchemaSyncLog

|  |  |  |
| --- | --- | --- |
| **COLUMN\_NAME** | **DATA\_TYPE** | **IS\_NULLABLE** |
| Id | bigint | NO |
| ExecutionId | uniqueidentifier | YES |
| SchemaChangeQuery | nvarchar(MAX) | YES |
| SyncDate | datetime | YES |
| TableName | nvarchar(500) | YES |

Custom Data Types

* ODS.EntityAttributeSchemaType: User defined Table Type
* ODS.EntitySyncType: User defined Table Type

Procedures

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Schema** | **ObjectName** | **ParameterName** | **ParameterDataType** | **Description** |
| ODS | usp\_CreateStagingTable | @sourceEntityName | nvarchar(500) | Procedure to create staging table |
| @PrimaryIdAttribute | nvarchar(500) |
| ODS | usp\_ExecutionLogDetail | @ExecutionId | uniqueidentifier(8) | Procedure to log execution details |
| @PipelineRunID | uniqueidentifier(8) |
| @StepName | varchar(250) |
| @Message | nvarchar(500) |
| @LogType | varchar(50) |
| @entityName | varchar(250) |
| ODS | usp\_InsertEntityDataSyncLog | @EntityName | nvarchar(500) | Procedure to details amount of data written/created in sink |
| @ExecutionId | uniqueidentifier(8) |
| @PipelineRunID | uniqueidentifier(8) |
| @InsertCount | int |
| @UpdateCount | int |
| @DeleteCount | int |
| @SkippedRows | int |
| @LogFilePath | nvarchar(500) |
| ODS | usp\_InsertEntityDeltaTokenLog | @ExecutionId | uniqueidentifier(8) | Procedure to log delta token logs. |
| @DeltaToken | varchar(250) |
| @PipelineRunId | uniqueidentifier(8) |
| @EntityName | nvarchar(500) |
| ODS | usp\_InsertEntitySchemaSyncLog | @ExecutionId | uniqueidentifier(8) | Procedure to capture schema changes on sink tables. |
| @SchemaChangeQuery | nvarchar(0) |
| @tableName | nvarchar(500) |
| ODS | usp\_InsertOrUpdateEntityTable | @sourceTableName | nvarchar(500) | Procedure to write data to sink |
| @primaryColumn | nvarchar(500) |
| @ExecutionId | nvarchar(50) |
| ODS | usp\_LoadEntityAttributeSchema | @passing | EntityAttributeSchemaType | Procedure to load master data for AttributeSchemaMapping |
| @sourceTableName | nvarchar(100) |
| ODS | usp\_LoadEntitySyncData | @Sourcetbl | EntitySyncType(0) | Procedure to load master data for EntitySync Table |
| ODS | usp\_LogEndExecution | @ExecutionId | uniqueidentifier(8) | Procedure to log pipeline completion status. |
| @RunStatus | varchar(50) |
| @Message | nvarchar(500) |
| ODS | usp\_LogStartExecution | @ExecutionId | uniqueidentifier(8) | Procedure to log pipeline execution start. |
| @PackageName | varchar(250) |
| @RunStatus | varchar(50) |
| ODS | usp\_SyncEntitySchema | @sourceEntityName | nvarchar(500) | Procedure to sync sink table schema |
| @PrimaryIdAttribute | nvarchar(500) |
| @ExecutionId | uniqueidentifier(8) |
| @StagingDBSchema | varchar(50) |
| ODS | usp\_TruncateStagingTable | @sourceEntityName | varchar(250) | Procedure to truncate staging tables. |
| @databaseSchema | varchar(50) |
| ODS | usp\_UpdateAttributeMapping\_WithJson | @sourceTableName | nvarchar(500) | Procedure to update Attribute Mapping |
| @isActivity | bit |
| @primaryColumnName | nvarchar(100) |
| ODS | usp\_UpdateDeltaToken | @sourceTableName | nvarchar(500) | Procedure to update delta tokens |
| @sourceSchema | nvarchar(100) |
| @pipelineRunId | nvarchar(100) |
| ODS | usp\_ValidateAttributes | @sourceTableName | varchar(250) | Procedure to validate attributes. |

## Best Practices when using ODS framework.

* To avoid synchronization errors due to resource throttling, we recommend that you have an Azure SQL Database Premium P1 or better plan
* Enable Change tracking on Dataverse Entities. More Information: [Enable Change Tracking in Power Platform.](https://learn.microsoft.com/en-us/power-platform/admin/enable-change-tracking-control-data-synchronization)
* Periodically update database statistics on tables and indexed views in the SQL database. More information: [Update Statistics](https://learn.microsoft.com/en-us/sql/relational-databases/statistics/update-statistics?view=sql-server-ver16)
* Monitor the SQL database's utilization. More information: [Perf monitoring](https://learn.microsoft.com/en-us/azure/azure-sql/database/monitor-tune-overview?view=azuresql)
* Monitor Data Factory Pipeline execution. More Information: [Monitor using Azure Monitor](https://learn.microsoft.com/en-us/azure/data-factory/monitor-using-azure-monitor)

# Deployment Strategy

# Known Issues

There are no known bugs when using the framework.

# Appendix

## Acronyms

## Reference Documents