This document is designed for developers which try apply DME API Examples and describes example for straight access from the database to matching service.

The Matching Engine in this example configured for suppressing management. It finds how many preloaded data source contains duplicates for given record. All calls are fired from the database they can be connected to triggers or stored procedures.

This documents describes the architecture of example, requirements, installation into database process

### Requirements

For working with this example on a PC must be installed:

SQL Server (or MS SQL Express Server)

MS Management Studio

Visual Studio 2017 (It may be Community Version)

### Description of Visual Studio solution

This example consists of three projects.

The first project is a web application that provides functions of web service. This service can receive commands, data for matching and can write results of matching into the database. Service receives commands by SOAP so any database that can use SOAP can use this service

The second project is created for interacting with the web service. And this project is loaded into MS SQL Server. It allows using of web service from SQL Server.

The third project is SQL CLR assembly that work as a bridge between SQL Server objects (triggers, stored procedures) and the second project

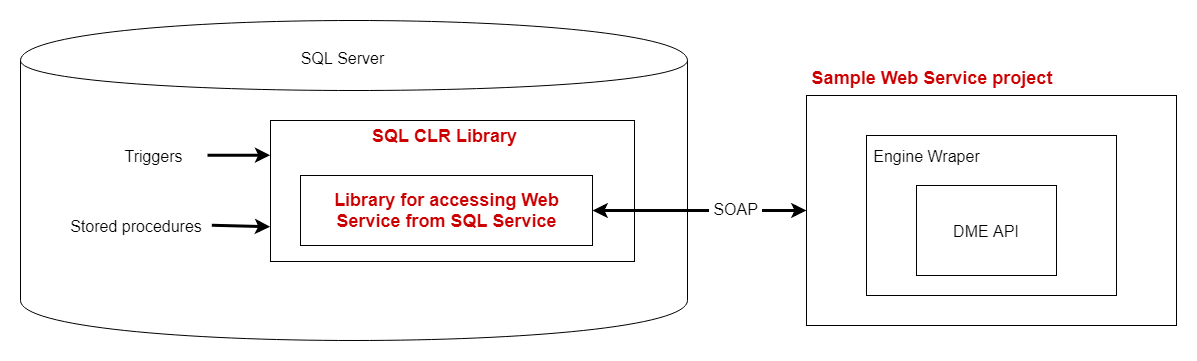


Fig. 1.

All three projects are described below

### Sample Web Service project

This project provides suppressing management service over HTTP.

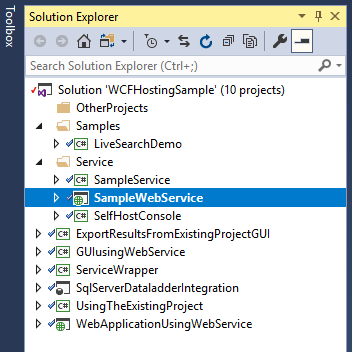


Fig. 2. The web application project inside Visual Studio

In initial stage project loads data from data source. Later, the service receives inserted records and verify are in the data source similar records or not. Results of the check are written into predefined database table.

The table must have definite structure. It must have columns: ‘id’(bigint), ‘StrongDuplicate’(int), ‘Duplicate’(int), how it shown on Fig.3. The table can have other columns but these three columns must exist

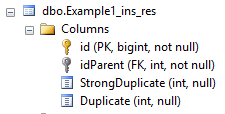


Fig.3 The web application project inside Visual Studio

In initial stage project also loads settings. They defined into ‘Properties.Settings’. Settings define which DME projects will be used, where find the table for results, etc. Settings are shown in Fig.4

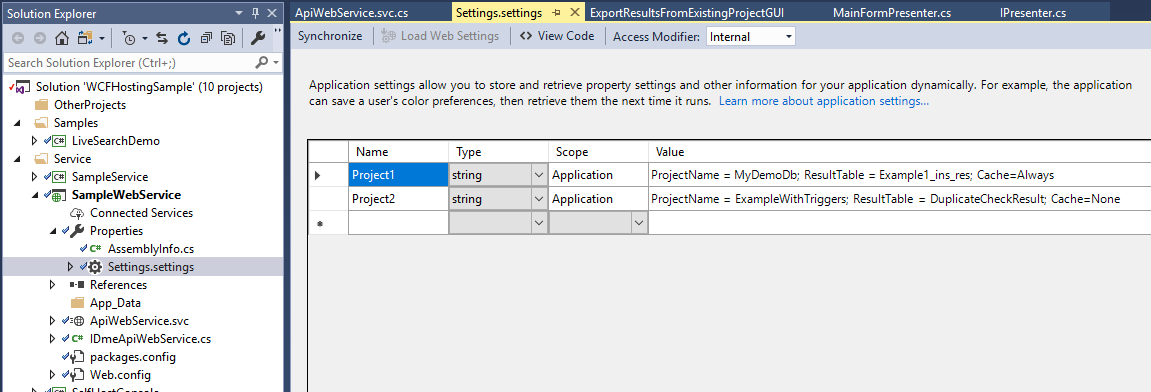


Fig. 4. Settings of Web Application project

The application can work with a few data sources in same time. Every string of settings defines one data source. The string must have such structure:

*“ProjectName = MyDemoDb; ResultTable = Example1\_ins\_res; Cache=Always”*

***ProjectName*** – name of DME project, where the data source, matching fields are defined; ***ResultTable*** – the table for results, it is described above; ***Cache*** – how the application should add checked records into the table with cached data source after checking.

***Cache*** can take one of the next value: *Allways*, *ExceptStrongDuplicates*, *ExceptDuplicates*, *None*.

*Allways* – every record will be added, *ExceptStrongDuplicates* – record that don’t have strong duplicates will be added, *ExceptDuplicates* – record that don’t have strong duplicates and don’t have duplicates will be added, *None* – record will not be added.

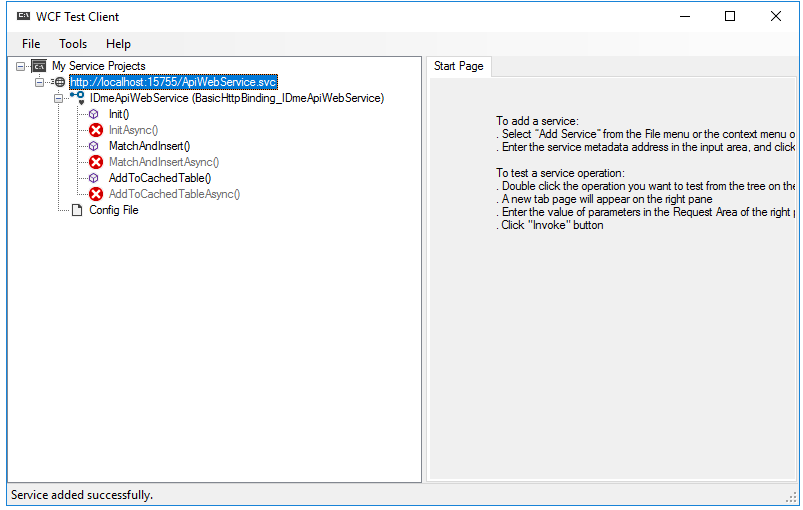
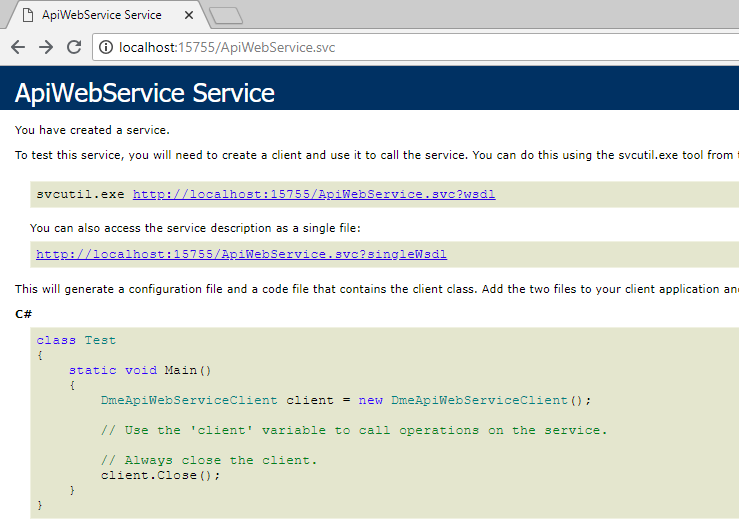


Fig. 5. Web Service after starting in Wcf Test Client

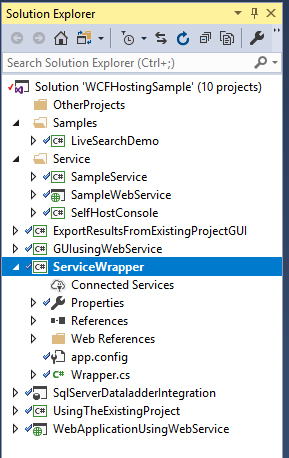
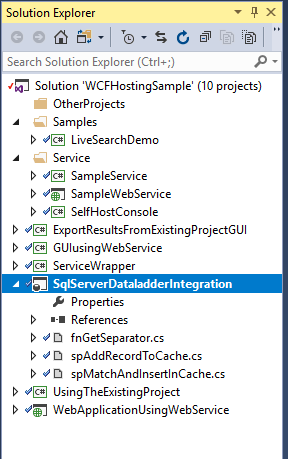
There are two ways to add new record in cache table inside Match Engine. The first automatically after matching. The second using web service method ‘AddToCacheTable’ (see Fig.5), this way can be used for inserting such records straight from the database.

After starting service all existing methods of service shown into ‘WCF Test Client’ (Fig. 5). Also service can be connected with web browser (Fig.6)

 Fig. 6. Web Service in browser

### Library for accessing Web Service from SQL Server

For accessing to web service from SQL Server the application uses the assembly that loaded in the database that can interact with SOAP. How you can find it in Visual Studio Solution Explorer is shown on Fig.7a

1. b)

Fig. 7. Assemblies that interact with SOAP from SQL Server

This project has a Service Reference to the project described in previous.

### SQL CLR library for SQL Server

This assembly connect C# and SQL languages. It is shown on Fig.7b. In this project stored procedures wraps SOAP calls

### Deploying

SQL scripts that allow load assemblies and create stored procedures are shown below.

**The database name and the path to assemblies is needed to be replaced!**

1) Load assemblies described in p.2 into SQL Server database

Enable unsafe assembly in database

alter database [DatabaseName]

set trustworthy on;

go

Enable CLR assemblies

USE [DatabaseName]

EXEC sp\_configure 'clr enabled', '1';

RECONFIGURE;

Load assemblies into database

IF EXISTS (

SELECT [name]

FROM sys.assemblies

WHERE [name] = N'SqlServerDataladderIntegration')

BEGIN

DROP ASSEMBLY SqlServerDataladderIntegration

ALTER ASSEMBLY SqlServerDataladderIntegration

FROM 'D:\ApiDemo\SqlServerDataladderIntegration.dll'

WITH PERMISSION\_SET = UNSAFE ;

END

ELSE

BEGIN

CREATE ASSEMBLY SqlServerDataladderIntegration

FROM 'D:\ ApiDemo \SqlServerDataladderIntegration.dll'

WITH PERMISSION\_SET = UNSAFE ;

END

2) Create Stored Procedures that allow use loaded assemblies from triggers and other objects of database

Use DatabaseName

Go

IF EXISTS (select \* from dbo.sysobjects where id = object\_id(N'[dbo].[spMatchInsert]') and OBJECTPROPERTY(id, N'IsProcedure') = 1)

DROP PROCEDURE [dbo].[spMatchInsert]

GO

IF EXISTS (select \* from dbo.sysobjects where id = object\_id(N'[dbo].[spAddToCacheTable]') and OBJECTPROPERTY(id, N'IsProcedure') = 1)

DROP PROCEDURE [dbo].[spAddToCacheTable]

GO

IF EXISTS (select \* from dbo.sysobjects where id = object\_id(N'[dbo].[spGetSeparator]') and OBJECTPROPERTY(id, N'IsScalarFunction') = 1)

DROP FUNCTION [dbo].[spGetSeparator]

GO

IF EXISTS (select \* from dbo.sysobjects where id = object\_id(N'[dbo].[spGetVersion]') and OBJECTPROPERTY(id, N'IsProcedure') = 1)

DROP PROCEDURE [dbo].spGetVersion

GO

CREATE PROCEDURE [dbo].spMatchInsert

@parameter1 nvarchar(max),

@parameter2 bigint,

@parameter3 nvarchar(max)

WITH EXECUTE AS CALLER

AS

EXTERNAL NAME SqlServerDataladderIntegration.StoredProcedures.spMatchAndInsertInCache

Go

CREATE PROCEDURE [dbo].spAddToCacheTable

@parameter1 nvarchar(max),

@parameter2 nvarchar(max)

WITH EXECUTE AS CALLER

AS

EXTERNAL NAME SqlServerDataladderIntegration.StoredProcedures.spAddRecordToCache

Go

CREATE FUNCTION [dbo].[spGetSeparator]()

RETURNS

nvarchar(max)

WITH EXECUTE AS CALLER

AS

EXTERNAL NAME SqlServerDataladderIntegration.UserDefinedFunctions.spGetSeparator

Go

CREATE PROCEDURE [dbo].spGetVersion

WITH EXECUTE AS CALLER

AS

EXTERNAL NAME SqlServerDataladderIntegration.StoredProcedures.spGetVersion

Go

3) View of Management Studio after executing scripts must be such it shown on Fig.8

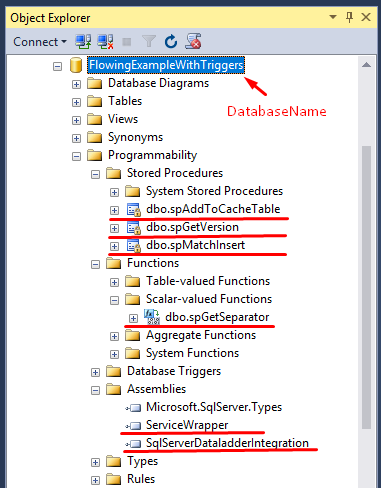


Fig. 8. Procedures and assemblies in the database

### Check installation

Run Sample Web Service project in Visual Studio. Execute next query for checking installation:

EXEC dbo.spGetVersion

Expected result (the first number is a version of DME API, the second is a version of API Demo):

3.0.26.0 (1.0.4.0)

### Example of using

Example of using is shown on Fig.9.

It has three tables Holding Table, DuplicateCheckResults Table, MasterTable. There are triggers that are attached to every table.

User inserts automatically or manually records into Holding table. Holding table has attached trigger that creates for every inserted record a new row in Duplicate Check table and sends inserted record to matching service. Matching Web service searches duplicates and writes results into the row created by Holding Table trigger. Every inserting or updating of Duplicate Check Table fires the attached trigger. This trigger decides copy new record in Master table or not. After inserting in Master Table, the trigger that attached to this table sends this record to Matching service for added to cached data.

Settings for this example are shown on Fig.4, as “Project2”

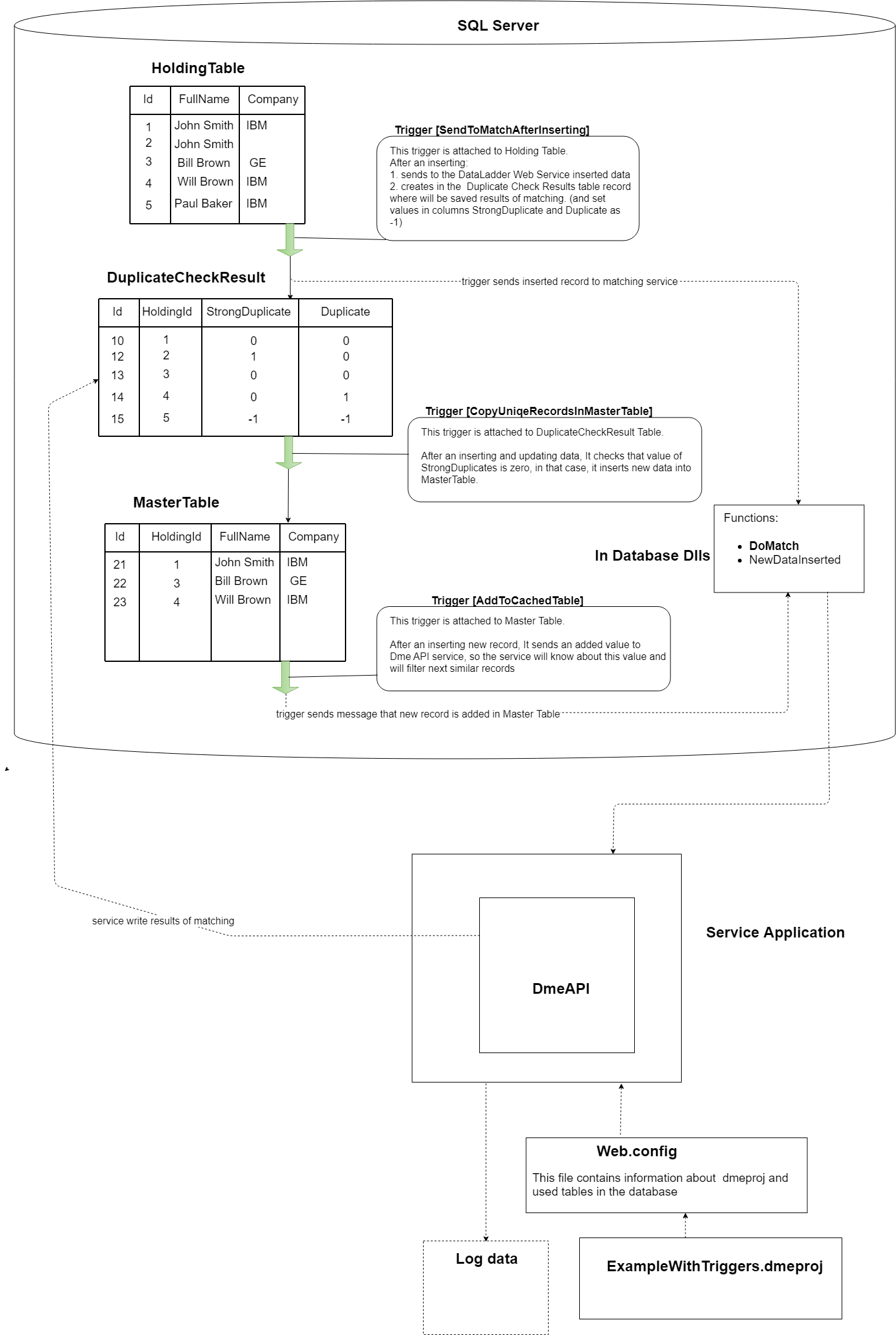


Fig. 9. Example of using

### Scripts for creating triggers

SQL scripts for creating triggers are shown bellow

1) Trigger for Holding Table

USE [DatabaseName]

GO

SET ANSI\_NULLS ON

GO

SET QUOTED\_IDENTIFIER ON

GO

CREATE TRIGGER [dbo].[SendToMatchAfterInserting]

ON [dbo].[HoldingTable]

AFTER INSERT

AS

BEGIN

SET NOCOUNT ON;

DECLARE @id INT

DECLARE @State nvarchar(max)

DECLARE @ContactName nvarchar(max)

SELECT @id=Id, @State=[State], @ContactName=[ContactName]

FROM INSERTED;

INSERT INTO DuplicateCheckResult

(HoldingId, StrongDuplicate, Duplicate)

values (@id, -1, -1);

DECLARE @idResult bigint;

SELECT @idResult=id FROM DuplicateCheckResult WHERE HoldingId=@id;

DECLARE @separator nvarchar(max);

EXEC @separator = spGetSeparator;

DECLARE @mergedstring nvarchar(max);

SET @mergedstring=@State + @separator + @ContactName

EXEC dbo.spMatchInsert 'ExampleWithTriggers', @idResult, @mergedstring;

END

GO

ALTER TABLE [dbo].[HoldingTable] ENABLE TRIGGER [SendToMatchAfterInserting]

GO

2) Trigger for Duplicate Check Table

USE [DatabaseName]

GO

SET ANSI\_NULLS ON

GO

SET QUOTED\_IDENTIFIER ON

GO

CREATE TRIGGER [dbo].[CopyUniqeRecordsInMasterTable]

ON [dbo].[DuplicateCheckResult]

AFTER INSERT, UPDATE

AS

BEGIN

SET NOCOUNT ON;

Declare @HoldingId int

Declare @Strong int

Declare @Duplicates int

SELECT @HoldingId=HoldingId, @Strong=StrongDuplicate, @Duplicates=Duplicate

FROM INSERTED;

if (@Strong IS NOT NULL)AND(@Duplicates IS NOT NULL)

Begin

IF (@Strong = 0)

Begin

DECLARE @id int;

DECLARE @City nvarchar(max);

DECLARE @Zip nvarchar(max);

DECLARE @CompanyName nvarchar(max);

DECLARE @Industry nvarchar(max);

DECLARE @Title nvarchar(max);

DECLARE @State nvarchar(max);

DECLARE @ContactName nvarchar(max);

DECLARE @Address nvarchar(max);

SELECT @id=Id, @City=City, @Zip=Zip, @CompanyName=CompanyName,

@Industry=Industry, @Title=Title, @State=[State], @ContactName=ContactName, @Address=[Address]

FROM HoldingTable WHERE id=@HoldingId;

INSERT INTO MasterTable

(HoldingId, City, Zip, CompanyName, Industry, Title, [State], ContactName, [Address] )

values

(@id, @City, @Zip, @CompanyName, @Industry, @Title, @State, @ContactName, @Address);

End

End

END

GO

ALTER TABLE [dbo].[DuplicateCheckResult] ENABLE TRIGGER [CopyUniqeRecordsInMasterTable]

GO

3) Trigger for Master Table

USE [DatabaseName]

GO

SET ANSI\_NULLS ON

GO

SET QUOTED\_IDENTIFIER ON

GO

CREATE TRIGGER [dbo].[AddToCachedTable]

ON [dbo].[MasterTable]

AFTER INSERT

AS

BEGIN

SET NOCOUNT ON;

DECLARE @id int;

DECLARE @City nvarchar(max);

DECLARE @Zip nvarchar(max);

DECLARE @CompanyName nvarchar(max);

DECLARE @Industry nvarchar(max);

DECLARE @Title nvarchar(max);

DECLARE @State nvarchar(max);

DECLARE @ContactName nvarchar(max);

DECLARE @Address nvarchar(max);

SELECT @id=Id, @City=City, @Zip=Zip, @CompanyName=CompanyName,

@Industry=Industry, @Title=Title, @State=[State], @ContactName=ContactName, @Address=[Address]

FROM INSERTED

DECLARE @separator nvarchar(max);

EXEC @separator = spGetSeparator;

DECLARE @mergedstring nvarchar(max);

SET @mergedstring=@State + @separator + @ContactName

EXEC dbo.spAddToCacheTable 'ExampleWithTriggers', @mergedstring;

END

GO

ALTER TABLE [dbo].[MasterTable] ENABLE TRIGGER [AddToCachedTable]

GO

Archive with useful scripts (click two times):



### 5.2 Ways improve the example

1) improve Holding table trigger: add work with bulk inserting, improve working with inserted values (it can be a table)

2) in Settings this example (Fig.4) change value of Cache:

Cache = *ExceptStrongDuplicates*;

Now if there are inserting a lot of same records then inserting duplicates are possible