



TUTORIAL KREO HMI Database connection and data exchange

Tutorial dedicated to the setting and data exchange with an external database via ODBC protocol

Connect
Ideas.
Shape
solutions.



Introduction

Using KREO, you can connect to databases based on the relational model (RDBMS).

It means that the data exchanged between KREO RUNTIME and PLC can be exported to the DATABASE tables.

The key factors are:

- The database exists. The RUNTIME will take care of creating the related project SQL tables (tags, alarms, datalogs, recipes, FDA-table,...)
- the odbc driver that is installed to connect to the sql db is a 32-bit type application
- The ESA CONNECT application must be installed in the same PC where the database is running.

The supported connections are odbc connections.

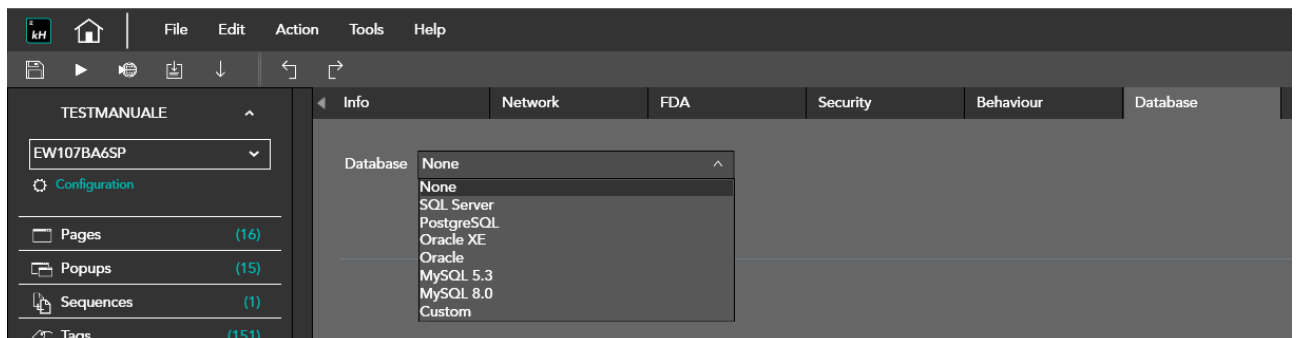
The data is written in sql language

How to do:

1. Suppose a simple project with 3 tags, 3 alarms, 1 datalog with 3 tags, 1 recipe with 3 tags.

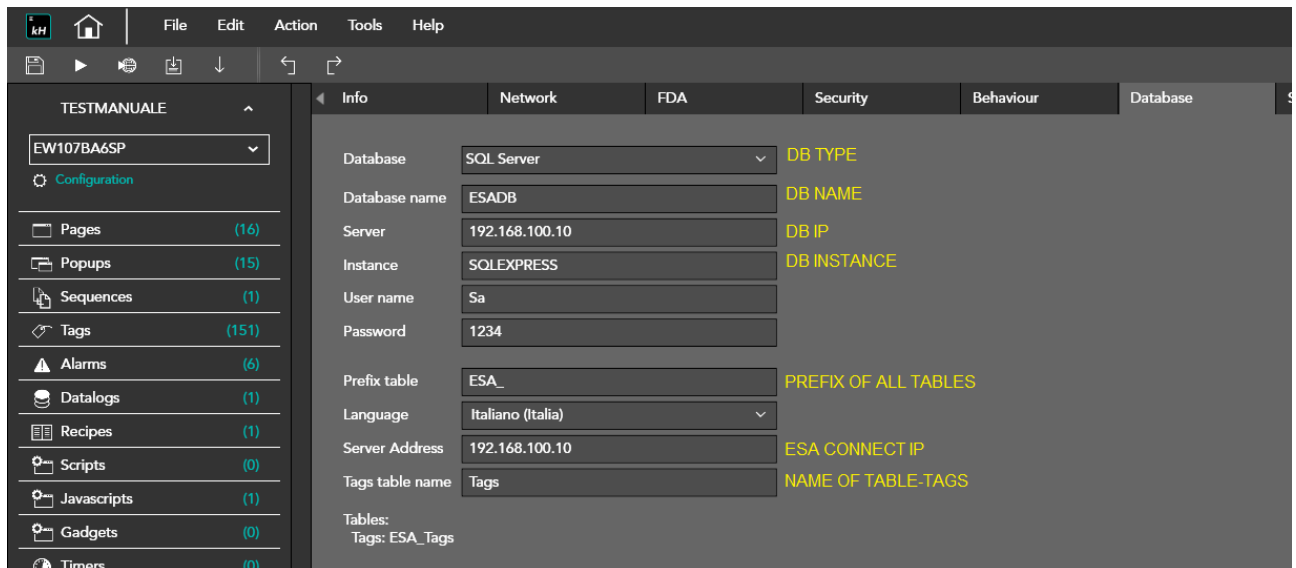
You want to export this data to SQL DB

2. You then prepare the project. In addition to the project data, you must configure the connection parameters to the SQL DB setting menu





3. KREO HMI allows you to define different types of DB (see figure above) but also write directly via a custom CONNECTION STRING
4. Here is an example of SQL SERVER parameterization with some descriptions of the meaning:



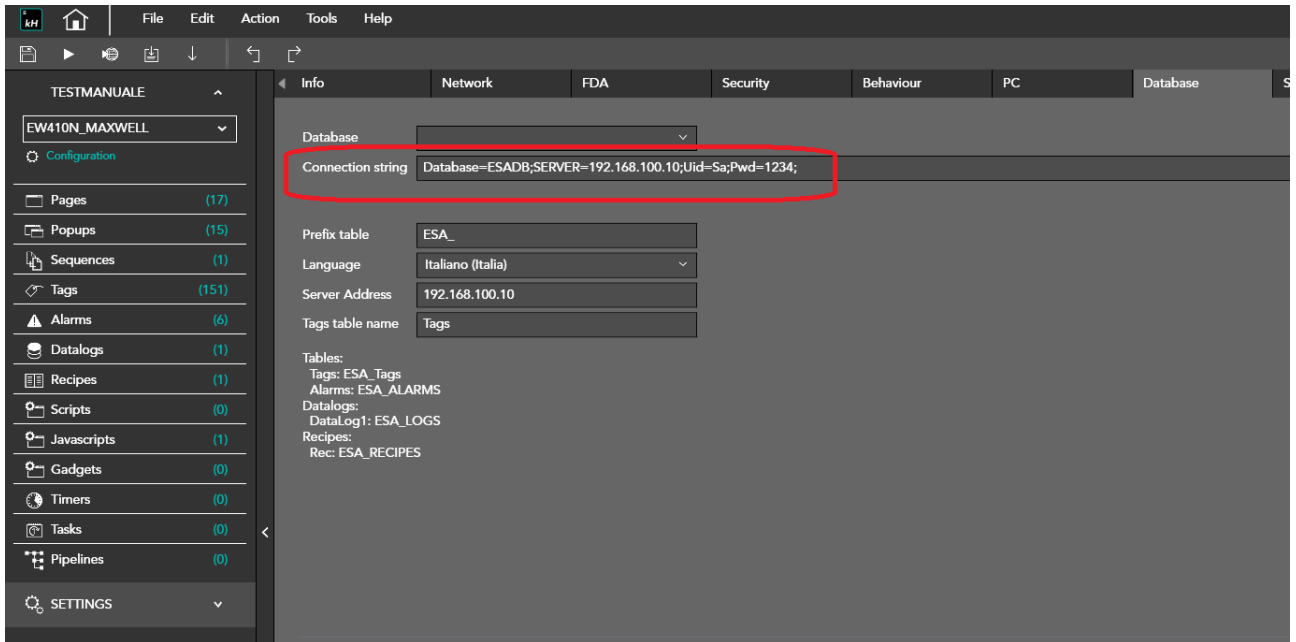
NOTE: Do not confuse SERVER with SERVER ADDRESS.

SERVER is the address/name of the PC where the SQL DB is installed.

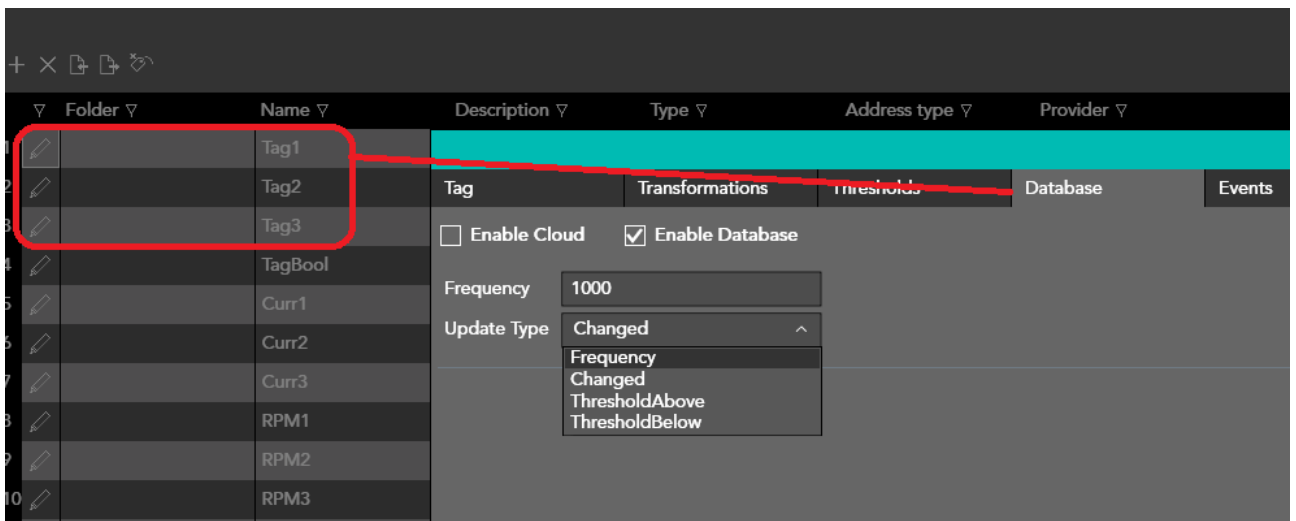
SERVER ADDRESS is the address/name of the PC where ESA CONNECT is installed.



5. You can define manually the same CONNECTION STRING with the CUSTOM configuration:



6. Define which Tags have to be exported to the SQL table and the export trigger. (frequency, change, on higher / lower threshold values).



7. The other tables-data will be optionally enabled and named with prefix ESA_ (editable in sql db connection parameters)



ALARMS

Folder	Name	Message	Tag	Activation type	Activation value	Priority
1	Alarm1	FIRE !!! EVERYBODY OUT	TagALARMS[Element:0]	Bit	0	Error
2	Alarm2	EMERGENCY ALARM!	TagALARMS[Element:1]	Bit	7	Error
3	Alarm3	SECURITY REMOVED! HALT MACHINE	TagALARMS[Element:2]	Bit	15	Error
4	Msg1	TANK ALMOST FULL	TagWARNING1	CounterThen	80	Warning
5	Msg2	TANK FULL	TagWARNING1	GreaterThen	100	Warning
6	Msg3	TAG OUT OF RANGE	TagWARNING2	OutOfRange	100	Warning

Properties

- Max registrations: 100
- Max history: 100
- Warning level: 0
- History mode: DiscardOld
- Priority mode: Background
- History file: [empty]
- Export history: Name;Message;Date;Time
- Export active: Name;Priority;Group;Alarm
- Export stats: Name;Priority;Group;Mess
- Enable database:
- Table name: ALARMS

RECIPES

Name	Description	Tag	Display text
1	RecipeId		Recipe Id
2	RecipeName	BoxName	Recipe name
3	ChangeDate		Change date
4	Comment		Comment
5	h	h	h
6	w	w	w
7	d	d	d

Properties

- Name: Rec
- Description: [empty]
- Command Area: [empty]
- Status Area: [empty]
- Enable write database:
- Database table name: RECIPES

LOGS

Name	Description	Tag	Header	File name
1	DL1	DL1	DL1	
2	DL2	DL2	DL2	
3	DL3	DL3	DL3	

Properties

- Name: DataLog1
- Description: [empty]
- Strobe Type: OnTime
- Strobe timer: 000h 00m 03s 0d
- Size (Samples): 1000
- Size (Time): 000h 50m 00s 0d
- Warning level (%): 75
- Enable log file:
- Enable at startup:
- Can enabled/disabled:
- Export file format: Date;Time;Value;Val
- Print column width: 10
- Enable write database:
- Database table name: LOGS



8. At RUNTIME, the PLC-data can be displayed in the specific objects on the page.

This data is exported as SQL tables on the expected DB via several built in functions.

For example, the FLUSH PERSISTENT DATA function (LOGS and ALARMS) or RECIPE EXPORT DB (RECIPES).

Of course these are only 2 of the SQL export functions.

We will see all the details later.

DB SQL

Tag1 11
Tag2 22
Tag3 33

ALARMS

State	On Time	Ack Time	Off Time	Priority	Message
ON	10:07:40 23/6/2021	--:--	--:--	ON	FIRE !!!! EVERYBODY OUT
ON	10:07:41 23/6/2021	--:--	--:--	ON	EMERGENCY ALARM!
ON	10:07:42 23/6/2021	--:--	--:--	ON	SECURITY REMOVED! HALT MACHINE
ON	10:07:47 23/6/2021	--:--	--:--	ON	TANK ALMOST FULL
ON	10:07:53 23/6/2021	--:--	--:--	ON	TAG OUT OF RANGE

DATALOG

Time	DL1	DL2	DL3
MIN	11	22	33
MAX	11	22	33
AVERAGE	11	22	33
SUM	165	330	495

RECIPES

RecipeId	Name
1	rec1
2	rec2

Flush Persistent Data

9. KREO RUNTIME and the SQL DATABASE exchange the data via the ESA CONNECT software.

ESA CONNECT has simply to be started in the server PC.

The connection via the ODBC driver starts automatically and export the data following the KREO PLC programming



10. In the DATABASE the different data tables are created and refreshed automatically (below examples TAGS / ALARMS / LOGS with queries).

The screenshot shows Microsoft SQL Server Management Studio with the following components:

- Object Explorer:** Shows the server instance 'DESKTOP-SA\SQLEXPRESS (SQL Server 15.0.2000)'. Under 'Databases', 'ESADB' is expanded to show 'Tables', including 'dbo.ESA_ALARMS', 'dbo.ESA_LOGS', 'dbo.ESA_RECIPES', and 'dbo.ESA_Tags'.
- Query Editor:** Contains the following SQL script:

```
/****** Script for SelectTopNRows command from SSMS *****/  
SELECT TOP (1000) [date_time]  
    , [Idx]  
    , [name]  
    , [value]  
FROM [ESADB].[dbo].[ESA_Tags] order by Date_Time desc
```
- Results:** A table with 9 rows and 5 columns: 'date_time', 'Idx', 'name', and 'value'.

	date_time	Idx	name	value
1	2021-06-24 06:54:41.450	0	Tag3	33
2	2021-06-24 06:54:38.447	0	Tag2	22
3	2021-06-24 06:54:35.443	0	Tag1	11
4	2021-06-24 06:54:12.340	0	Tag1	0
5	2021-06-24 06:54:12.340	0	Tag2	0
6	2021-06-24 06:54:12.340	0	Tag3	0
7	2021-06-24 06:52:17.897	0	Tag1	0
8	2021-06-24 06:52:17.897	0	Tag2	0
9	2021-06-24 06:52:17.897	0	Tag3	0



SQLQuery4.sql - DESKTOP-SA\SQLEXPRESS.ESADB (DESKTOP-SA) - Microsoft SQL Server Management Studio

File Edit View Project Tools Window Help

Object Explorer

- DESKTOP-SA\SQLEXPRESS (SQL Server 15.0.2000 -
 - Databases
 - System Databases
 - Database Snapshots
 - ESADB
 - Database Diagrams
 - Tables
 - System Tables
 - FileTables
 - External Tables
 - Graph Tables
 - dbo.ESA_ALARMS
 - dbo.ESA_LOGS
 - dbo.ESA_RECIPES
 - dbo.ESA_Tags
 - Views
 - External Resources
 - Synonyms
 - Programmability
 - Service Broker
 - Storage
 - Security
 - Security
 - Server Objects
 - Replication
 - PolyBase
 - Management
 - XEvent Profiler

SQLQuery4.sql - DE...

```
/****** Script for SelectTopNRows command from SSMS ******/
SELECT TOP (1000) [Name]
, [AlarmGroup]
, [Description]
, [AlarmType]
, [Priority]
, [Event_Type]
, [Date_Time]
, [Quality]
, [UserName]
, [Station]
FROM [ESADB].[dbo].[ESA_ALARMS]
```

100 %

Results Messages

	Name	AlarmGroup	Description	AlarmType	Priority	Event_Type	Date_Time	Quality	UserName	Station
1	Alam1		FIRE !!! EVERYBODY OUT	2	0	0	2021-06-25 09:30:46.127	0	defaultuser	EW410N_MAXWELL
2	Alam2		EMERGENCY ALARM!	2	0	0	2021-06-25 09:30:46.743	0	defaultuser	EW410N_MAXWELL
3	Alam3		SECURITY REMOVED! HALT MACHINE	2	0	0	2021-06-25 09:30:47.393	0	defaultuser	EW410N_MAXWELL
4	Meg1		TANK ALMOST FULL	1	1	0	2021-06-25 09:33:35.847	0	defaultuser	EW410N_MAXWELL
5	Meg3		TAG OUT OF RANGE	1	1	0	2021-06-25 09:33:44.910	0	defaultuser	EW410N_MAXWELL



```
/****** Script for SelectTopNRows command from SSMS *****/
SELECT TOP (1000) [Date_Time]
, [Idx]
, [DL1_V]
, [DL1_Q]
, [DL2_V]
, [DL2_Q]
, [DL3_V]
, [DL3_Q]
FROM [ESADB].[dbo].[ESA_LOGS] order by Date_Time desc
```

	Date_Time	Idx	DL1_V	DL1_Q	DL2_V	DL2_Q	DL3_V	DL3_Q
1	2021-06-24 06:54:51.310	0	11	3	22	3	33	3
2	2021-06-24 06:54:48.310	0	11	3	22	3	33	3
3	2021-06-24 06:54:45.310	0	11	3	22	3	33	3
4	2021-06-24 06:54:42.310	0	11	3	22	3	33	3
5	2021-06-24 06:54:39.310	0	11	3	22	3	33	3
6	2021-06-24 06:54:36.310	0	11	3	22	3	33	3
7	2021-06-24 06:54:33.307	0	11	3	22	3	33	3
8	2021-06-24 06:54:30.307	0	11	3	22	3	33	3
9	2021-06-24 06:54:27.307	0	11	3	22	3	33	3
10	2021-06-24 06:54:24.307	0	11	3	22	3	33	3
11	2021-06-24 06:54:21.307	0	11	3	22	3	33	3
12	2021-06-24 06:54:18.307	0	11	3	22	3	33	3
13	2021-06-24 06:54:15.307	0	11	3	22	3	33	3
14	2021-06-24 06:54:12.307	0	11	7	22	7	33	7
15	2021-06-24 06:53:08.943	0	11	3	22	3	33	3
16	2021-06-24 06:53:05.943	0	11	3	22	3	33	3
17	2021-06-24 06:53:02.943	0	11	3	22	3	33	3
18	2021-06-24 06:52:59.943	0	11	3	22	3	33	3

In the LOGS table you can also see the READING-QUALITY data of the data:

- 7=OK before reading the LOG (at startup, after a start/stop LOG,...)
- 3=OK next readings

In the ALARMS tables we will find more information:

- alarmtype: 1(simpleevent), 2 (ISAalarm)
- event type: 0 (ON) , 1(OFF) , 2(ACK)



- quality: 0 (OK), 1 (the value saved is not consistent due to communication error).

General notes

NOTE1: The data exchanged between the KREO runtime and the SQL database are exchanged in UT mode.

It is possible, via a specific parameter, display both UTC and TIMEZONE data.

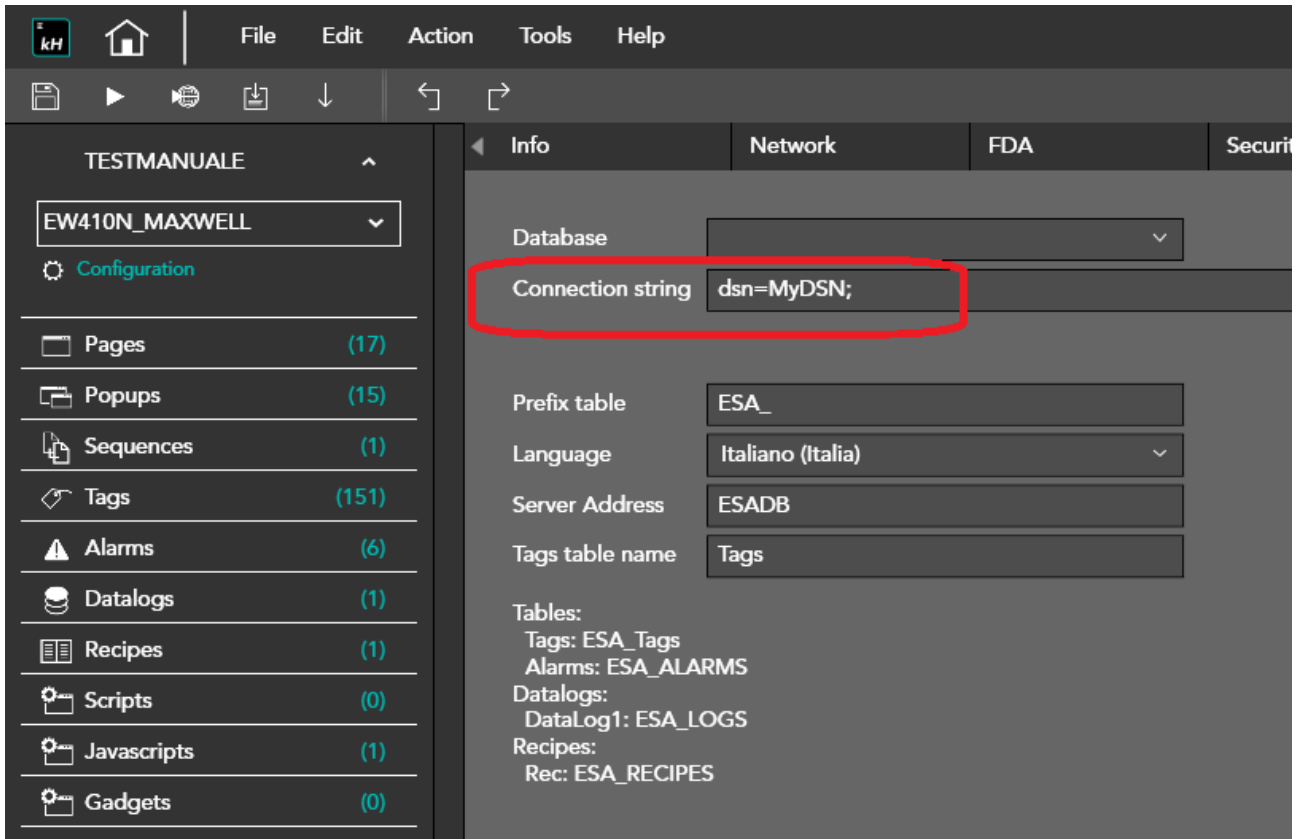
NOTE2: The CONNECTION-STRING setting must be defined according to the SQL DB.

For example:

```
DRIVER={SQL Server};Database=ESADB; SERVER=192.168.100.10\SQLEXPRESS; Uid=Sa;  
Pwd=1234;
```



If the credentials for the SQL DB connection are coming via the WINDOWS NT AUTHENTICATION and not via the SQL SERVER AUTHENTICATION it is necessary to define the DSN connection string as displayed below.





The screenshot shows the Windows Control Panel with the 'Administrative Tools' folder highlighted. Inside this folder, 'ODBC Data Sources (32-bit)' is selected. The 'ODBC Data Source Administrator (32-bit)' window is open, showing the 'User DSN' tab. A new DSN named 'MyDSN' is being added, configured as a '32/64-bit SQL Server'. The 'Microsoft SQL Server DSN Configuration' wizard is also visible, with the 'Name' field set to 'MyDSN' and the 'Server' field set to 'ESADBS\SQLEXPRESS'.

Name	Date modified	Type	Size
Component Services	16/07/2016 13:42	Shortcut	2 KB
Computer Management	16/07/2016 13:42	Shortcut	2 KB
Defragment and Optimize Drives	16/07/2016 13:42	Shortcut	2 KB
Disk Cleanup	16/07/2016 13:43	Shortcut	2 KB
Event Viewer	16/07/2016 13:42	Shortcut	2 KB
iSCSI Initiator	16/07/2016 13:42	Shortcut	2 KB
Local Security Policy	16/07/2016 13:43	Shortcut	2 KB
ODBC Data Sources (32-bit)	16/07/2016 13:42	Shortcut	2 KB
ODBC Data Sources (64-bit)			
Performance Monitor			
Print Management			
Resource Monitor			
Services			
System Configuration			
System Information			
Task Scheduler			
Windows Firewall with Advanced Security			
Windows Memory Diagnostic			

ESA CONNECT will still use ODBC driver and it will connect to the SQL DB via that DSN.



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