MsSQL Library for TIA Portal V13 & Newer

User guide

V1.5.3.0

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Last revision: January 2020

Contents

Chapter 1

Product description

This library allows you to connect your PLC Siemens S7-1200 or S7-1500 application to Microsoft SQL database. With this library you are able to store and read process data. Read recipes from ERP, save breakdown report and etc. No more OPC servers and other middleware.

Basic requirement for this library is TIA Portal V13 or higher and Microsoft SQL Server (2005 or higher).

Microsoft SQL Server 2014 Express is there: `https://www.microsoft.com/en-us/download/details.aspx?id=42299`

1.1 Range of function

This library allows to the user connect to Microsoft SQL Server from 2005 to 2017. This library use for communication with server TDS protocol.

Supported commands:

- SELECT
- INSERT
- UPDATE
- DELETE
- Execute stored procedures

1.2 Supported datatypes

Other datatypes, which are not in the table below, will cause **xExecuteSQLError** Unsupported datatype. Strikethrough datatypes are not currently supported, but they will be available in the future.

Datatype	**SQL datatype**	**PLC datatype**	**ID of datatype**
boolean	bit	BOOL	16#32 or 16#68
string	nvarchar(n)	STRING(255)	16#E7 or 16#A7
int	int	DINT	16#26 or 16#38 or 16#34
bigInt	bigint	DINT	16#7F (8 bytes only S7-1500)
float	float	REAL	16#6D (8 bytes only S7-1500)
real	real	LREAL (Only S7-1500)	16#3E or 16#3B
datetime	datetime	DTL	16#3D or 16#6F

1.3 Function blocks

1.3.1 fbMsSQL

FB for complete connecting and executing commands with Microsoft SQL from 2005 to 2017.
Author: krajcart
V1.5.3.0

Table 1.1: fbMsSQL

Scope	Name	Type	Inital	Comment
Input	usiIP1	Usint		1st octet of IP Address
	usiIP2	Usint		2nd octet of IP Address
	usiIP3	Usint		3rd octet of IP Address
	usiIP4	Usint		4th octet of IP Address
	uiPort	Uint	1433	port of MsSQL server
	uiID_CONN	CONN_OUC	12	unique ID of TCP communication in Simatic
	tTimeout	Time	T#1s	timeout
	sActivationNumber	String		activation number received after purchase
	interfaceID	HW_ANY	64	X1(64), X2(72)
Output	xConnectSucessfully	Bool		indication of sucessfull conection to SQL
	xConnTestOK	Bool		indication of sucessfull conection to SQL test
	xLoginFailed	Bool		login to SQL failed
	xExecuteSQLError	Bool		execution of SQL command failed
	xCommandExecutedOK	Bool		execution of SQL command was sucessfull
	wRowDoneCnt	Word		no. of rows done
	dwError	DWord		error identifier
	sErrorMessage	String		error message
	sStatus	String		status message
	xLicenseValid	Bool		info about license
	DONE	Bool		signal that operation was finished OK
	BUSY	Bool		signal that operation is busy
	ERR0R	Bool		signal that operation ended with Error
	sVersion	String[10]		info about current library version
InOut	xConnectSQL	Bool		trigger for login,to SQL
	xDisconnectSQL	Bool		trigger for logout from SQL
	xExecuteSQL	Bool		trigger to execute SQL command executing
	xTryConnSQL	Bool		trigger for testing if connection with SQL server
	sqlLogin	sqlLogin		structure for login information
	query	stQuery		structure for stQuery
	stSqlResponse	stSqlResponse		structure for SQL Response

1.4 Functions

1.4.1 fcGetBOOL

FC for converting raw SQL data to datatype BOOL.
Allowed data types: 16#32(TDS_DATA_BIT1) or 16#68(TDS_DATA_BITN)
Author: krajcart
V1.5.0.0

Table 1.2: fcGetBOOL

Scope	**Name**	**Type**	**Inital**	**Comment**
Input	iCol	Int		index of selected column
	iRow	Int		index of selected row
InOut	stSqlResponse	stSqlResponse		response structure
	eError	Word		error variable
	xValue	Bool		return value

1.4.2 fcGetDINT

FC for converting raw SQL data to datatype DINT.
Allowed data types: 16#26(TDS_DATA_INTN) or 16#38(TDS_DATA_INT4) or 16#7F(TDS_DATA_INT8) or 16#34(TDS_DATA_INT2)
Author: krajcart
V1.5.1.0

Table 1.3: fcGetDINT

Scope	**Name**	**Type**	**Inital**	**Comment**
Input	iCol	Int		index of selected column
	iRow	Int		index of selected row
InOut	stSqlResponse	stSqlResponse		response structure
	eError	Word		error variable
	diValue	Dint		return value

1.4.3 fcGetSTRING

FC for converting raw SQL data to datatype STRING.
Allowed data types: 16#E7(TDS_DATA_NVARCHAR) or 16#A7(TDS_DATA_BIGVARCHAR)
Author: krajcart
V1.5.1.0

Table 1.4: fcGetSTRING

Scope	**Name**	**Type**	**Inital**	**Comment**
Input	iCol	Int		index of selected column
	iRow	Int		index of selected row
InOut	stSqlResponse	stSqlResponse		response structure
	eError	Word		error variable
	uiLen	Uint		length of string variable
	sString	String		return value

1.4.4 fcGetREAL

FC for converting raw SQL data to datatype REAL(4 bytes) and LREAL(8 bytes) only S7-1500.
Allowed data types: 16#6D(TDS_DATA_FLOATN) or 16#3E(TDS_DATA_FLOAT8)
or 16#3B(TDS_DATA_FLOAT4)
Author: krajcart
V1.5.1.0

Table 1.5: fcGetREAL

Scope	**Name**	**Type**	**Inital**	**Comment**
Input	iCol	Int		index of selected column
	iRow	Int		index of selected row
InOut	stSqlResponse	stSqlResponse		response structure
	eError	Word		error variable
	rValue	Real		return Value

1.4.5 fcGetDATETIME

FC for converting raw SQL data to datatype DTL
Allowed data types: 16#3D(DATETIME8) or 16#6F(DATETIMEN)
Author: krajcart
V1.5.0.0

Table 1.6: fcGetDATETIME

Scope	**Name**	**Type**	**Inital**	**Comment**
Input	iCol	Int		index of selected column
	iRow	Int		index of selected row
InOut	stSqlResponse	stSqlResponse		response structure
	eError	Word		error variable
	dtlDateTime	DTL		return Value

1.5 Errors

List of errors stored in value **dwError** as output from **fbMsSql**.

Table 1.7: Error table

Code	Error message	Advice
16#400000	No error.	
16#400001	Timeout destination server is unreachable.	Remote server unreachable, try fbPing and firewall.
16#400002	Login failed.	Wrong login or security settings on server side.
16#400003	Command failed.	Executed command failed.
16#400004	SQL error ocurred.	Read the description of error.
16#400005	Query has unsupported data type.	Use supported datatype according 1.2 Supported datatypes.
16#400006	Error data row affected.	MS SQL error.
16#400007	Wrong flag on received row affected.	MS SQL error.
16#400008	Wrong row done.	MS SQL error.
16#400009	No command to execute.	Write some SQL command.
16#400010	More columns than are defined in gc_iNoOfColumns.	Increase c_iNoOfColumns constant in global parameters.
16#400011	More rows than are defined in gc_iNoOfRows.	Increase c_iNoOfRows constant in global parameters
16#400012	More raw data than are defined in gc_iLengthOfDataArray.	Increase gc_iLengthOfDataArray constant in global parameters.
16#400014	License is not valid! Demo expired.	Buy the license.
16#400016	sqlLogin is not filled completely.	Fill all variables in sqlLogin.
16#400019	Receiving invalid or unexpected PACKET from server.	
16#400020	MSSQL-ERROR: Login Ack Token not received.	MS SQL error.
16#400021	MSSQL-ERROR: Receiving unknown TOKEN FROM server.	MS SQL error.
16#400022	MSSQL-ERROR: Could NOT obtain length information of column data.	MS SQL error.
16#400023	Name of column is longer than is defined in c_iMaxIdentifierLength.	MS SQL error.
16#400024	MSSQL Library DO NOT support SQL-Batch.	
16#400025	State machine ended on timeout.	Look in which step it failed and try to increase timeout.

Table 1.8: Error table convert functions

eError	Error message	Advice
16#00	No error.	
16#01	iRow is 0.	Set variable iRow bigger than 0.
16#02	iRow is out of range.	Set variable iRow between 1 and stSqlResponse.uiRowCount.
16#03	iColumn is 0.	Set variable iColumn bigger than 0.
16#04	iColumn is out of range.	Set variable iRow between 1 and stSqlResponse.uiColumnCount.
16#05	Requested value is NULL.	Fill this column in database.
16#06	Structure stSqlResponse is empty.	Execute some SQL query.
16#68	Wrong datatype for BOOL to convert.	Allowed is TDS_DATA_BITN or TDS_DATA_BIT1.
16#3D6F	Wrong datatype for DATETIME to convert.	Allowed is TDS_DATA_DATETIME8 or TDS_DATA_DATETIMEN.
16#2638	Wrong datatype for DINT to convert.	Allowed is TDS_DATA_INT4 or TDS_DATA_INT2 or TDS_DATA_INT8 or TDS_DATA_INTN.
16#6D	Wrong datatype for REAL to convert.	Allowed is TDS_DATA_FLOATN or TDS_DATA_FLOAT4 or TDS_DATA_FLOAT8.
16#E7	Wrong datatype for STRING to convert.	Allowed is TDS_DATA_NVARCHAR or TDS_DATA_BIGVARCHAR.

1.6 Licensing

MsSQL library for TIA Portal V13, V14, V15 and V15.1 is licensed per runtime license. Each license is binded to SN of PLC. Price for one runtime license is **199€ without VAT.** Without valid license library works only 2 hours after startup. Link for purchase: `https://www.plc2sql.com/products/mssql-library-for-tia-portal-v13-v14-v15/#license`

Chapter 2

Installation

2.1 Installation MsSQL library to TIA Portal

Open example project for TIA Portal. Copy these block into your TIA Portal projects[1] :

Function Blocks

- fbMsSQL (S7-1200 & S7-1500)

Functions

- fcGetBOOL (S7-1200 & S7-1500)
- fcGetDINT (S7-1200 & S7-1500)
- fcGetSTRING (S7-1200 & S7-1500)
- fcGetREAL (S7-1200 & S7-1500)
- fcGetDATETIME (S7-1200 & S7-1500)

PLC data types

- astColData
- astRowDet
- stColumn
- stLogin
- stQuery
- stSqlResponse

[1] Numbers of fb, fc and db can be arbitrary

This library package contains:

- Library for TIA Portal V14 or V15
- Example project S7-1200 & S7-1500
- User guide

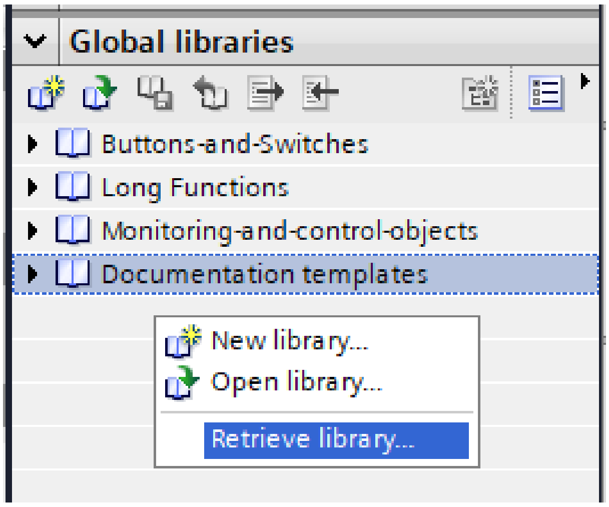
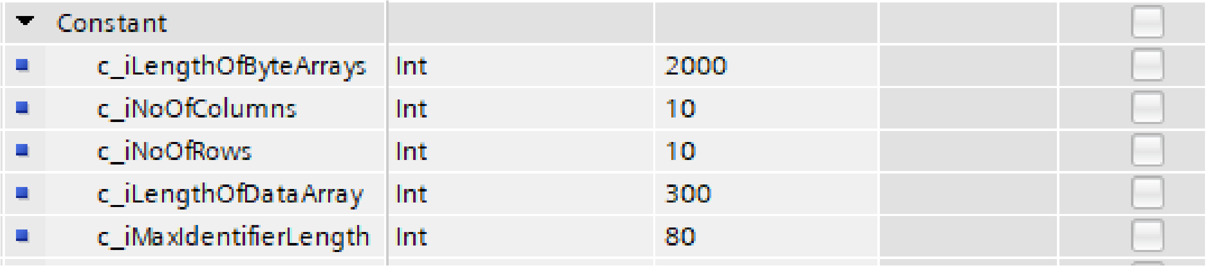


Figure 2.1: Loading Global Library

Limits of data to read from SQL

fbMsSQL has internally setup array bound for data able to read from MsSQL. Because this is about definition of arrays and memory in PLC. In default you are able to read max 10 collumn, 10 rows and each row can contain max 300 bytes of data.



▼	Constant				□
■	c_iLengthOfByteArrays	Int	2000		□
■	c_iNoOfColumns	Int	10		□
■	c_iNoOfRows	Int	10		□
■	c_iLengthOfDataArray	Int	300		□
■	c_iMaxIdentifierLength	Int	80		□

Figure 2.2: Constants in fbMsSQL Library

Chapter 3

Example application

On the picture 3.1 is main program in OB1 with fbMsSQL and function block. All example files are in Global Library. Master copies S7-1200 or S7-1500.

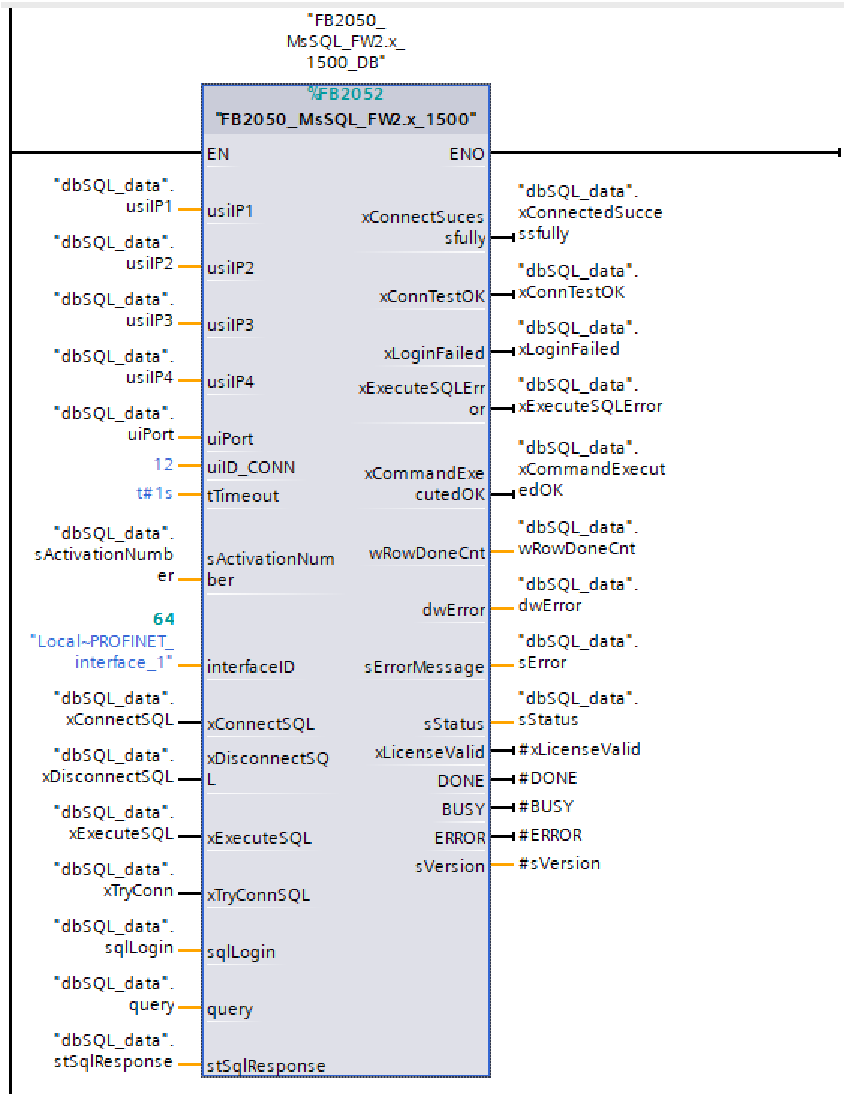


Figure 3.1: fbMsSQL call in OB1(for S7-1512)

3.1 Example commands for SQL Server

3.1.1 tblTestPLC

In this table we have 6 collumns:

- **Bools** [bit]
- **String** [nvarchar(50)]
- **ID** [int]
- **Real** [float]
- **DoubleInt** [bigint]

```
/****** This command is for db test ******/

USE [test]
GO

SET ANSI_NULLS ON
GO

SET QUOTED_IDENTIFIER ON
GO

CREATE TABLE [dbo].[tblTestPLC](
[Bools] [bit] NULL,
[String] [nvarchar](50) NULL,
[ID] [int] NULL,
[Real] [float] NULL,
[DoubleInt] [bigint] NULL

) ON [PRIMARY]

GO
```

Figure 3.2: Create tblTestPLC

```
SELECT [Bools]
      ,[String]
      ,[ID]
      ,[Real]
      ,[DoubleInt]
  FROM [test].[dbo].[tblTestPLC]
```

Figure 3.3: SELECT from tblTestPLC

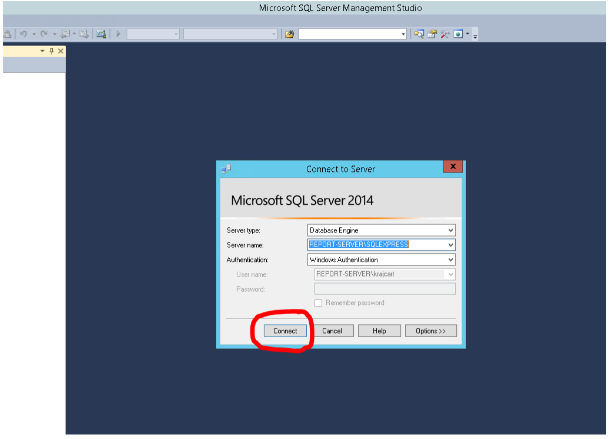
Table 3.1: Example of values, which you can add to your tblTestPLC table

[rows]	**Bools**	**String**	**ID**	**Real**	**DoubleInt**
1	0	Test 12	456	13.2	445568
2	1	Hello youtube	78964	0.4	44556

3.2 Installation of Microsoft SQL Server

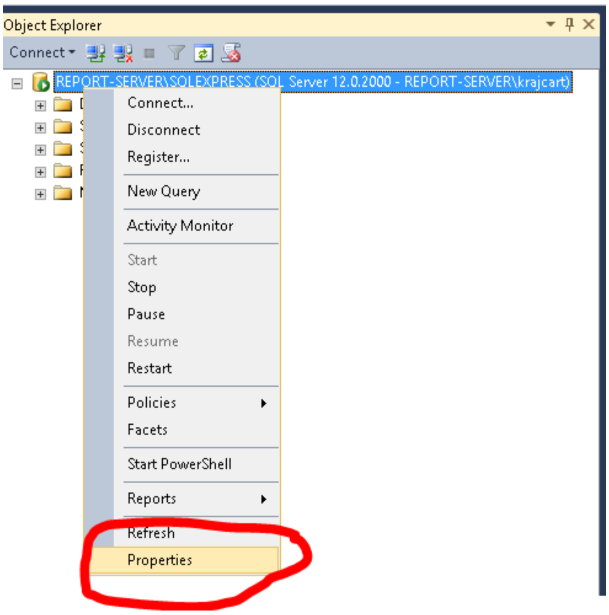
How to install Microsoft SQL Server is shown on this video: `https://www.youtube.com/watch?v=QFyetK805bo`
In subsections below are shown necessary steps which has to be done on SQL Server side to be accessible from PLC.

3.2.1 Enable SQL authentication

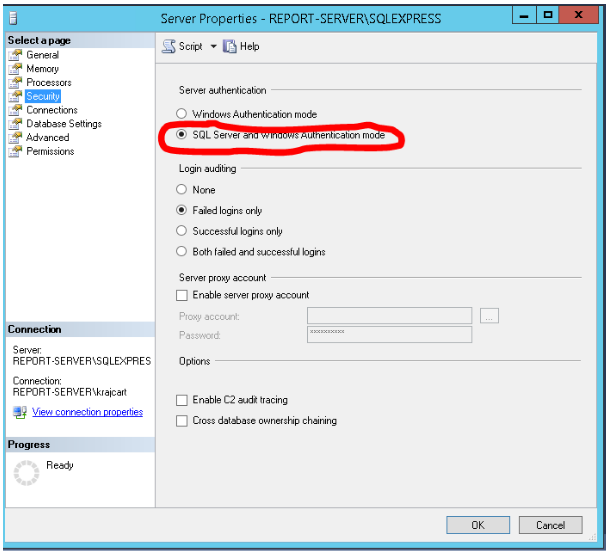

Microsoft SQL Server Management Studio
Connect to Server
Microsoft SQL Server 2014
Connect
Cancel
Help
Options >>

Server type: Database Engine
Server name: REPORT-SERVER\SQLEXPRESS
Authentication: Windows Authentication
User name: REPORT-SERVER\krajcart
Password:
□ Remember password

Connect to your database with Microsoft SQL Management Studio. You will login with **Windows authentication**.



After successful connection to the SQL Server. Right click on the SQL server icon and choose **Properties**.



Server authentication

○ Windows Authentication mode

● SQL Server and Windows Authentication mode

Login auditing

○ None

● Failed logins only

○ Successful logins only

○ Both failed and successful logins

Server proxy account

□ Enable server proxy account

Proxy account:

Password: **********

Options

□ Enable C2 audit tracing

□ Cross database ownership chaining

Connection

Server:
REPORT-SERVER\SQLEXPRES

Connection:
REPORT-SERVER\krajcart

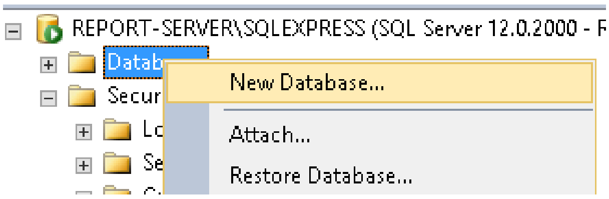
View connection properties

Progress

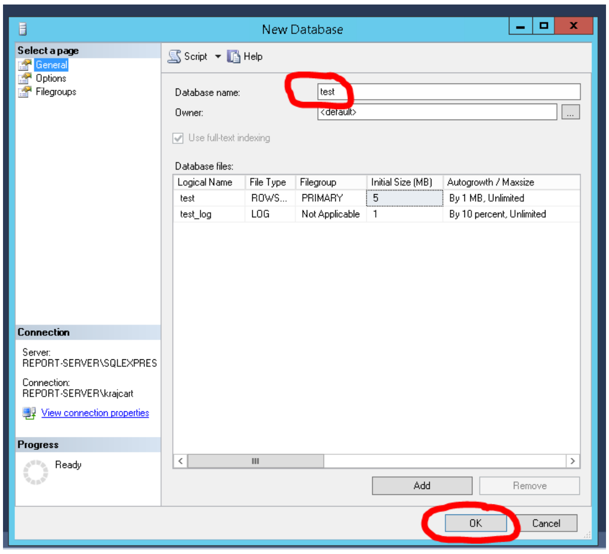
Ready

In Server Properties choose page **Security**, and choose **SQL Server and Windows Authentication mode**.

3.2.2 Create database



Now we need to create test database. Right click on tab **Database**, a choose **New Database**.



Database name: test

Owner: <default>

☑ Use full-text indexing

Database files:

Logical Name	File Type	Filegroup	Initial Size (MB)	Autogrowth / Maxsize
test	ROWS...	PRIMARY	5	By 1 MB, Unlimited
test_log	LOG	Not Applicable	1	By 10 percent, Unlimited

Connection

Server:
REPORT-SERVER\SQLEXPRES

Connection:
REPORT-SERVER\krajcart

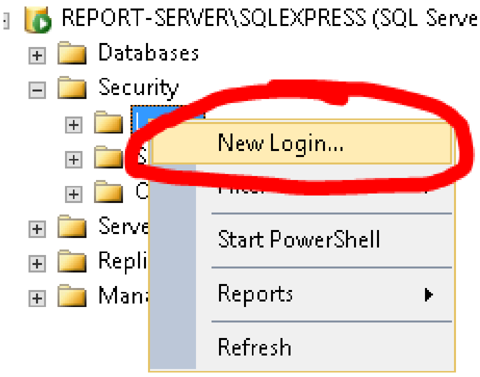
View connection properties

Progress

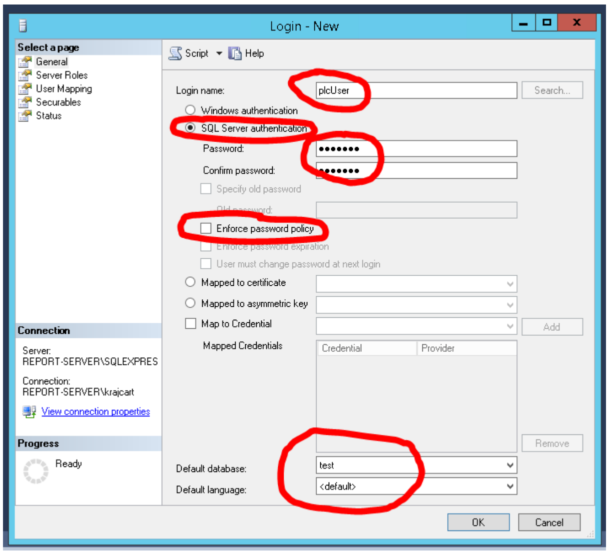
Ready

In this window we will set only **Database name:** in our case name will be **test** and press **OK**.

3.2.3 Create new user



Right click on tab **Security** and click on **New Login**.



Select a page
- General
- Server Roles
- User Mapping
- Securables
- Status

Login name: plcUser

○ Windows authentication

● SQL Server authentication

Password: ●●●●●●●

Confirm password: ●●●●●●●

□ Specify old password

Old password:

□ Enforce password policy

□ Enforce password expiration

□ User must change password at next login

○ Mapped to certificate

○ Mapped to asymmetric key

□ Map to Credential

Mapped Credentials

Credential	Provider

Default database: test

Default language: <default>

Connection

Server:
REPORT-SERVER\SQLEXPRES

Connection:
REPORT-SERVER\krajcart

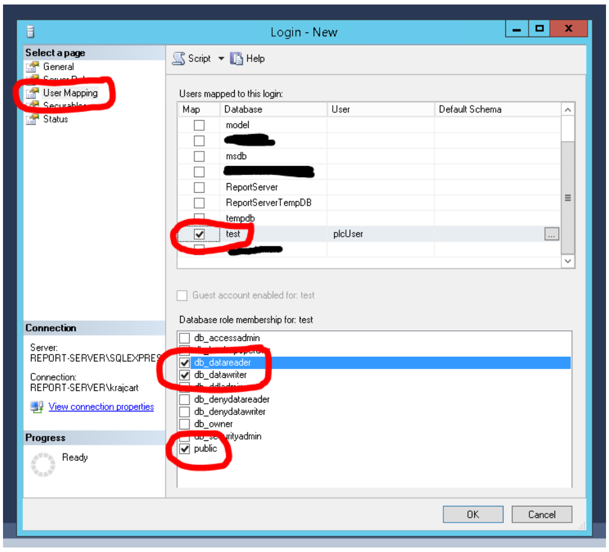
View connection properties

Progress

Ready

In this window we will fill these columns:

- **Login name** - name of new user
- **SQL Server authentication** - and set **password**
- uncheck **Enforce password policy**
- **Default database** - our case db test



Select a page
- General
- Server Roles
- User Mapping
- Securables
- Status

Users mapped to this login:

Map	Database	User	Default Schema
□	model		
□	[redacted]		
□	msdb		
□	[redacted]		
□	ReportServer		
□	ReportServerTempDB		
□	tempdb		
☑	test	plcUser	
□	[redacted]		

□ Guest account enabled for: test

Database role membership for: test

□ db_accessadmin
□ db_backupoperator
☑ db_datareader
☑ db_datawriter
□ db_ddladmin
□ db_denydatareader
□ db_denydatawriter
□ db_owner
□ db_securityadmin
☑ public

Connection

Server:
REPORT-SERVER\SQLEXPRES

Connection:
REPORT-SERVER\krajcart

View connection properties

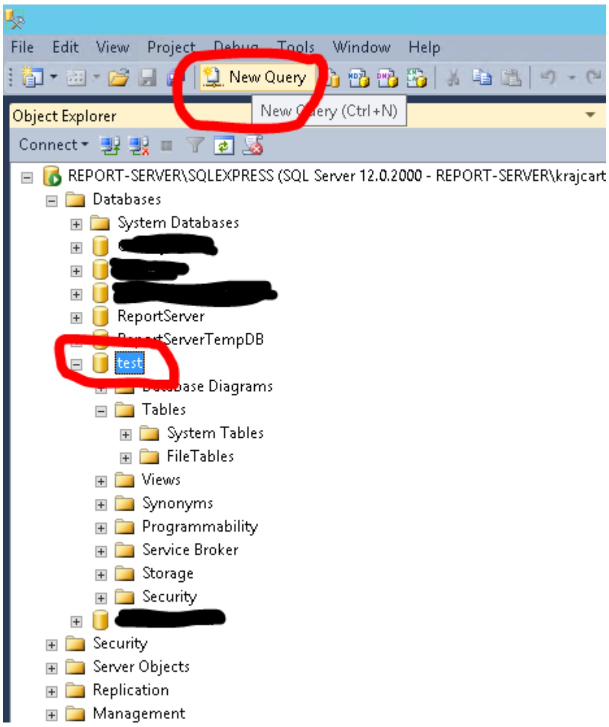
Progress

Ready

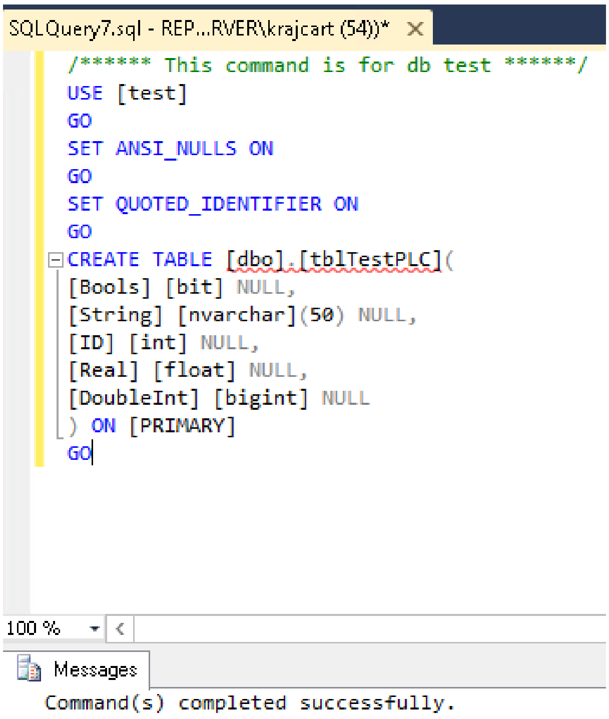
Another tab is **User Mapping**. In this tab we will set permissions for this user. We will map our database **test**. And for this database we will set these permissions:

- **db_datareader** - allows to read data from tables
- **db_datawriter** - allows to write data into tables
- **public** - this one is set by default

3.2.4 Create new table



Left click on our database **test** in tab Databases and then choose **New Query**.



```
/****** This command is for db test ******/
USE [test]
GO
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
CREATE TABLE [dbo].[tblTestPLC](
[Bools] [bit] NULL,
[String] [nvarchar](50) NULL,
[ID] [int] NULL,
[Real] [float] NULL,
[DoubleInt] [bigint] NULL
) ON [PRIMARY]
GO
```

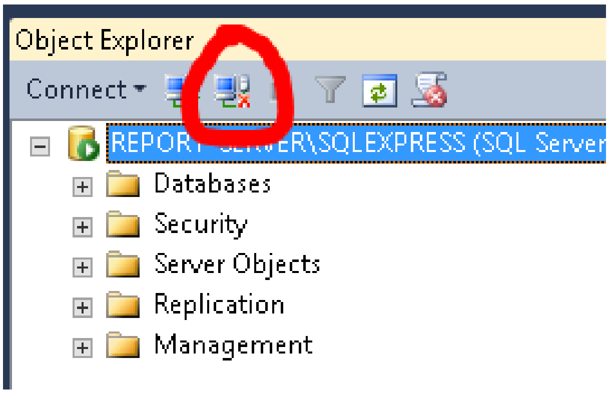
```
Command(s) completed successfully.
```

Into the new window we will insert code from figure: 3.4. And after **press F5** to execute command.

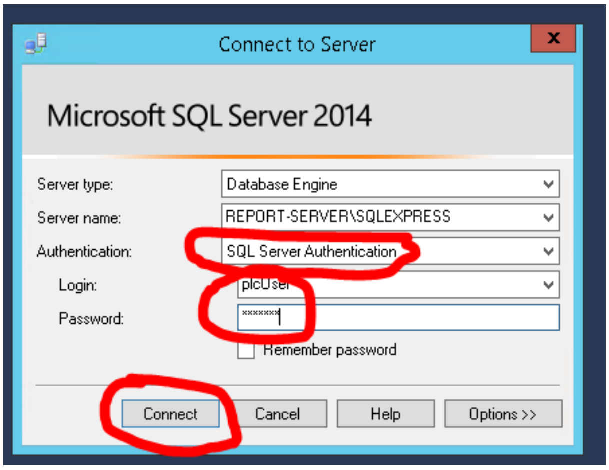
```
/****** This command is for db test ******/

USE [test]
GO

SET ANSI_NULLS ON
GO

SET QUOTED_IDENTIFIER ON
GO

CREATE TABLE [dbo].[tblTestPLC](
[Bools] [bit] NULL,
[String] [nvarchar](50) NULL,
[ID] [int] NULL,
[Real] [float] NULL,
[DoubleInt] [bigint] NULL

) ON [PRIMARY]

GO
```

Figure 3.4: Create tblTestPLC

3.2.5 Test connection to the database with new user



First thing is to disconnect from the database.



Server type: Database Engine

Server name: REPORT-SERVER\SQLEXPRESS

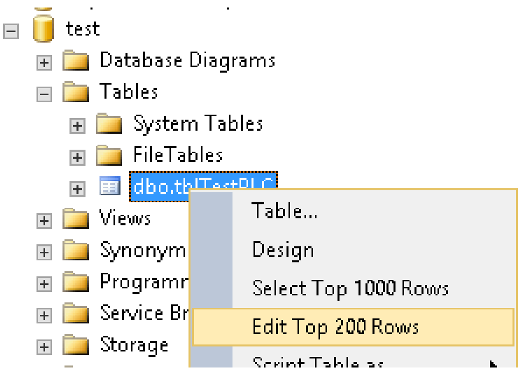
Authentication: SQL Server Authentication

Login: plcUser

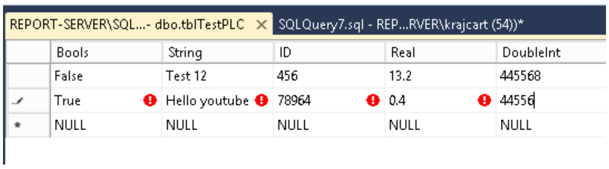
Password: *******

☐ Remember password

In the login screen we will change **Windows authentication** to **SQL Server Authentication**, and fill **Login** and **Password** of our new user.



Next step is to try if permission which we set earlier to our user. So in tab Databases -> Test -> Tables -> tblTestPLC right click and choose **Edit Top 200 Rows**. And this command will open window where we can modify data in our table.

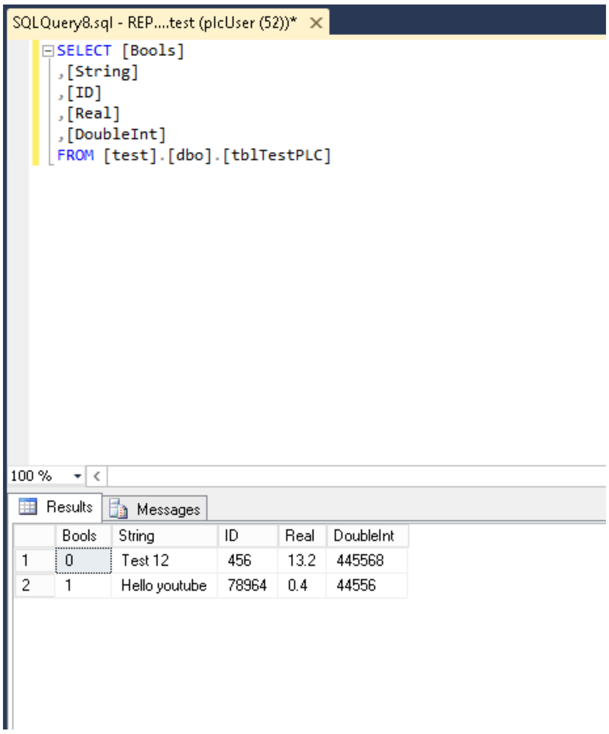

REPORT-SERVER\SQL...- dbo.tblTestPLC
SQLQuery7.sql - REP...RVER\krajcart (54))*

Bools	String	ID	Real	DoubleInt
False	Test 12	456	13.2	445568
True	Hello youtube	78964	0.4	44556
NULL	NULL	NULL	NULL	NULL

In table 3.2 are shown sample data which you can put into this table.

Table 3.2: Example of values, which you can add to your tblTestPLC table

[rows]	Bools	String	ID	Real	DoubleInt
1	0	Test 12	456	13.2	445568
2	1	Hello youtube	78964	0.4	44556

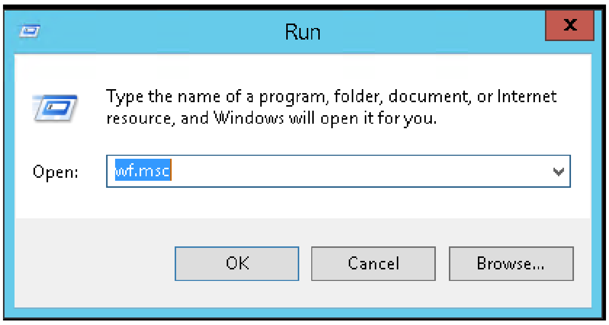


```
SELECT [Bools]
      ,[String]
      ,[ID]
      ,[Real]
      ,[DoubleInt]
  FROM [test].[dbo].[tblTestPLC]
```

	Bools	String	ID	Real	DoubleInt
1	0	Test 12	456	13.2	445568
2	1	Hello youtube	78964	0.4	44556

Last step is to try which data are in the table. Example of Select command is here: 3.2.

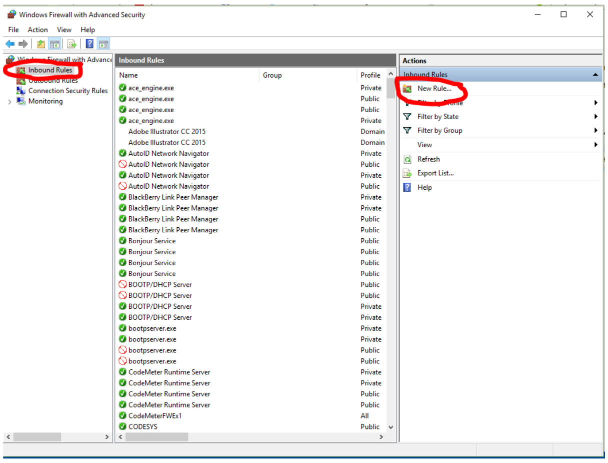
3.2.6 Setup firewall permission for SQL Server



Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

Open: wf.msc

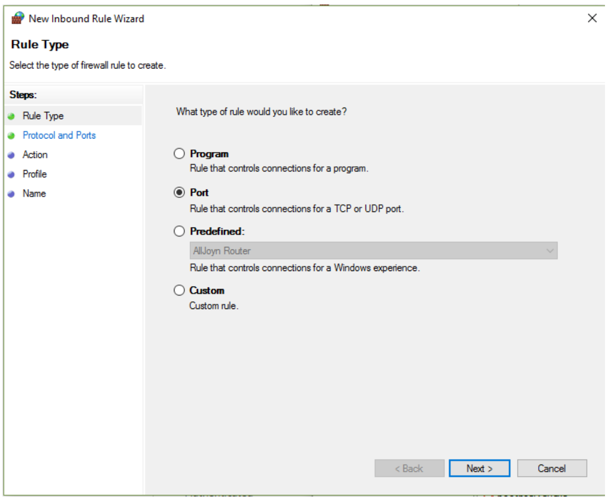
Open **Windows Firewall with Advanced Security**. Open **Run** and insert command **wf.msc**



Inbound Rules

Name	Group	Profile
✓ ace_engine.exe		Private
✓ ace_engine.exe		Public
✓ ace_engine.exe		Public
✓ ace_engine.exe		Private
Adobe Illustrator CC 2015		Domain
Adobe Illustrator CC 2015		Domain
✓ AutoID Network Navigator		Private
⃠ AutoID Network Navigator		Public
✓ AutoID Network Navigator		Private
⃠ AutoID Network Navigator		Public
✓ BlackBerry Link Peer Manager		Private
✓ BlackBerry Link Peer Manager		Private
✓ BlackBerry Link Peer Manager		Public
✓ BlackBerry Link Peer Manager		Public
✓ Bonjour Service		Public
✓ Bonjour Service		Public
✓ Bonjour Service		Public
✓ Bonjour Service		Public
⃠ BOOTP/DHCP Server		Public
⃠ BOOTP/DHCP Server		Public
✓ BOOTP/DHCP Server		Private
✓ BOOTP/DHCP Server		Private
✓ bootpserver.exe		Private
✓ bootpserver.exe		Private
⃠ bootpserver.exe		Public
⃠ bootpserver.exe		Public
✓ CodeMeter Runtime Server		Private
✓ CodeMeter Runtime Server		Private
✓ CodeMeter Runtime Server		Public
✓ CodeMeter Runtime Server		Public
✓ CodeMeterFWEx1		All
✓ CODESYS		Public

On left side choose **Inbound Rules** by left click. This will open list with all Inbound rules set for your PC. On right side choose **New Rule**.



Rule Type

Select the type of firewall rule to create.

Steps:
- Rule Type
- Protocol and Ports
- Action
- Profile
- Name

What type of rule would you like to create?

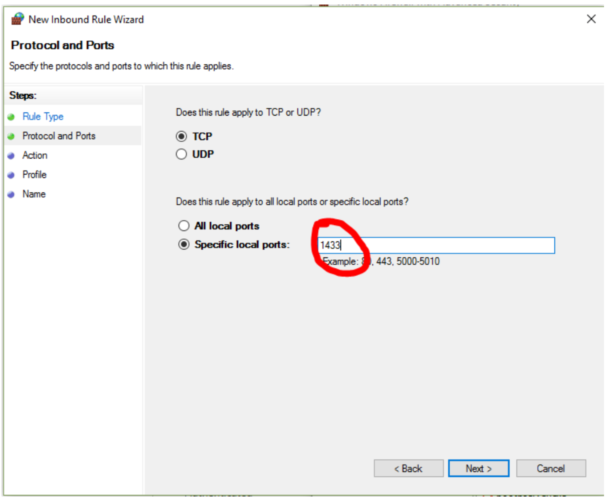
○ **Program**
Rule that controls connections for a program.

● **Port**
Rule that controls connections for a TCP or UDP port.

○ **Predefined:**
AllJoyn Router
Rule that controls connections for a Windows experience.

○ **Custom**
Custom rule.

This wizard will help us to set correct firewall rule for our PC. First we have to choose **Port** and press **Next**.



Protocol and Ports

Specify the protocols and ports to which this rule applies.

Does this rule apply to TCP or UDP?

● TCP

○ UDP

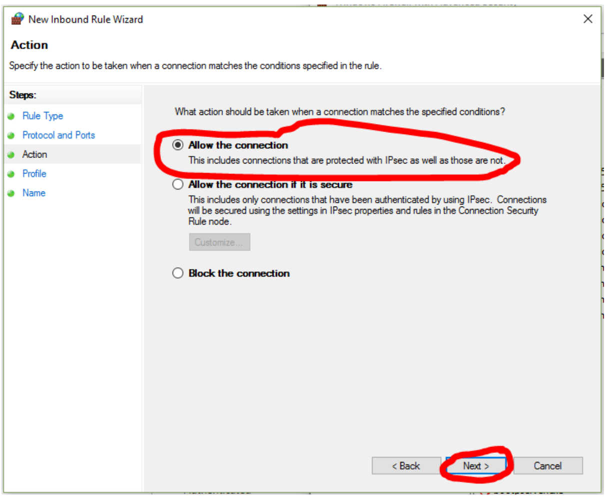
Does this rule apply to all local ports or specific local ports?

○ All local ports

● Specific local ports: 1433

Example: 80, 443, 5000-5010

Here we will specify on which port is our SQL server running, default port is **1433**. It's adjustable in settings of SQL Server.



Action

Specify the action to be taken when a connection matches the conditions specified in the rule.

What action should be taken when a connection matches the specified conditions?

● Allow the connection

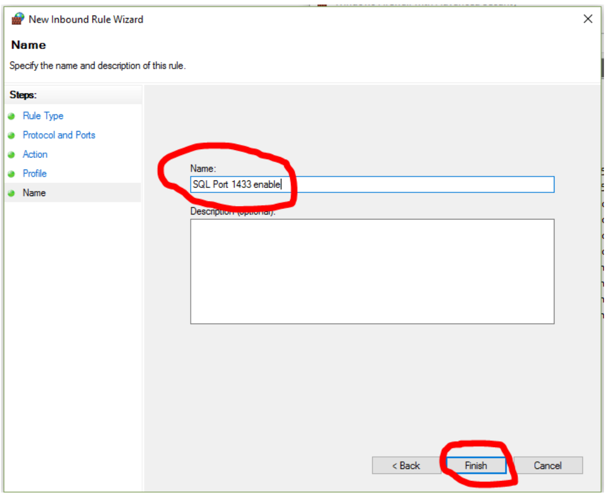
This includes connections that are protected with IPsec as well as those are not.

○ Allow the connection if it is secure

This includes only connections that have been authenticated by using IPsec. Connections will be secured using the settings in IPsec properties and rules in the Connection Security Rule node.

○ Block the connection

Just choose **Allow the connection** and press **Next**.



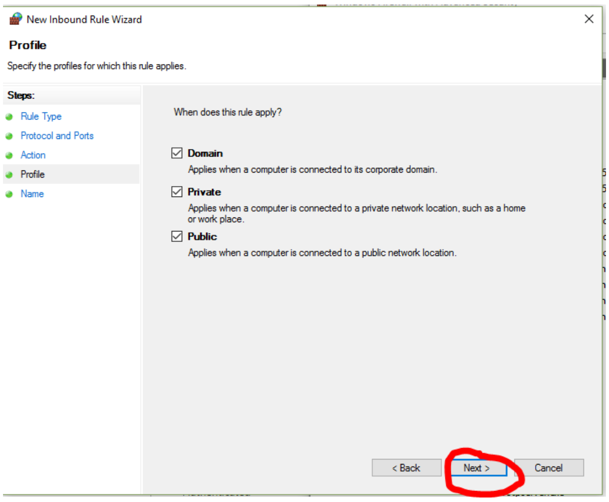
Name

Specify the name and description of this rule.

Name: SQL Port 1433 enable

Description (optional):

Insert name of the firewall rule and press **Next**.



New Inbound Rule Wizard

Profile

Specify the profiles for which this rule applies.

Steps:

- Rule Type
- Protocol and Ports
- Action
- Profile
- Name

When does this rule apply?

☑ **Domain**

Applies when a computer is connected to its corporate domain.

☑ **Private**

Applies when a computer is connected to a private network location, such as a home or work place.

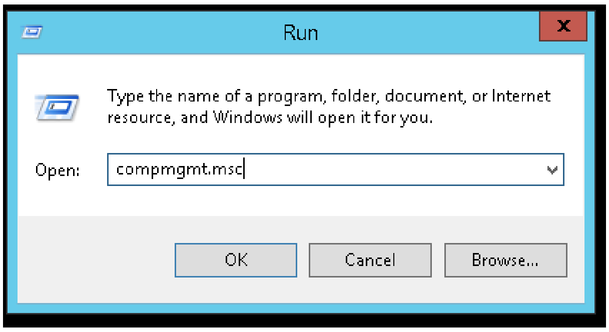
☑ **Public**

Applies when a computer is connected to a public network location.

In this last windows we will choose for which types of zones will be rule applied.

Note: this is just basic example for enable firewall!!

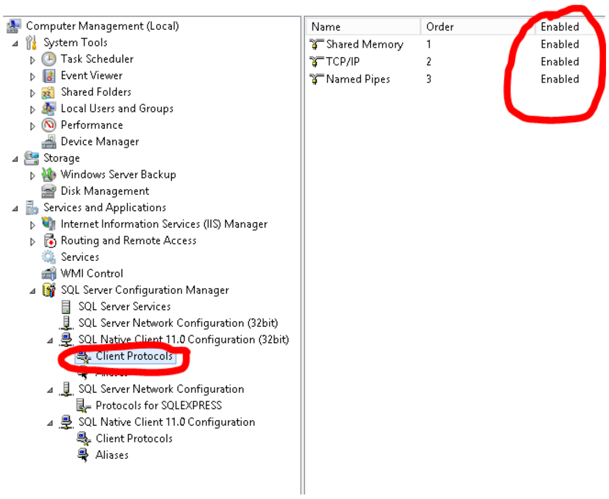
3.2.7 SQL Server configuration



Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

Open: compmgmt.msc

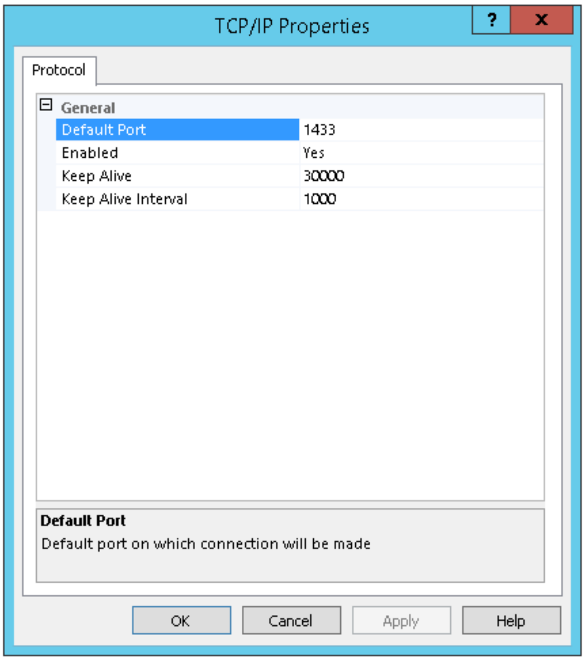
First thing is to open **Computer management**. Easiest way how to do that is to open **Run**: insert command **compmgmt.msc**


Computer Management (Local)
System Tools
Task Scheduler
Event Viewer
Shared Folders
Local Users and Groups
Performance
Device Manager
Storage
Windows Server Backup
Disk Management
Services and Applications
Internet Information Services (IIS) Manager
Routing and Remote Access
Services
WMI Control
SQL Server Configuration Manager
SQL Server Services
SQL Server Network Configuration (32bit)
SQL Native Client 11.0 Configuration (32bit)
Client Protocols
Aliases
SQL Server Network Configuration
Protocols for SQLEXPRESS
SQL Native Client 11.0 Configuration
Client Protocols
Aliases

Name	Order	Enabled
Shared Memory	1	Enabled
TCP/IP	2	Enabled
Named Pipes	3	Enabled

On left side choose Services and Applications -> SQL Server Configuration Manager -> SQL Native Client 11.0 Configuration -> Client Protocols. All 3 protocols has to be **Enabled**.

Note: SQL Native Client 11.0 Configuration naming is different in every version of SQL Server and also version(32 or 64 bits)!!



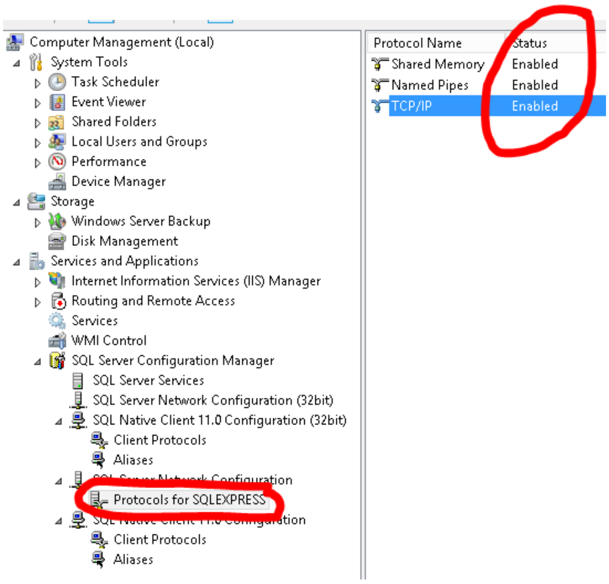
General

Default Port	1433
Enabled	Yes
Keep Alive	30000
Keep Alive Interval	1000

Default Port
Default port on which connection will be made

By right click on **TCP/IP** you can edit **Properties**:

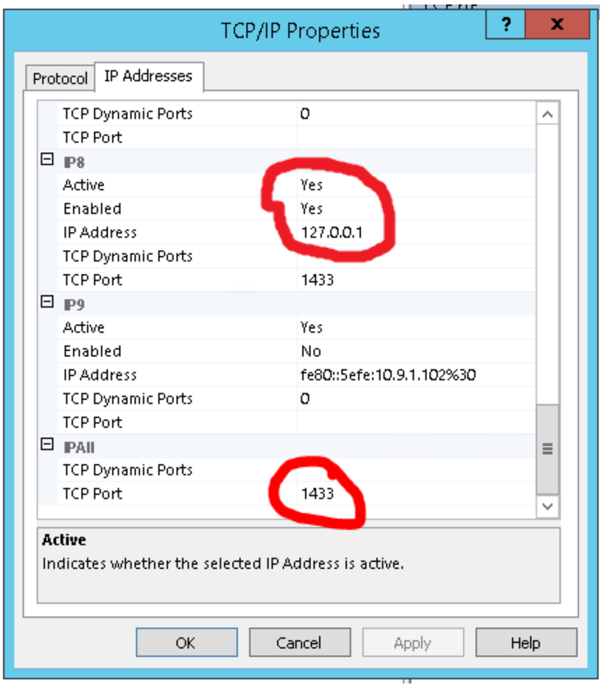
- **Default Port** - port on which will be your SQL server reachable across network
- **Enabled** - Enabling of TCP/IP protocol



- Computer Management (Local)
  - System Tools
    - Task Scheduler
    - Event Viewer
    - Shared Folders
    - Local Users and Groups
    - Performance
    - Device Manager
  - Storage
    - Windows Server Backup
    - Disk Management
  - Services and Applications
    - Internet Information Services (IIS) Manager
    - Routing and Remote Access
    - Services
    - WMI Control
    - SQL Server Configuration Manager
      - SQL Server Services
      - SQL Server Network Configuration (32bit)
      - SQL Native Client 11.0 Configuration (32bit)
        - Client Protocols
        - Aliases
      - SQL Server Network Configuration
        - Protocols for SQLEXPRESS
      - SQL Native Client 11.0 Configuration
        - Client Protocols
        - Aliases

Protocol Name	Status
Shared Memory	Enabled
Named Pipes	Enabled
TCP/IP	Enabled

Another settings will be made in SQL Server Network Configuration. Click on **Protocols for SQLEXPRESS**. Also all 3 protocols has to be **Enabled**. We need to check if port is set correctly right click on **TCP/IP** and choose tab **IP Addresses**.

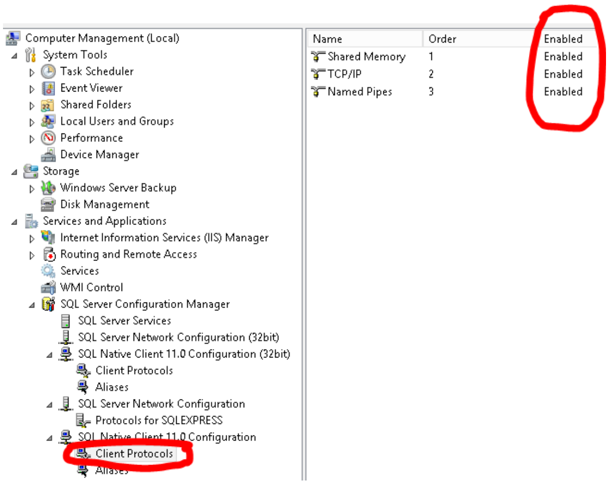


TCP Dynamic Ports	0
TCP Port	
IP8	
Active	Yes
Enabled	Yes
IP Address	127.0.0.1
TCP Dynamic Ports	
TCP Port	1433
IP9	
Active	Yes
Enabled	No
IP Address	fe80::5efe:10.9.1.102%30
TCP Dynamic Ports	0
TCP Port	
IPAll	
TCP Dynamic Ports	
TCP Port	1433

Active

Indicates whether the selected IP Address is active.

Here is set the default port for **SQL Server** and also all **IP addresses** for connection to the SQL Server. And click yes to parameter **Enabled** on each IP address which you want to have active for SQL. We activated 127.0.0.1(localhost). So for your ip 192.168.1.1 you have to scroll up and find the right interface.



```
Computer Management (Local)
  System Tools
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    Event Viewer
    Shared Folders
    Local Users and Groups
    Performance
    Device Manager
  Storage
    Windows Server Backup
    Disk Management
  Services and Applications
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        Client Protocols
        Aliases
      SQL Server Network Configuration
        Protocols for SQLEXPRESS
      SQL Native Client 11.0 Configuration
        Client Protocols
        Aliases
```
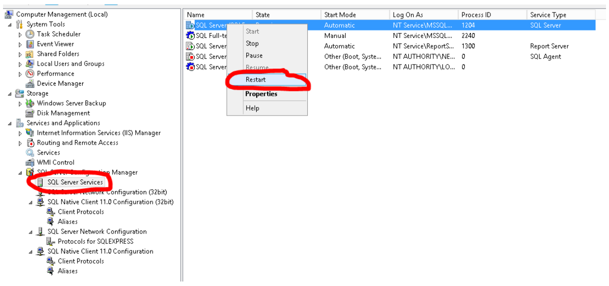

Name	Order	Enabled
Shared Memory	1	Enabled
TCP/IP	2	Enabled
Named Pipes	3	Enabled

In case you have 64 bit SQL Server you have to also Enable Protocols in 64 bits client.



```
Computer Management (Local)
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      SQL Server Network Configuration
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      SQL Native Client 11.0 Configuration
        Client Protocols
        Aliases
```

Name	State	Start Mode	Log On As	Process ID	Service Type
SQL Server		Automatic	NT Service\MSSQL...	1204	SQL Server
SQL Full-te		Manual	NT Service\MSSQL...	2240	
SQL Server		Automatic	NT Service\ReportS...	1300	Report Server
SQL Server		Other (Boot, Syste...	NT AUTHORITY\NE...	0	SQL Agent
SQL Server		Other (Boot, Syste...	NT AUTHORITY\LO...	0	

All these changes requires restart of SQL Server.

Chapter 4

Change Log

V 1.0.0.0

- Released

V 1.2.0.0

- **UPDATE** - Updated library to TIA V14 SP1.
- **UPDATE** - Performance improvement.
- **BUG** - Check string for null value.

V 1.2.1.0

- **BUG** - Check string for length 0.

V 1.2.2.0

- **BUG** - Reading errors from Server.
- **UPDATE** - Updated library to TIA V13 SP2.

V 1.3.0.0

- **UPDATE** - Modified library to work without external datablock for memory movement(DINT,STRING), optimized performance and created TIA Global library.

V 1.3.1.0

- **UPDATE** - Modified library to work without external datablock for memory movement for REAL datatype.

V 1.3.2.0

- **UPDATE** - Length of bytes readed from SQL for one row was increased from 50 bytes to 300 bytes.

V 1.4.4.0

- **UPDATE** - Add variable interfaceID, which allows to set which interface will be used for MsSQL Library connection.
- **UPDATE** - Changed structure stQuery. Now you it possible to send query to database through asQuery : Array[0..9] of String.
- **UPDATE** - In/Out Variables xConnectSQL, xExecuteSQL, xDisconnectSQL reacts on Rising Edge of this signal.
- **BUG** - dwError and sError will show error after unsuccesfull Connection.

V 1.4.11.0

- **UPDATE** - Add variables DONE, BUSY, ERROR.
- **UPDATE** - Add function fcGetDATETIME.
- **BUG** - sError show message in correct step call.
- **UPDATE** - Library for S7-1200 temporarily disabled.

V 1.4.12.0

- **BUG** - Wrongly interpreted new row Token.
- **BUG** - Wrongly readed token about finished procedure inside of readed data.
- **UPDATE** - Added sVersion on output.
- **UPDATE** - Library for S7-1200 is now enabled but without demo, due missing system function in S7-1200.

V 1.5.0.0

- **UPDATE** - Refactoring of whole library, delete unused variables and improve performance.

V 1.5.1.0

- **UPDATE** - Library disconnects from SQL when connection is lost.
- **UPDATE** - Convert function for DINT, REAL was updated for S7-1200 to show error 16#07 when it's 8 byte variable which PLC cannot handle.
- **UPDATE** - Convert function for STRING is updated to shorten string, if it's longer than 255 bytes.

V 1.5.2.0

- **UPDATE** - Library has now implemented skiping tokens TABNAME and COLINFO. This feature is neccesary for some advanced stored procedures.

V 1.5.3.0

- **UPDATE** - Added skiping not-implemented TOKENS (RETURN_STATUS, DONEPROC, DONEINPROC) from SQL Server.