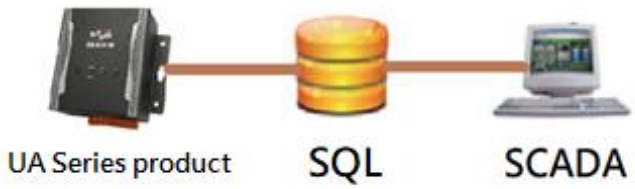
How to save the UA collected data into SQL and then show trend chart in InduSoft? (Take MS SQL 2017 Express as an example)

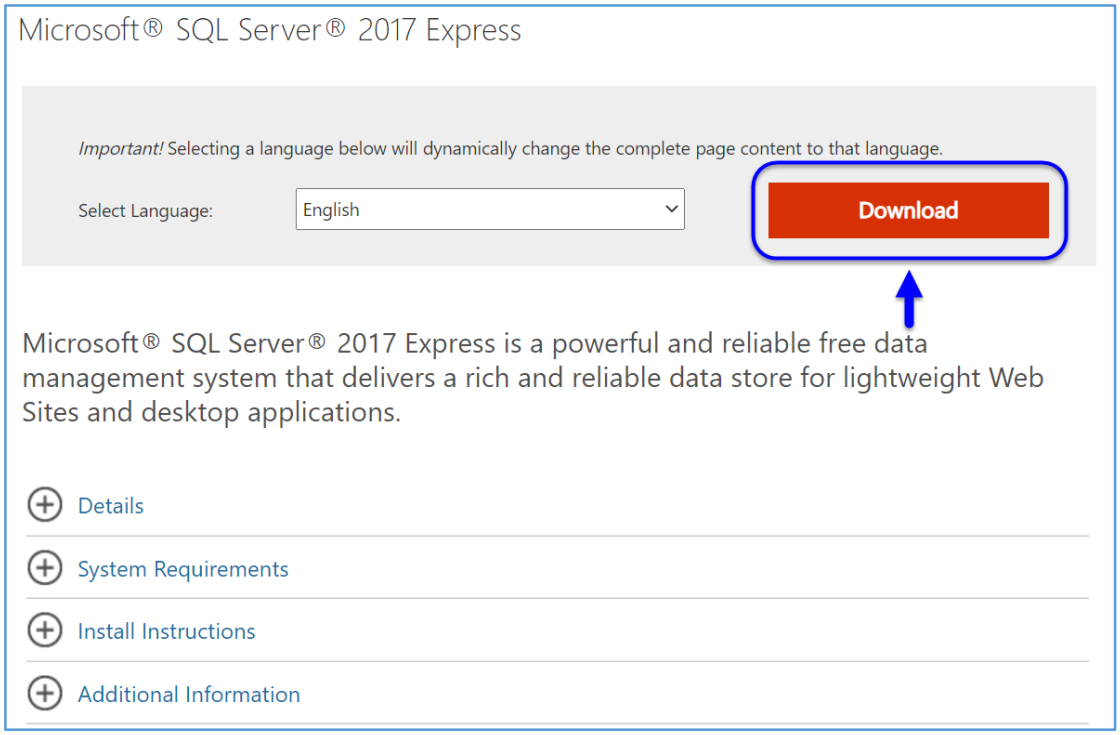
UA series products of ICP DAS provide a useful service to transfer TCP/RTU data to SQL. SQL is to store device data, and then by using InduSoft can retrieve the data to manage the database easily.
Due to the time format written by UA is different from the reading format of InduSoft, here is how InduSoft read data.

(In this example, we use UA-5231M-4GE + Windows 10 OS + MS SQL 2017 Express Database + DL-302 with Modbus RTU protocol)



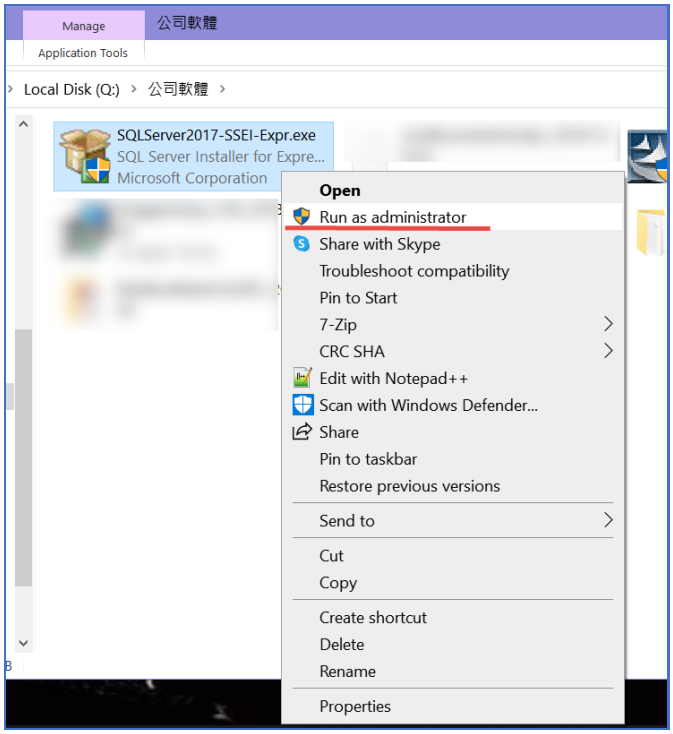
- **How to create MS SQL environment?**

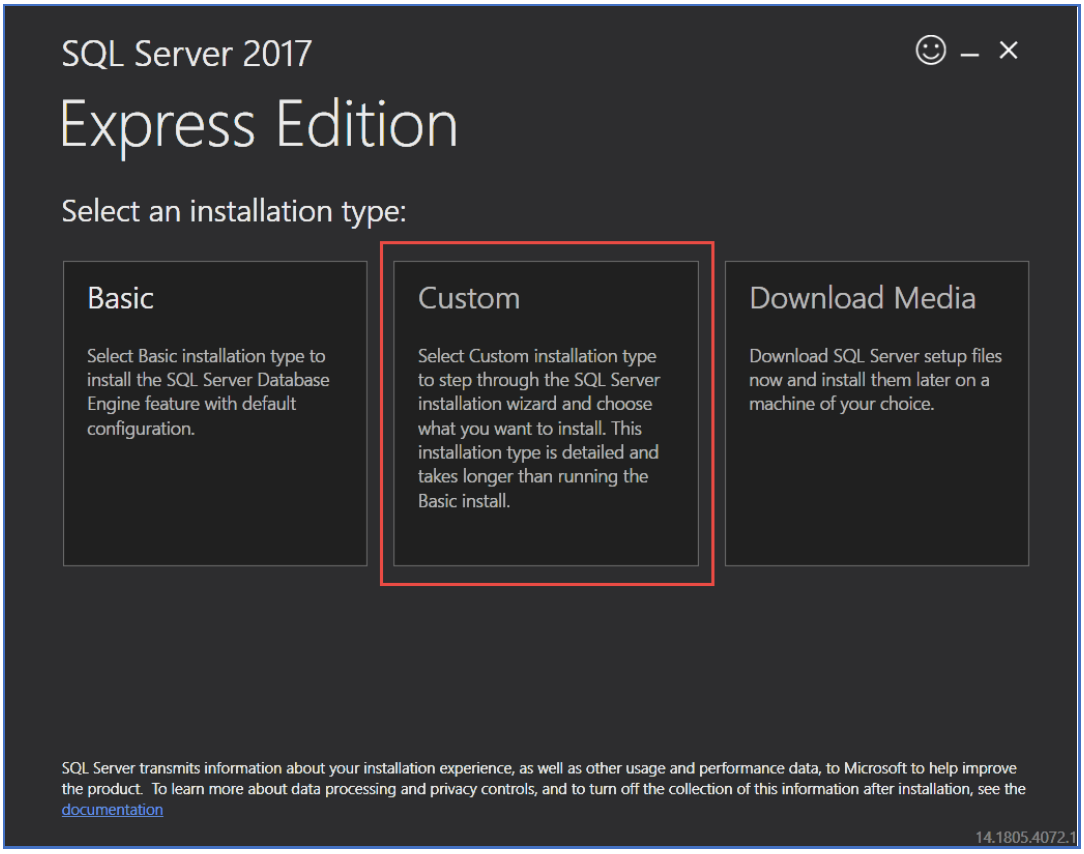
Go to Microsoft Official Website: https://www.microsoft.com/en-US/download/details.aspx?id=55994 to download SQL Server 2017 Express.



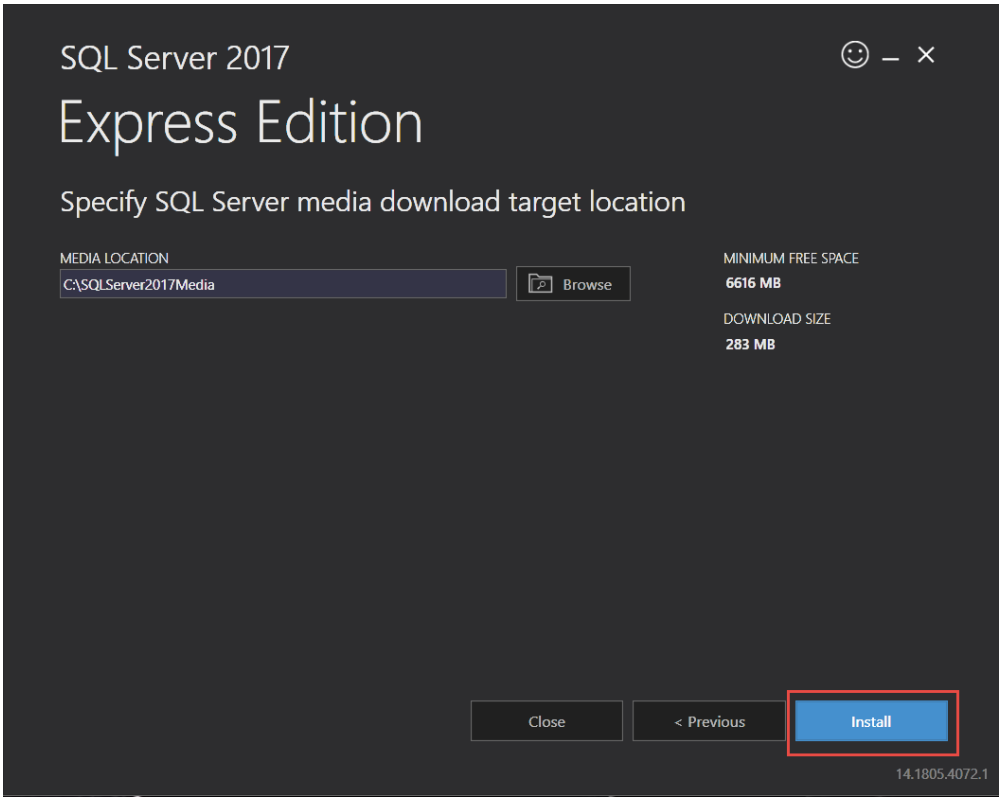
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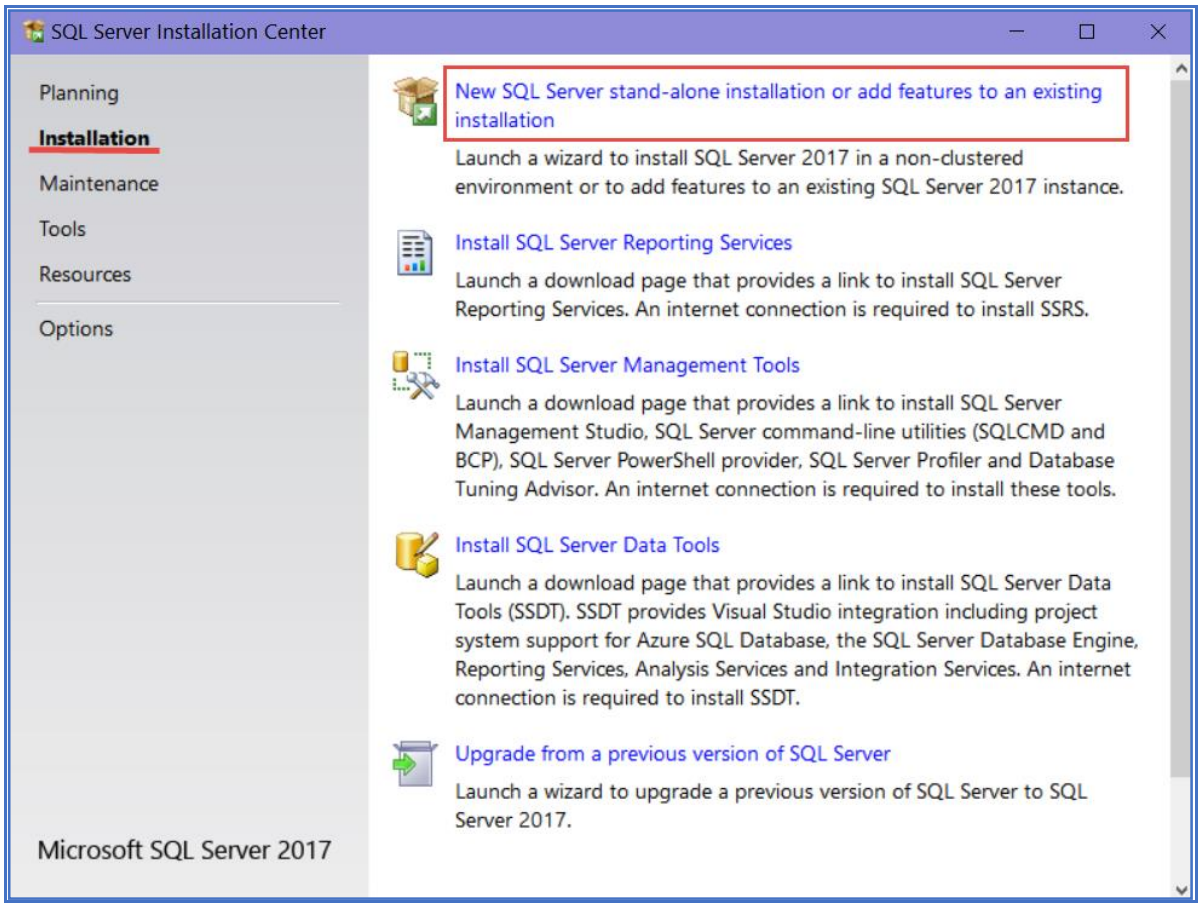
- **Install "SQLServer2017-SSEI-Expr"**



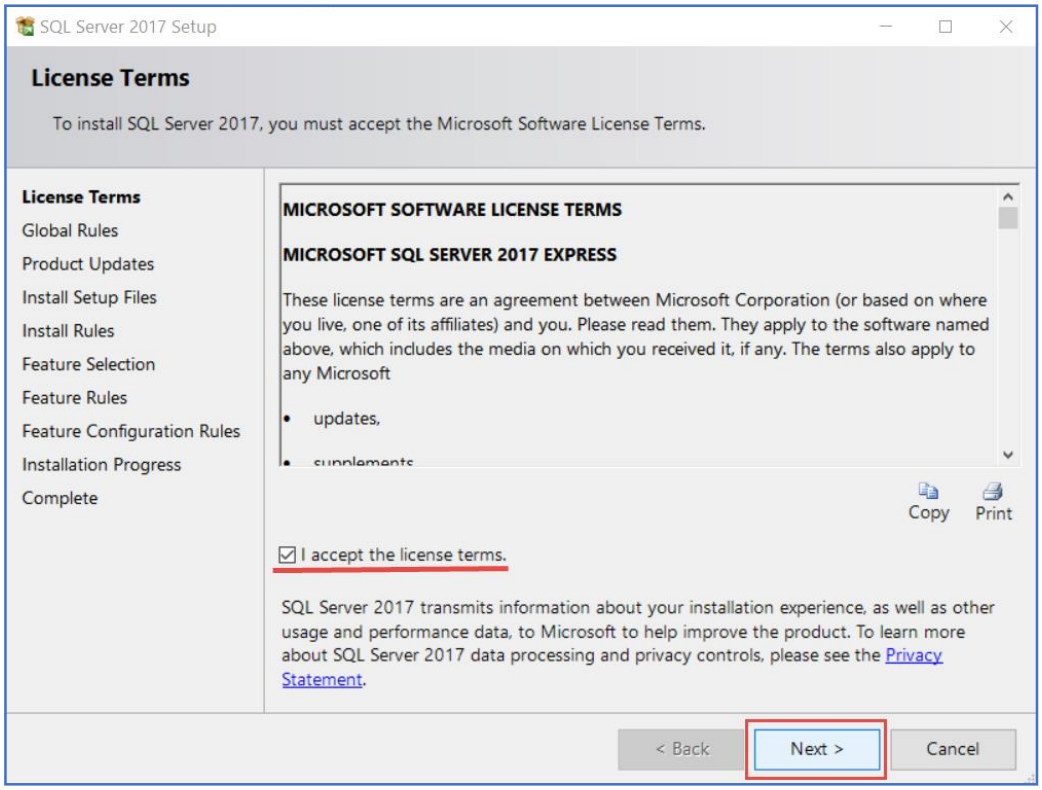


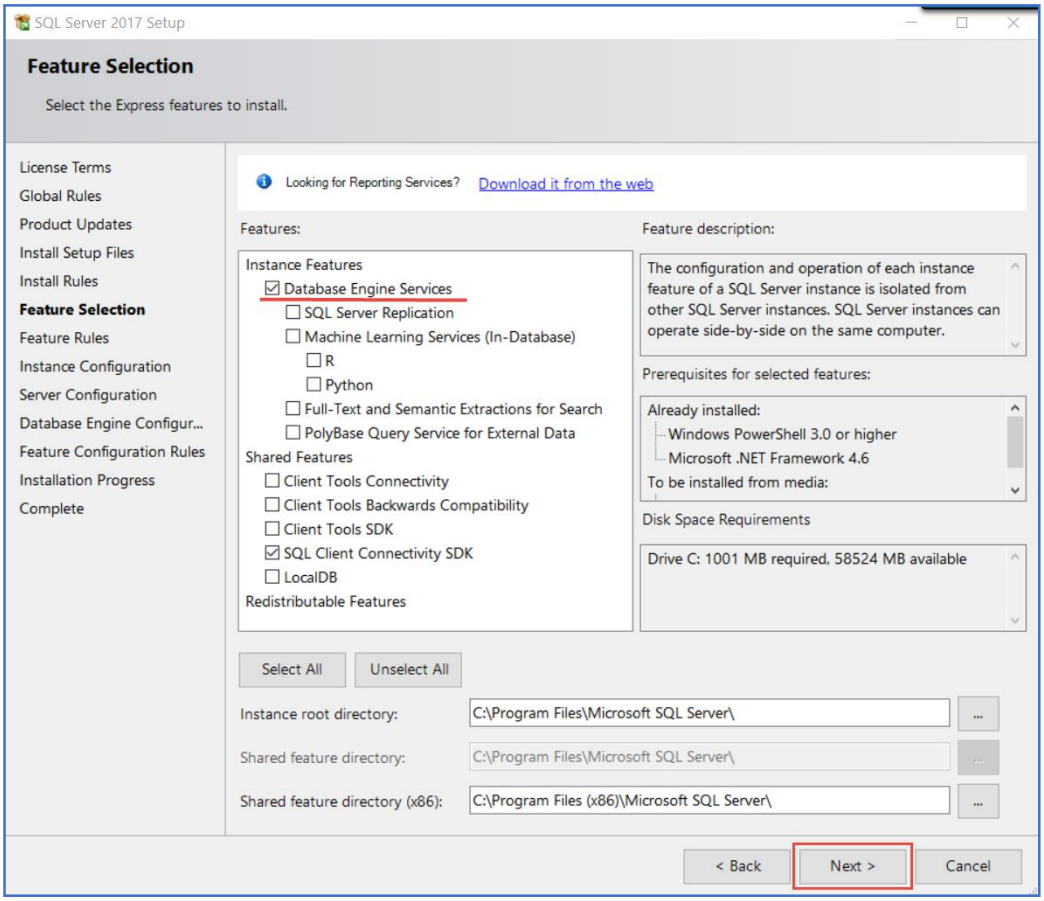
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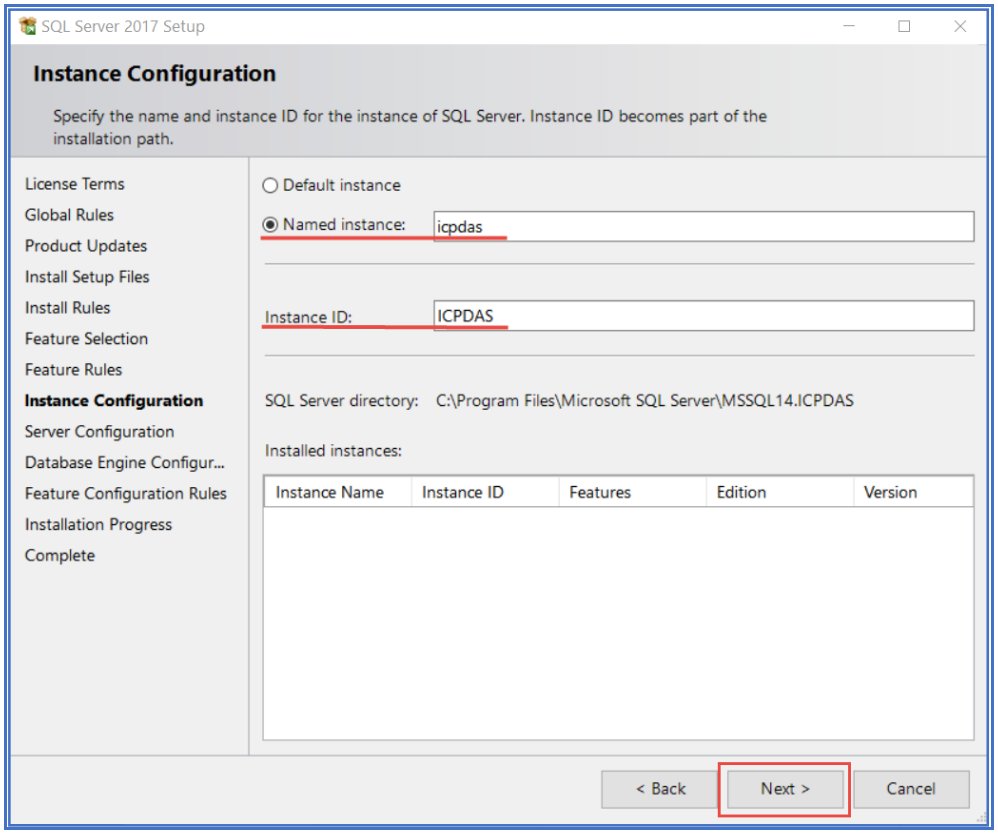
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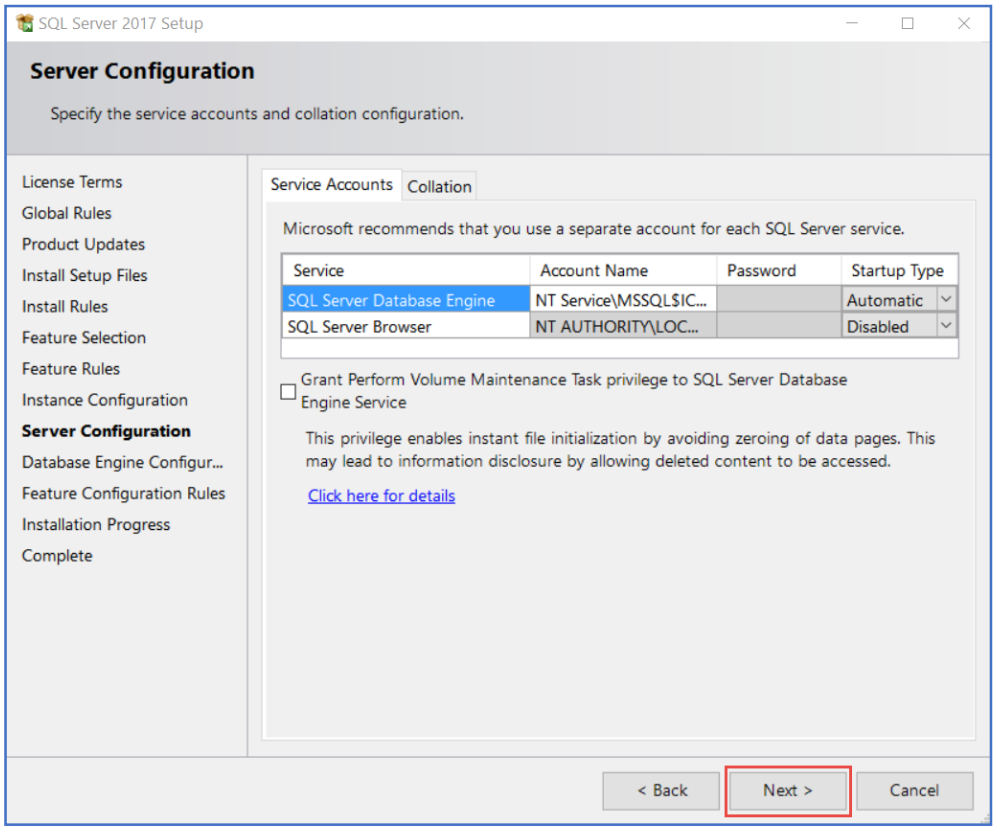




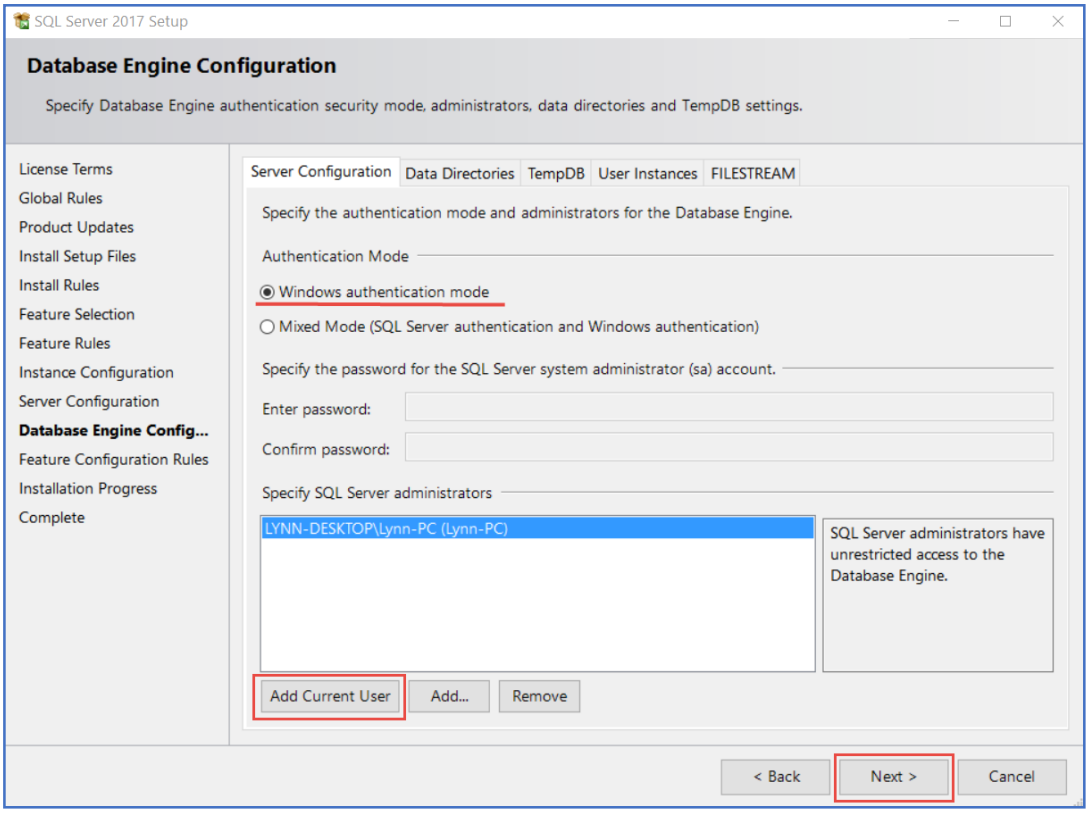
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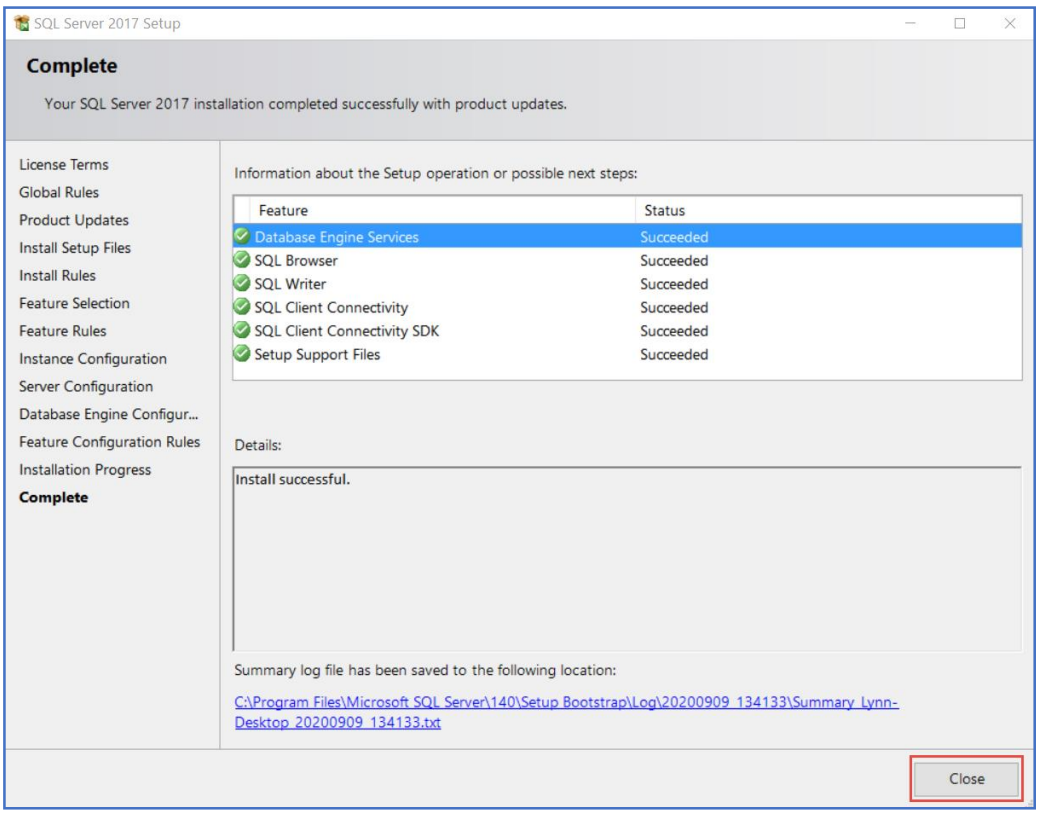
※Red Line must be filled!





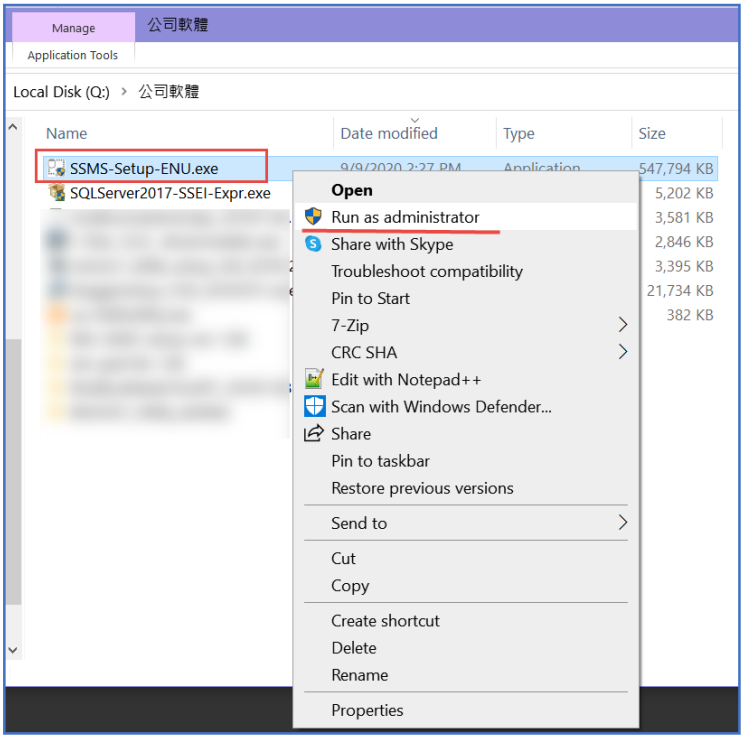
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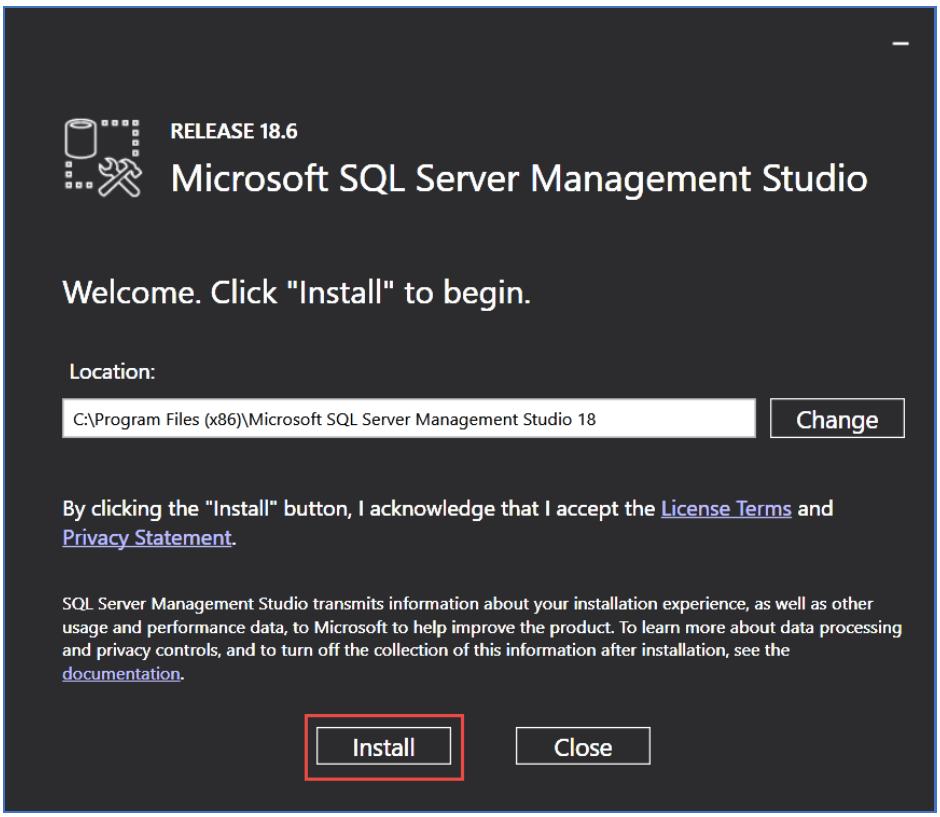




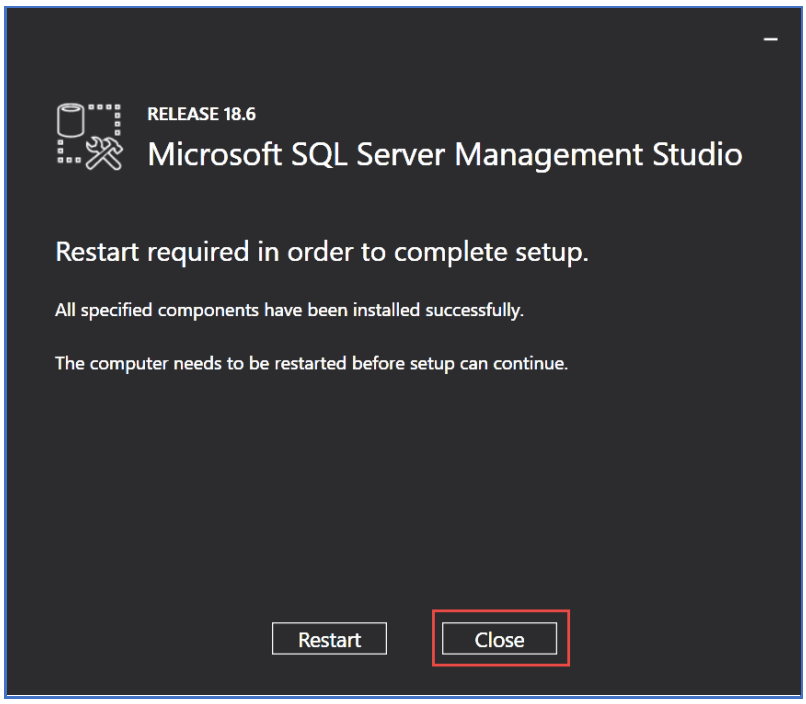
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- **Download from Microsoft Website:** https://docs.microsoft.com/en-us/sql/ssms/download-sql-server-management-studio-ssms?redirectedfrom=MSDN&view=sql-server-ver15
- **Install "SSMS-Setup-ENU"**





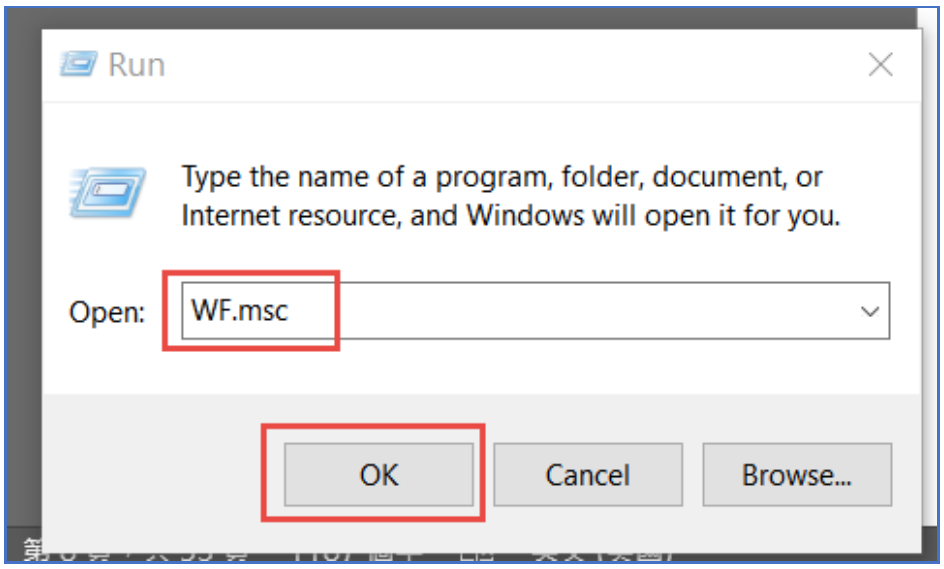
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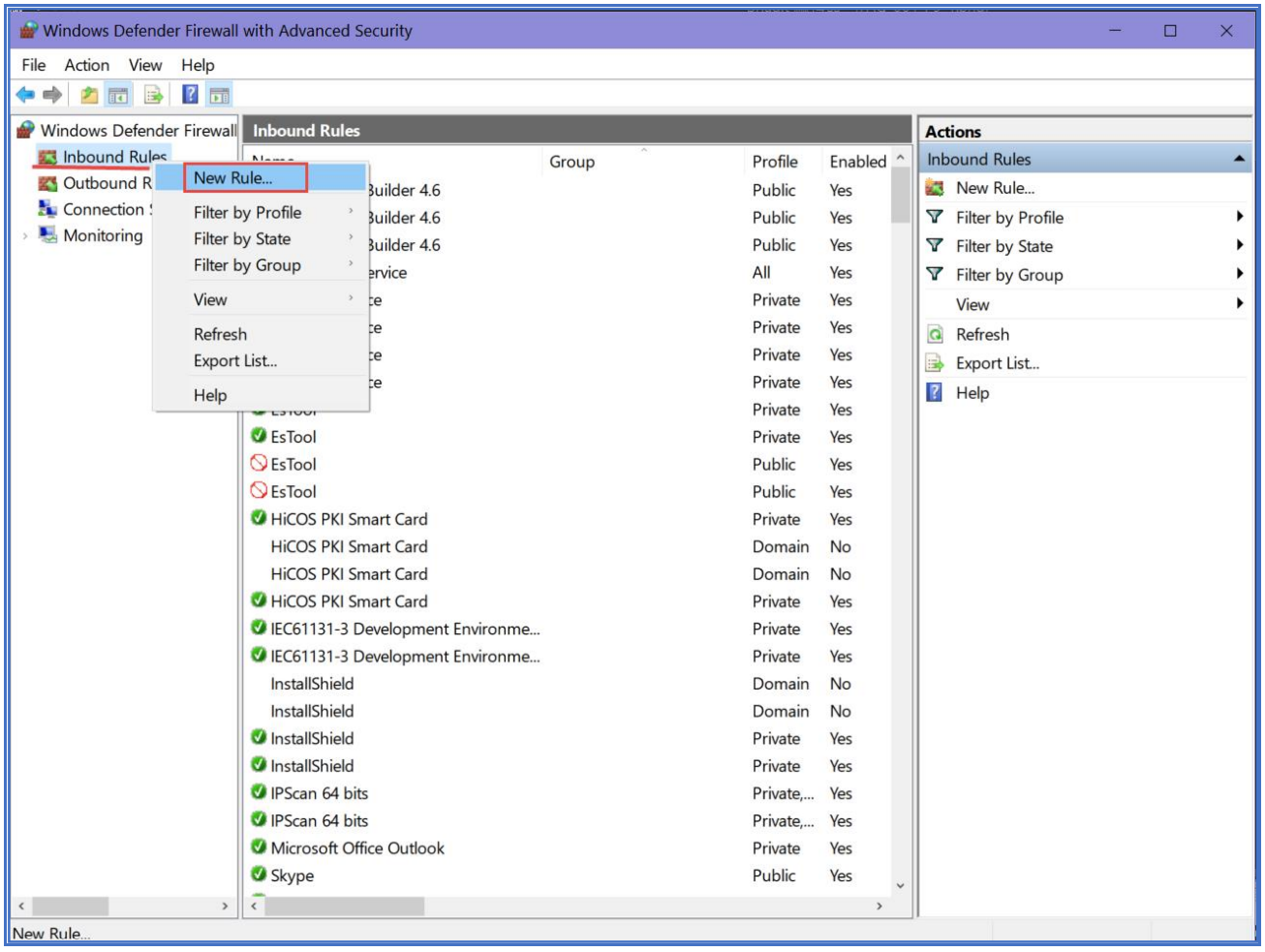


- **After restarting the PC, we can go following steps to <u>Environment Settings 1</u>**

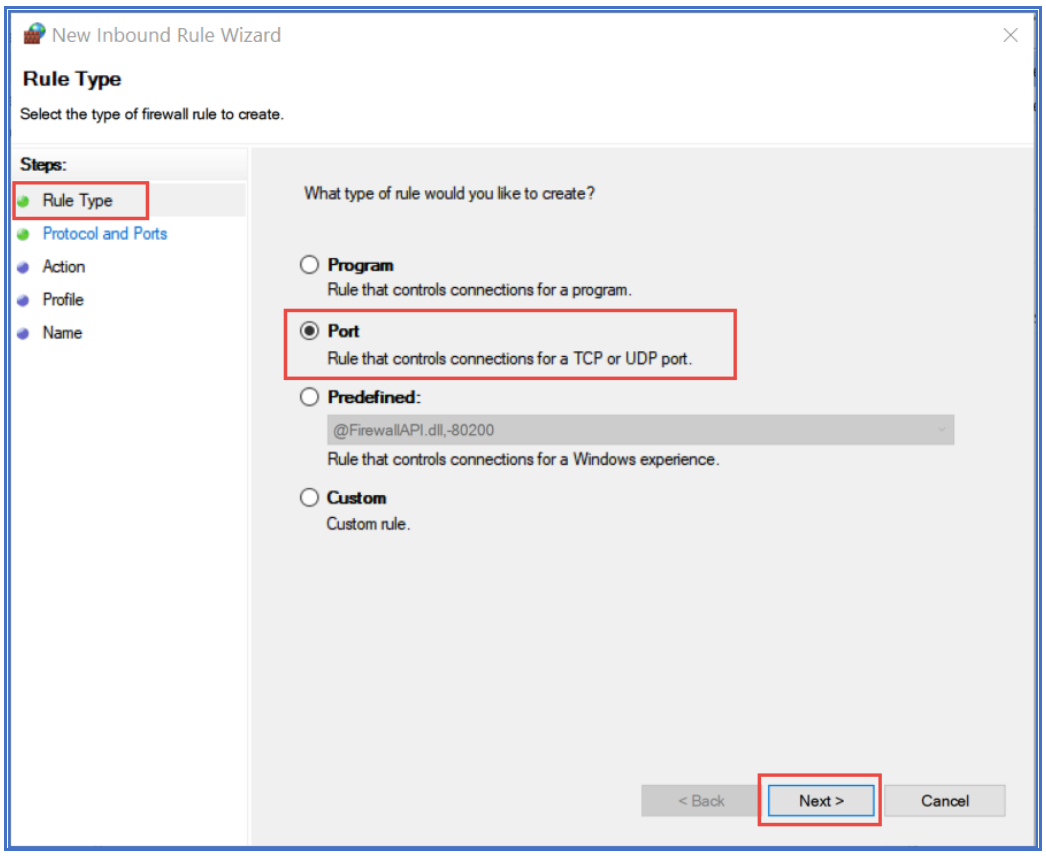


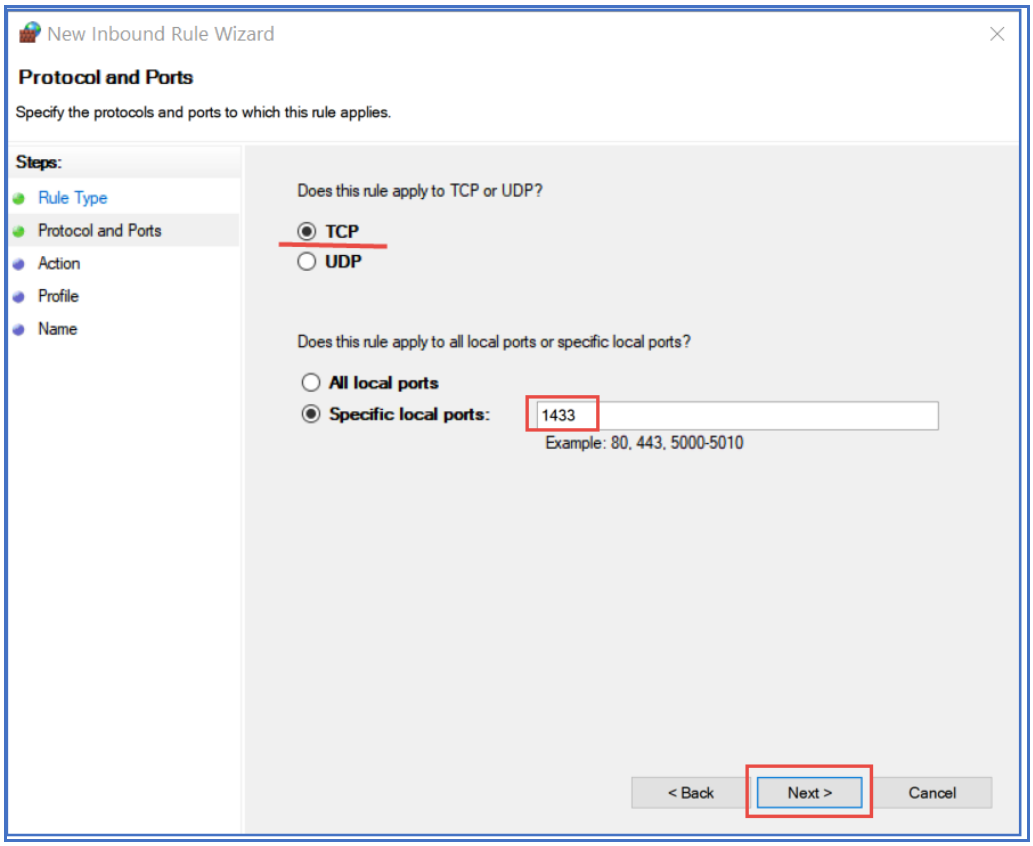
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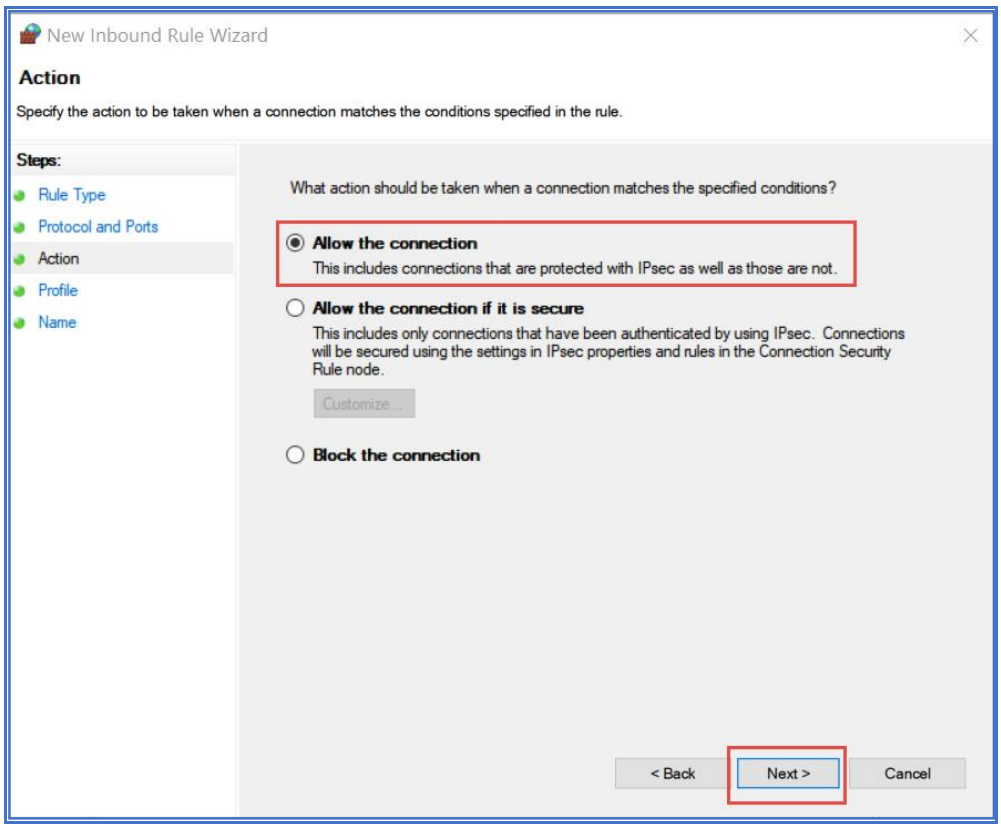


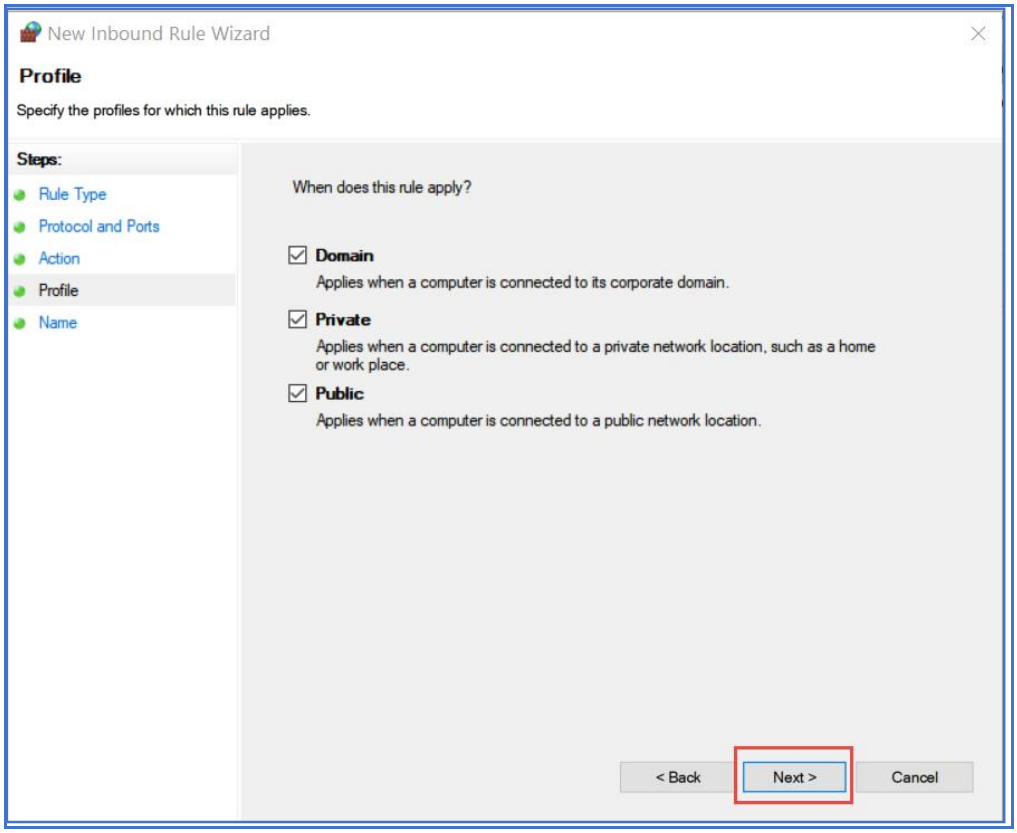
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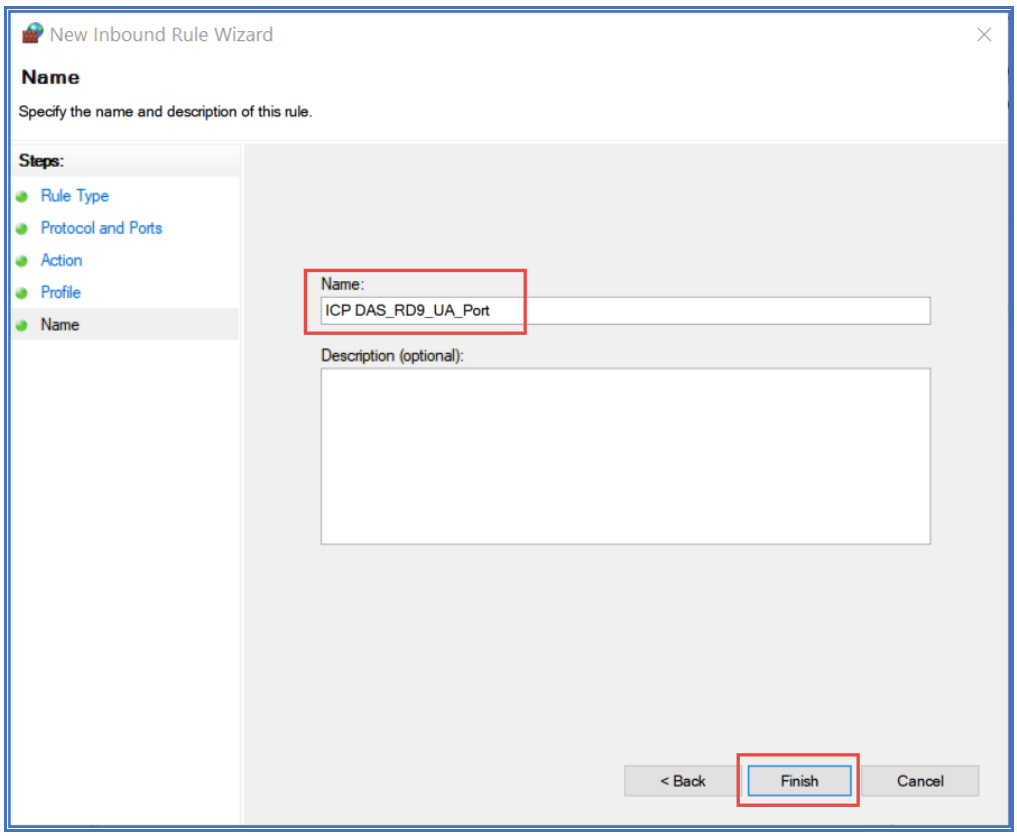


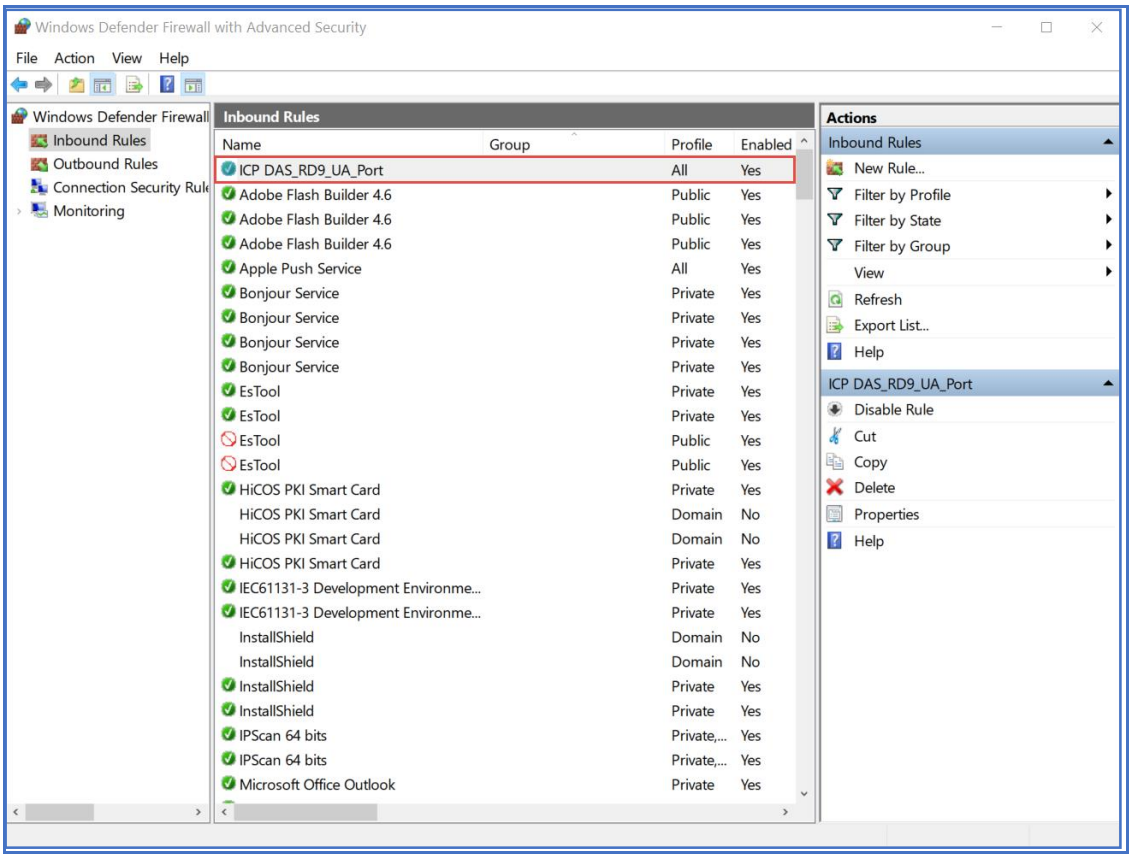
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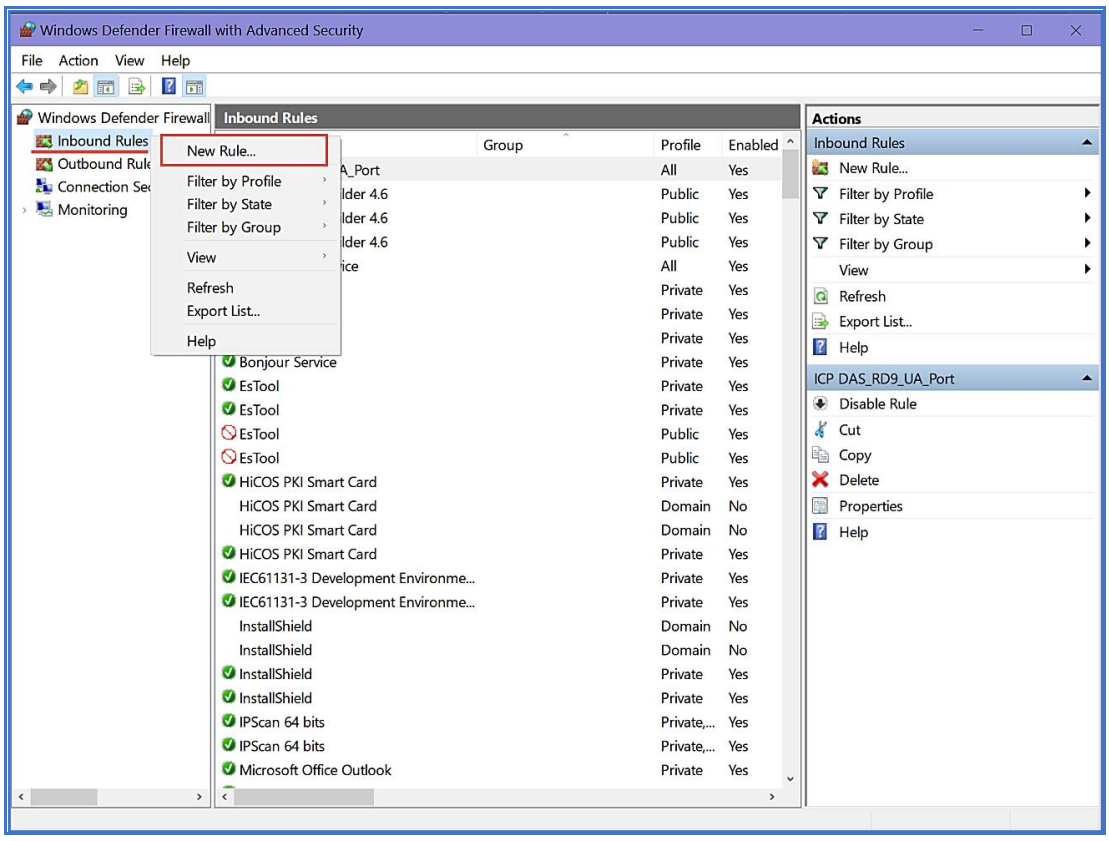


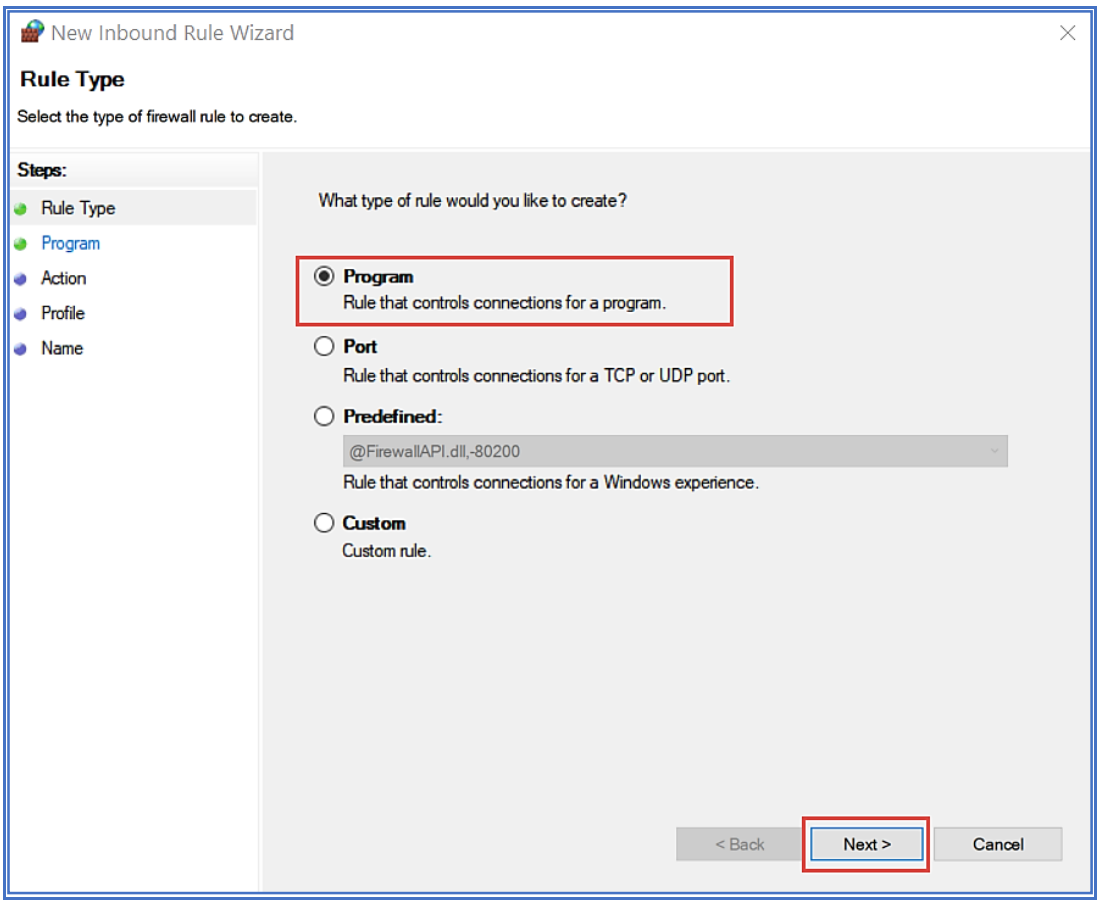
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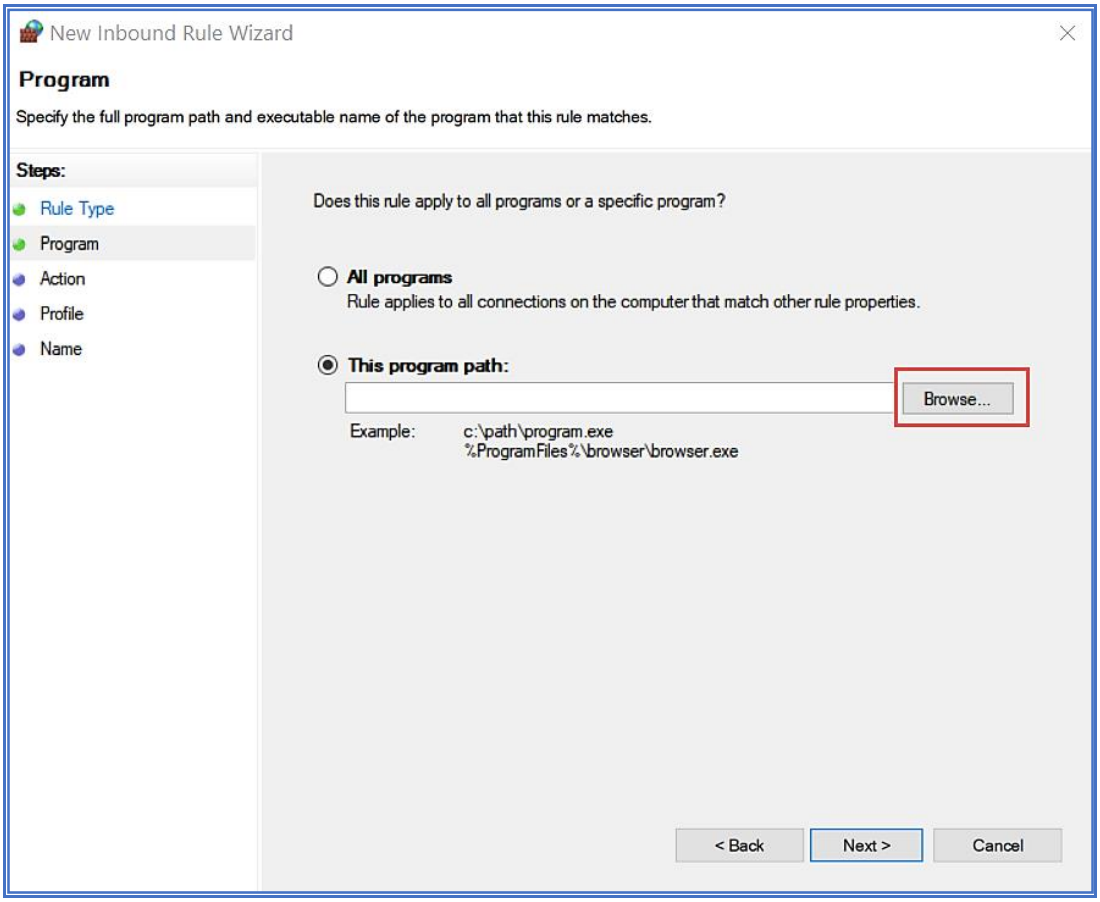


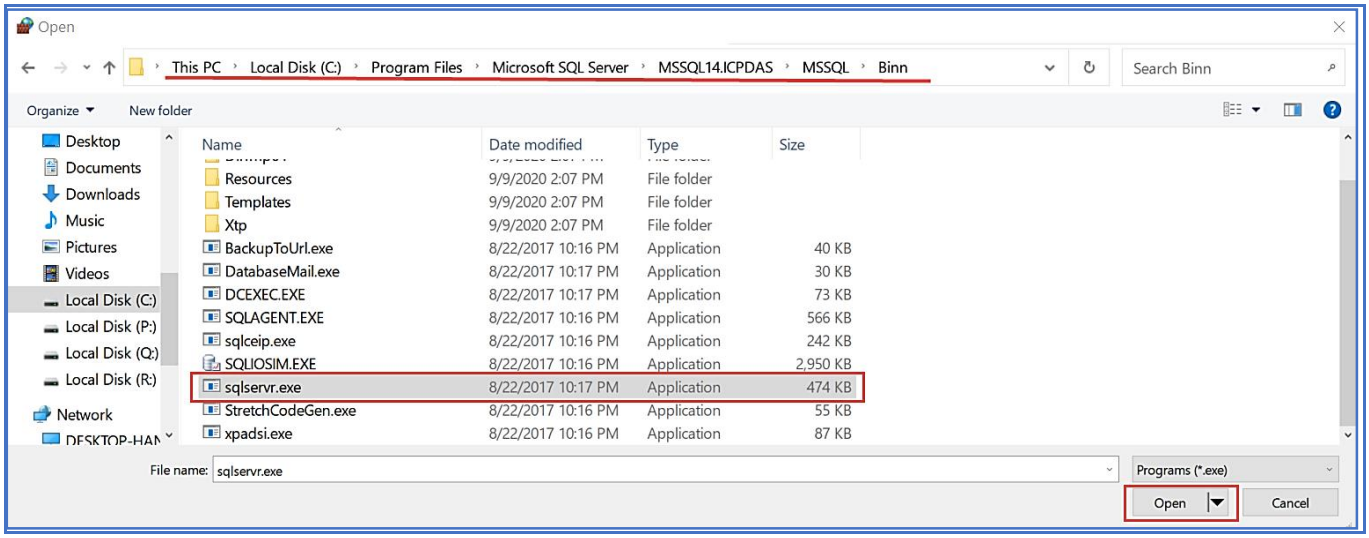
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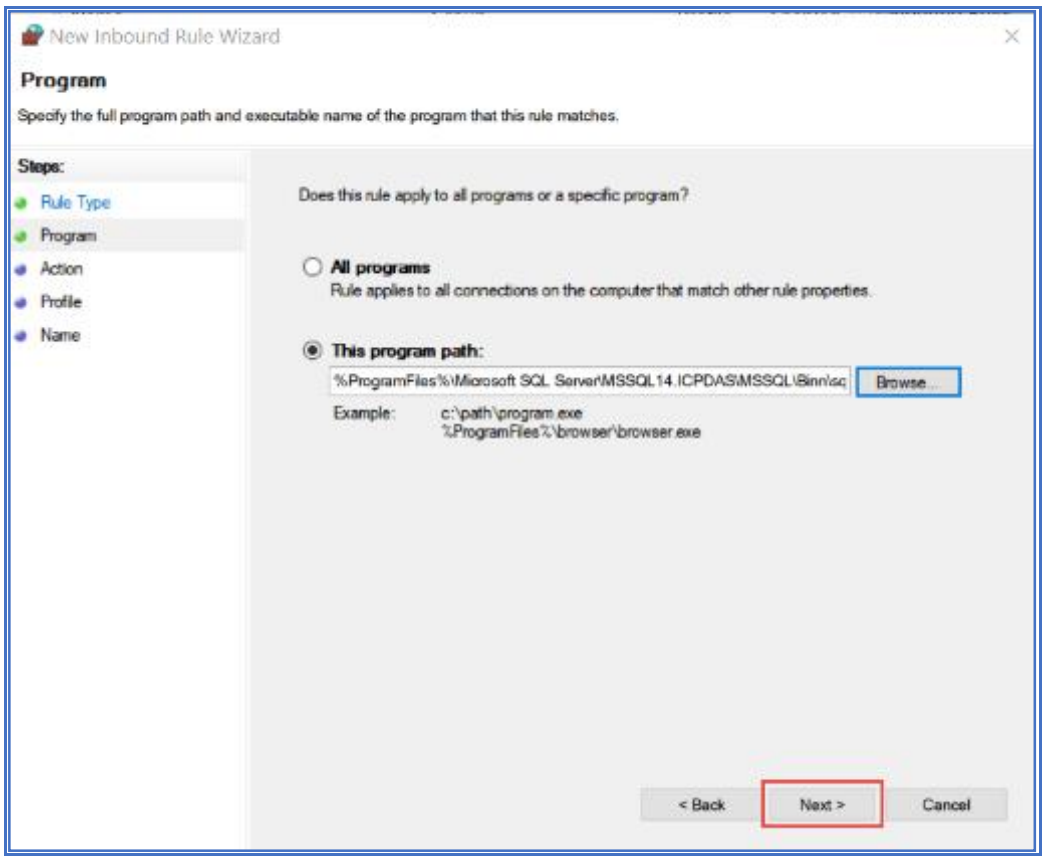


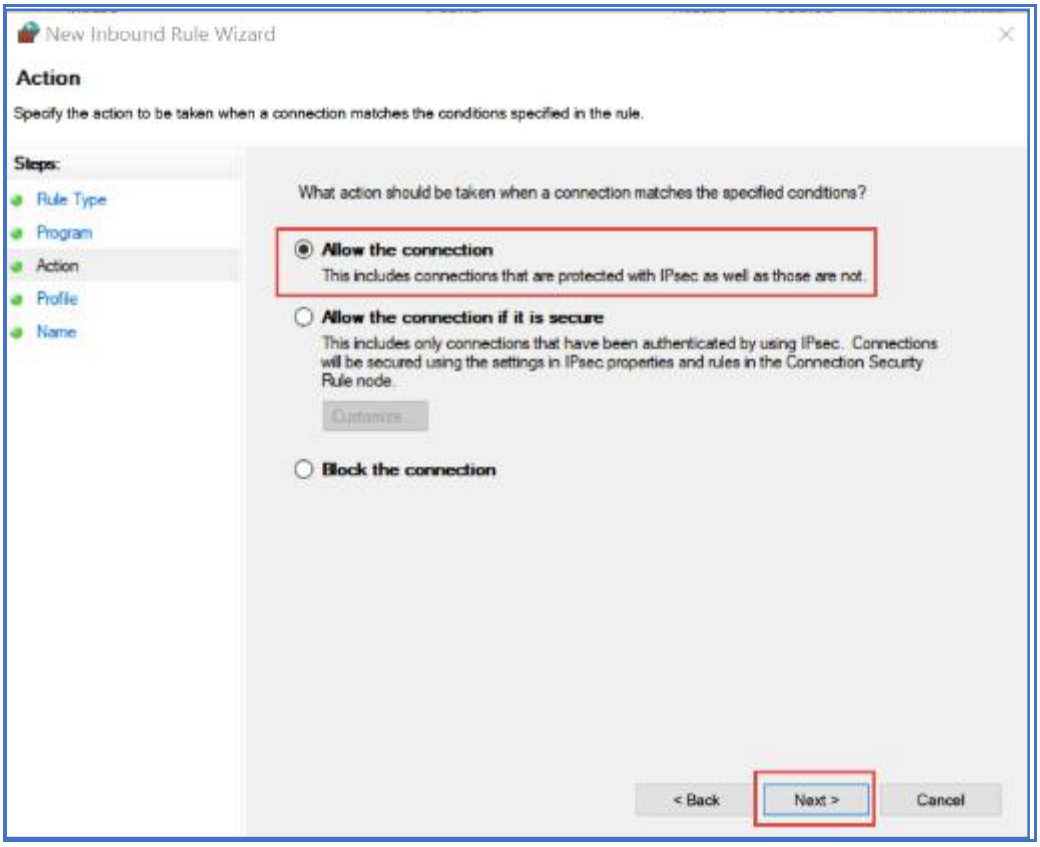
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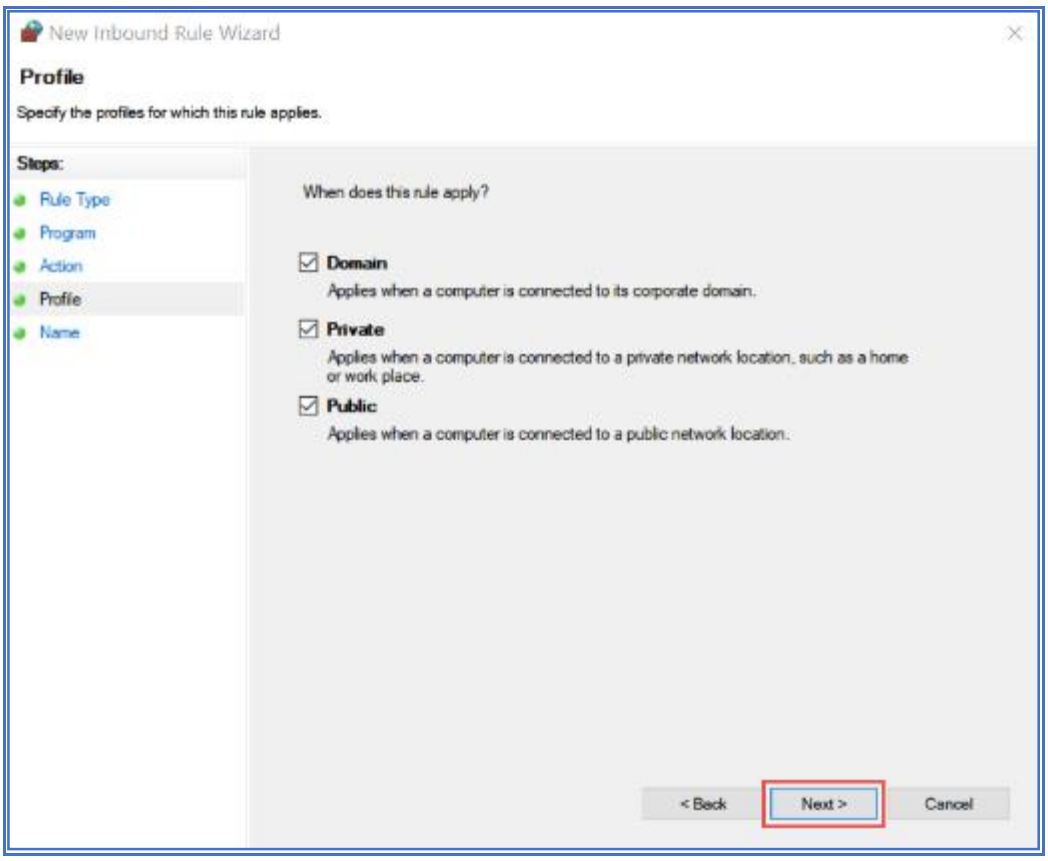


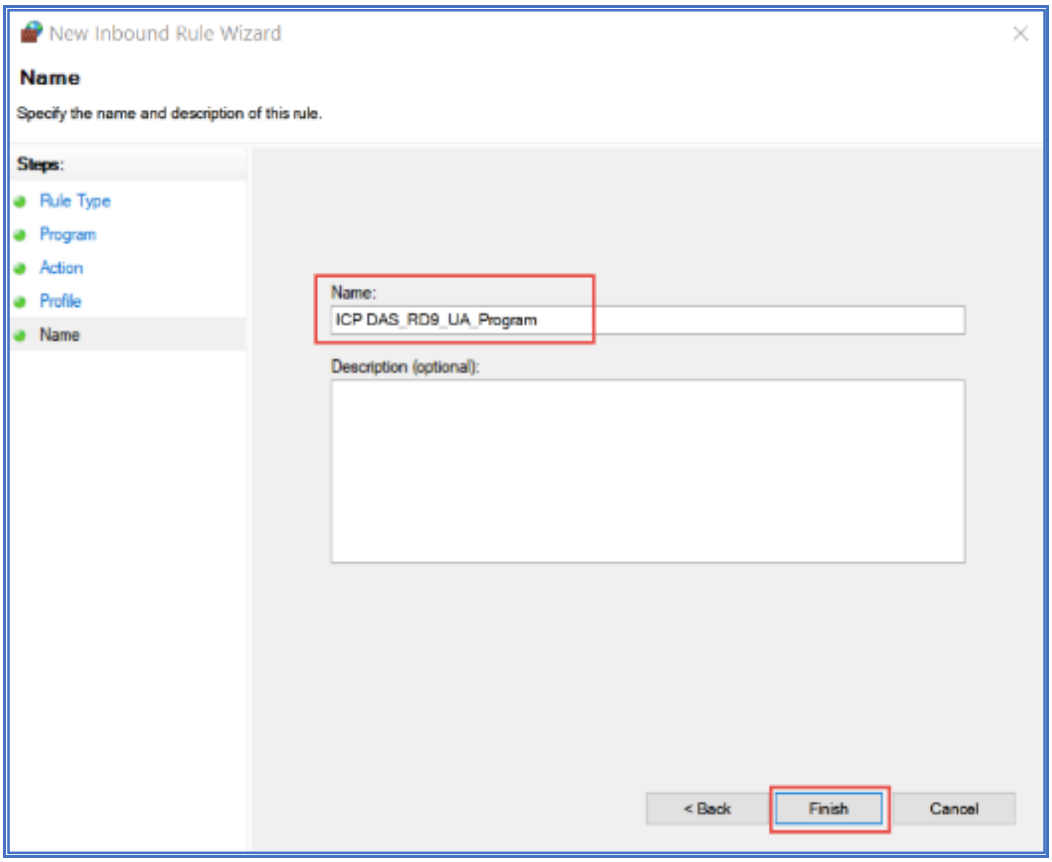
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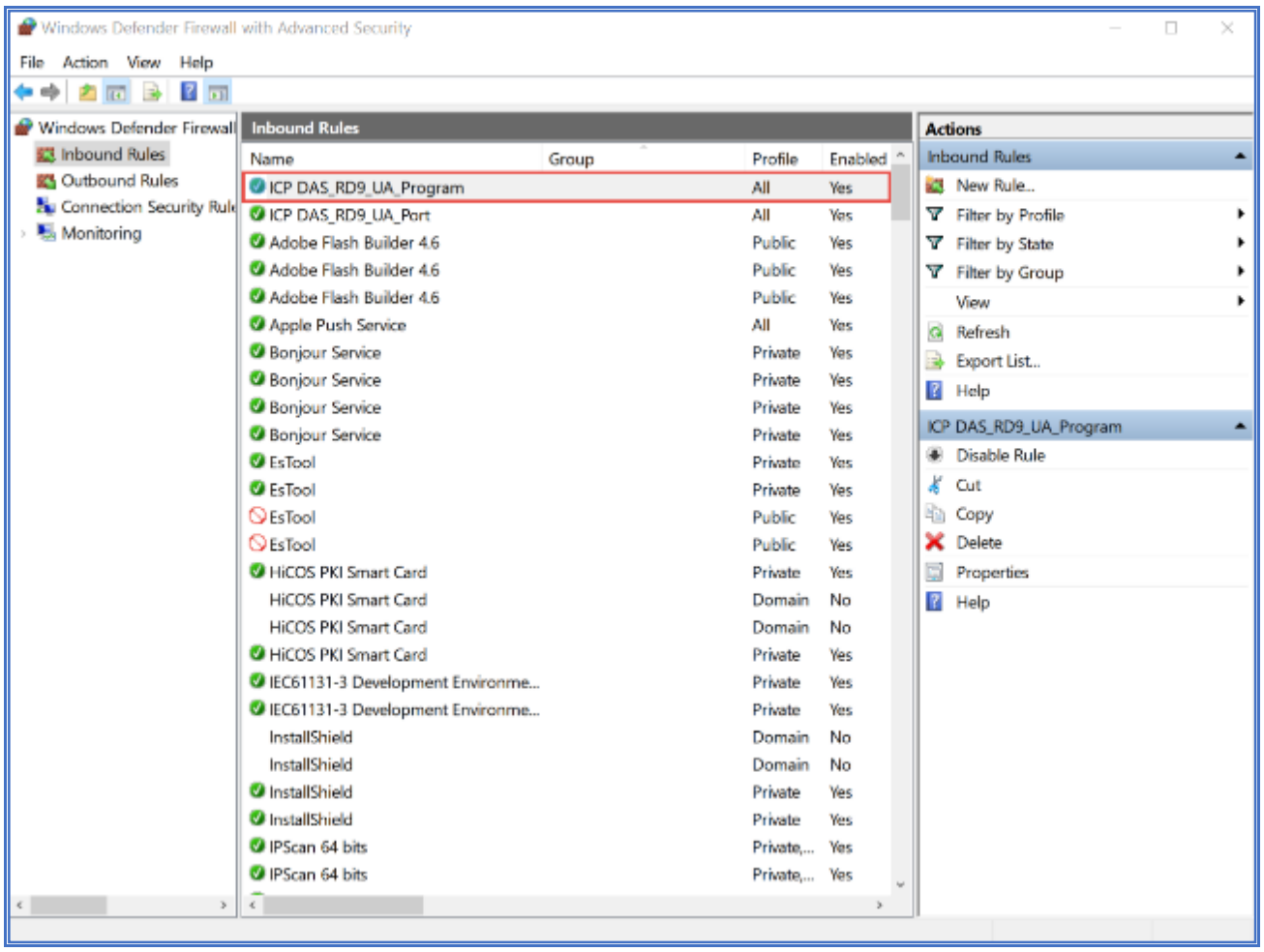


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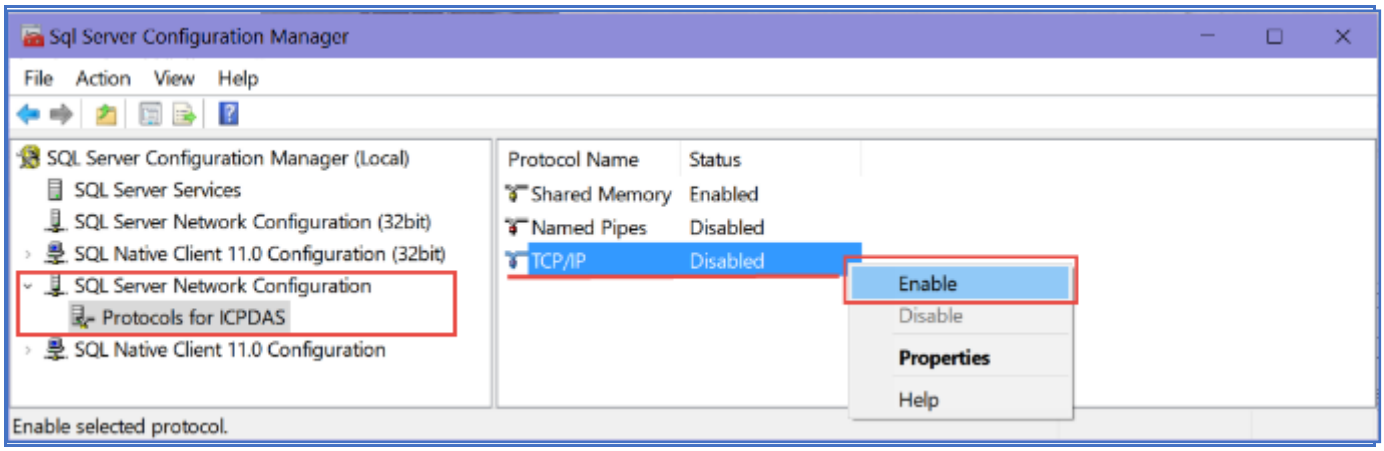


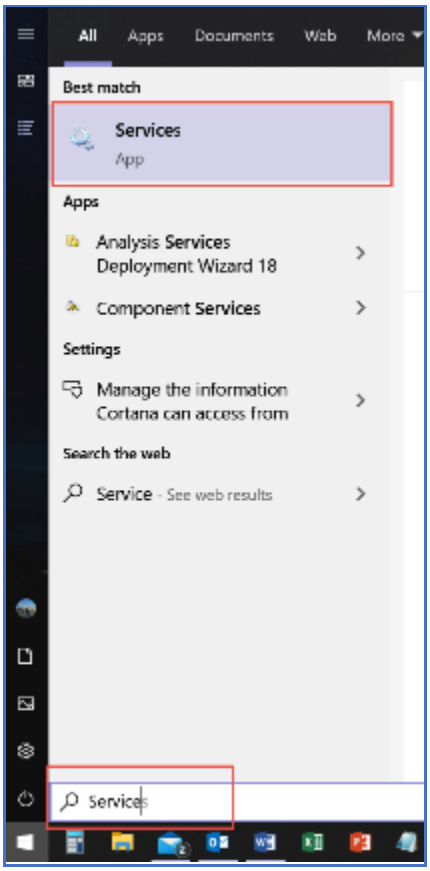
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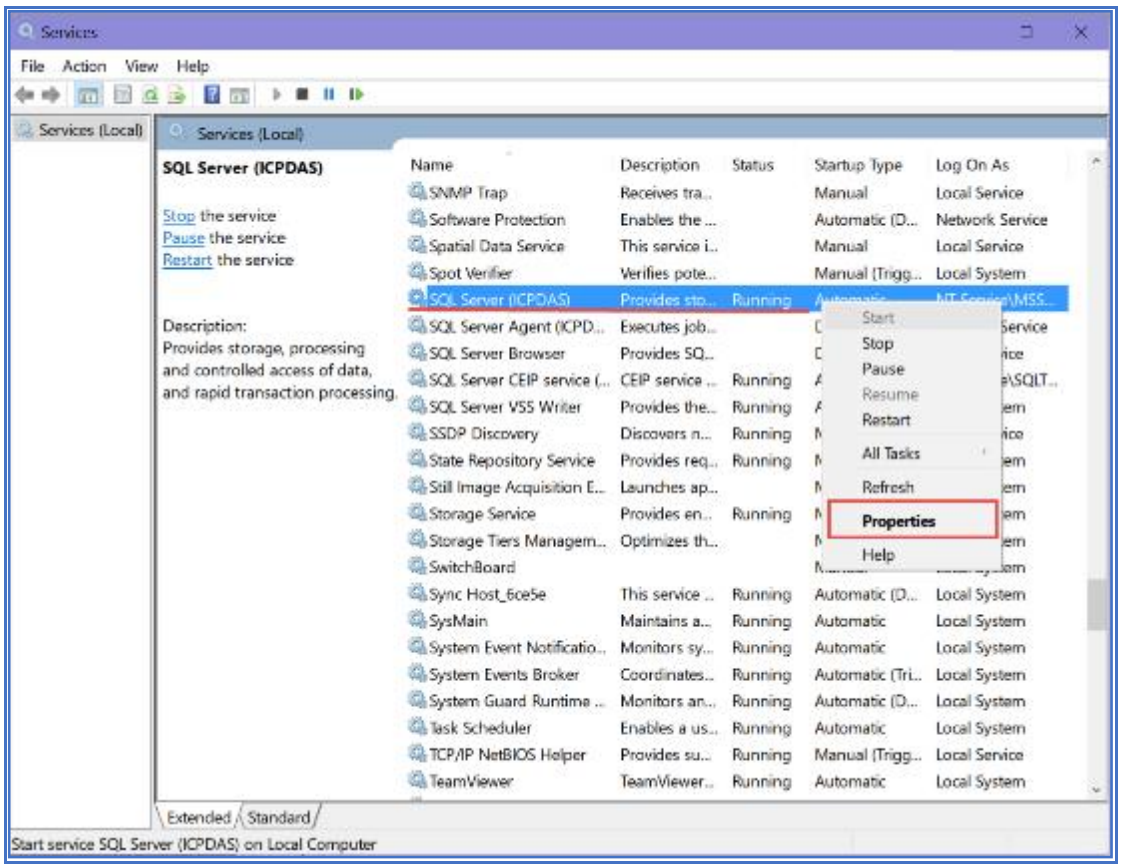
- **Go following steps to <u>Environment Settings 2</u>**

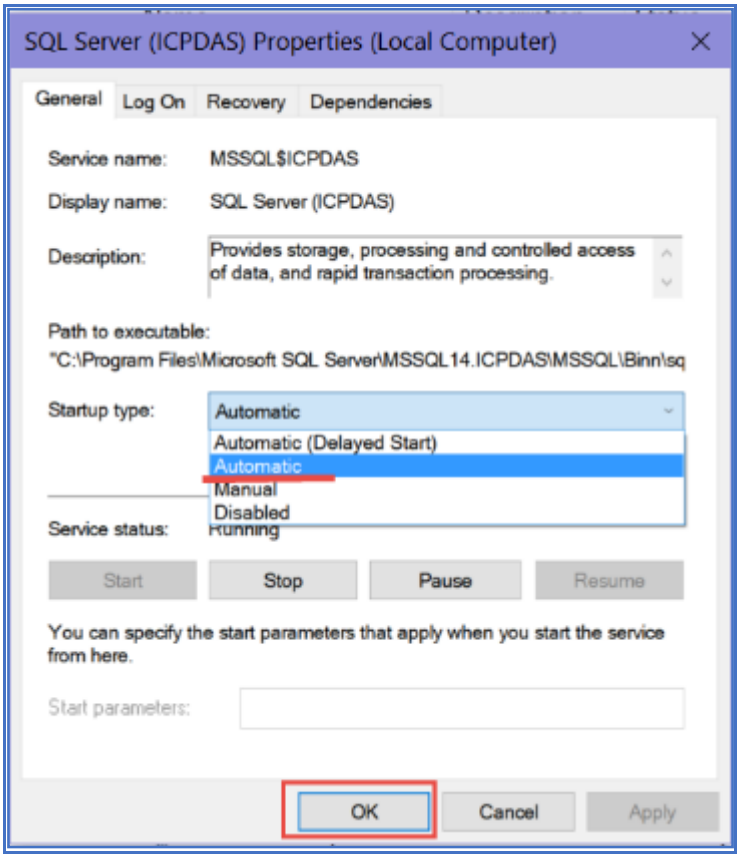




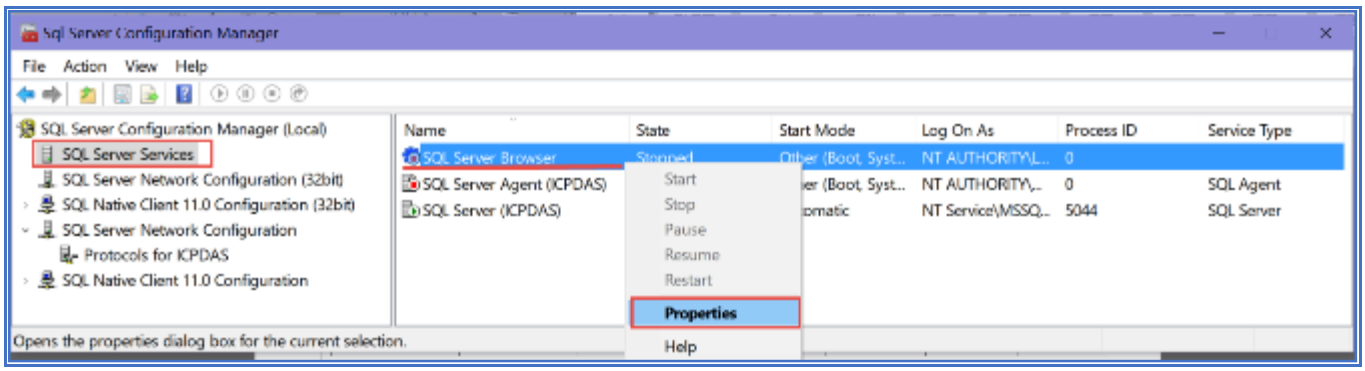


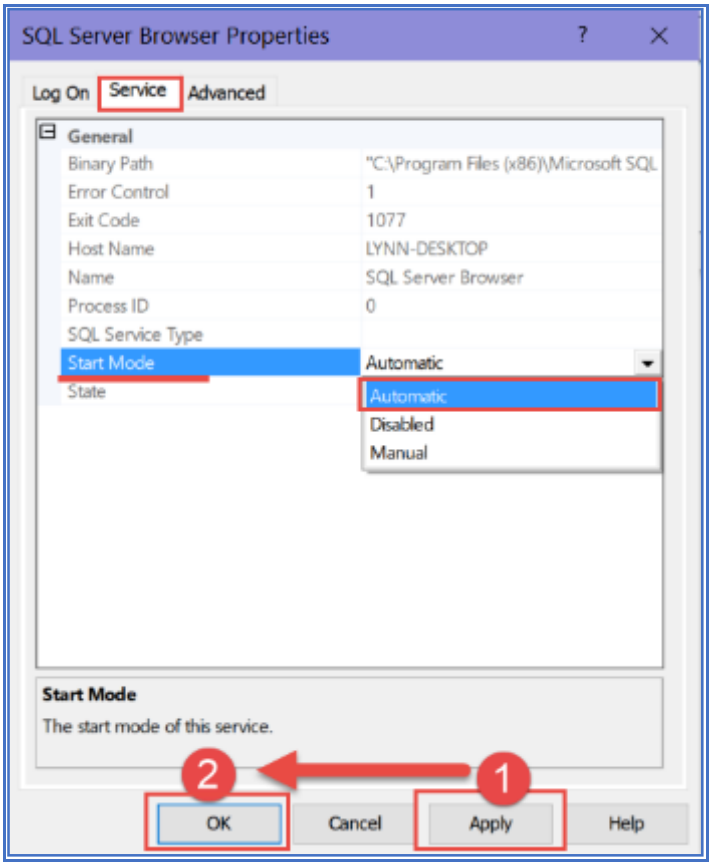
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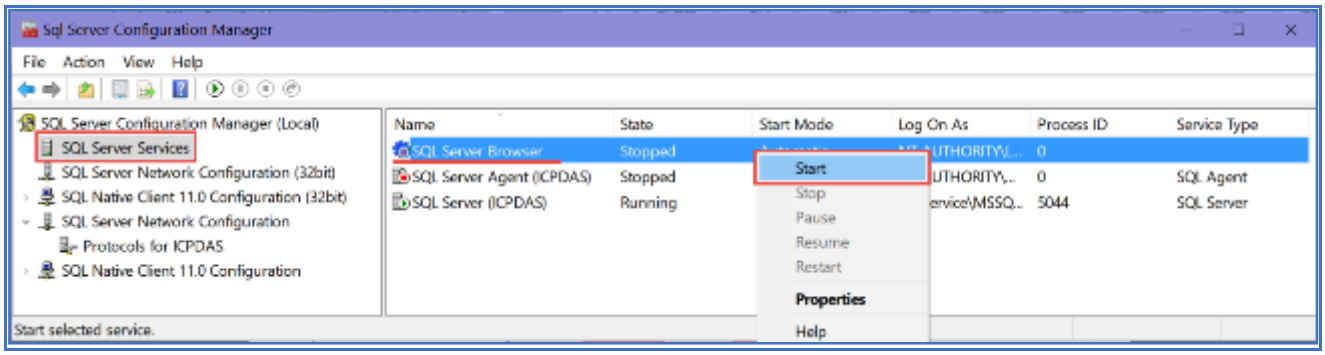




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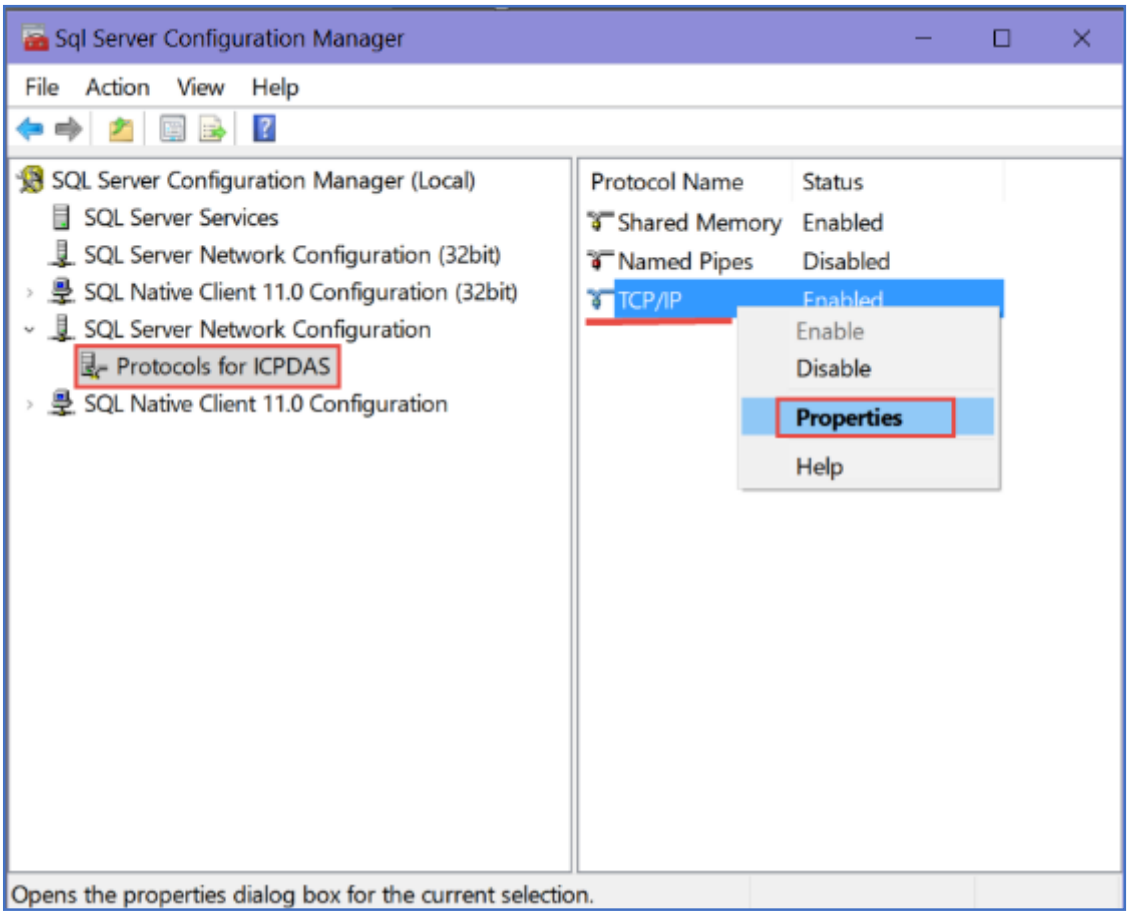


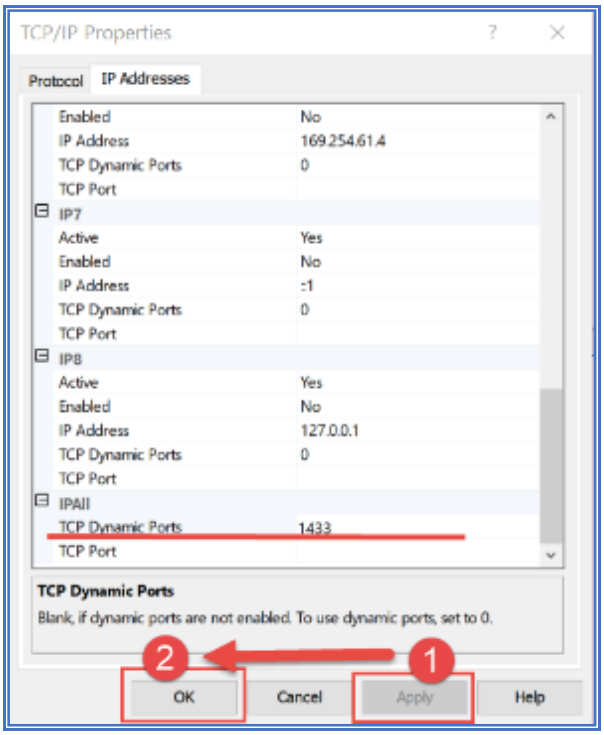


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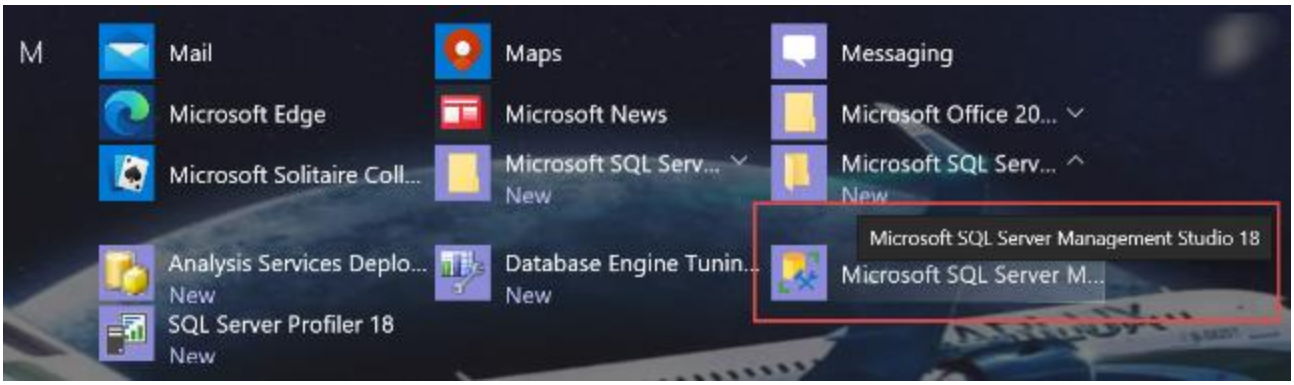
- **Communication Port Settings**

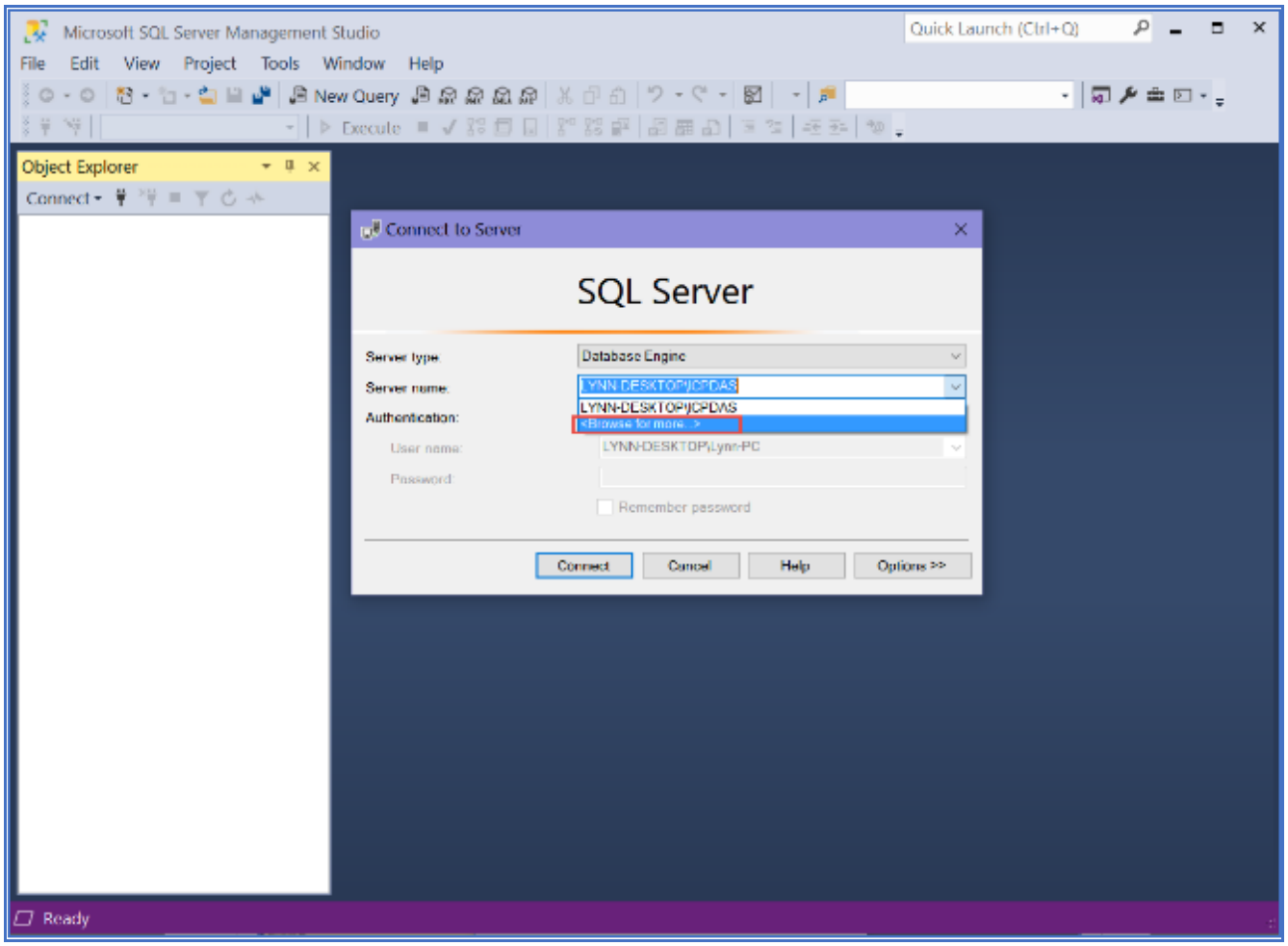




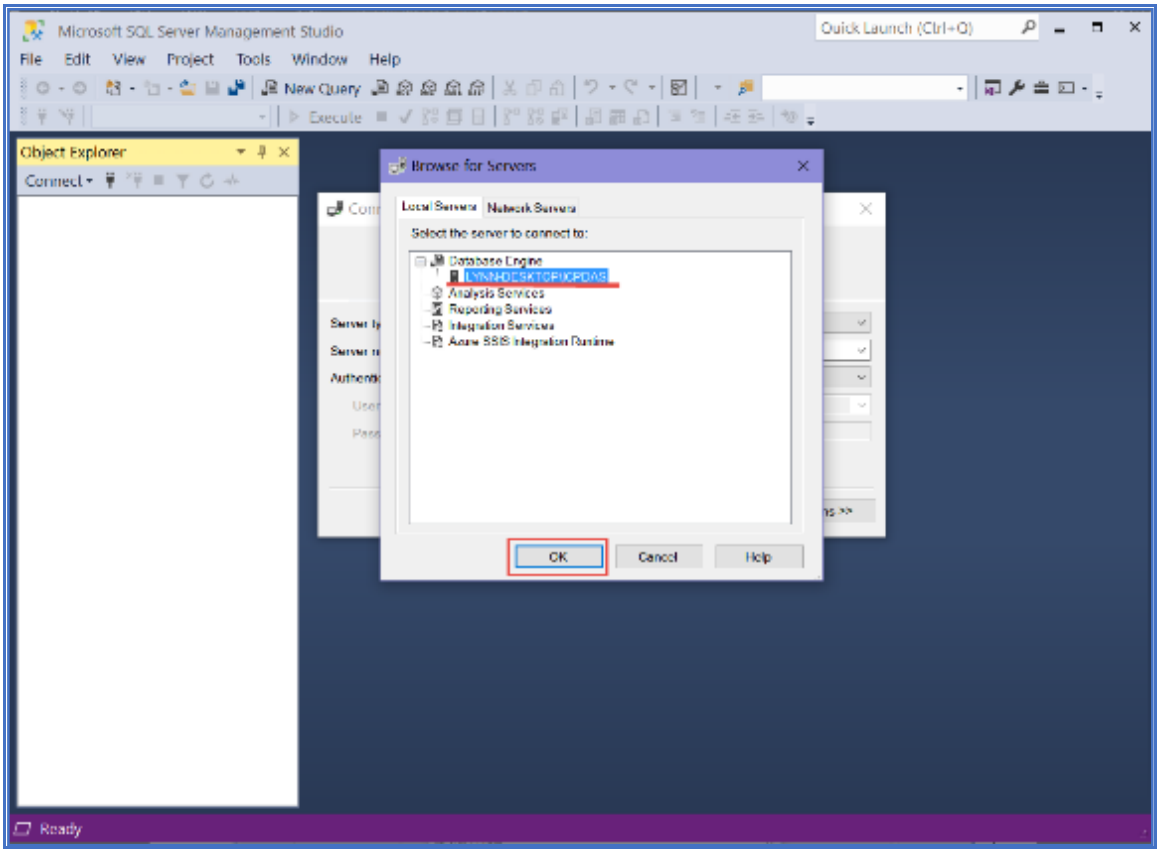
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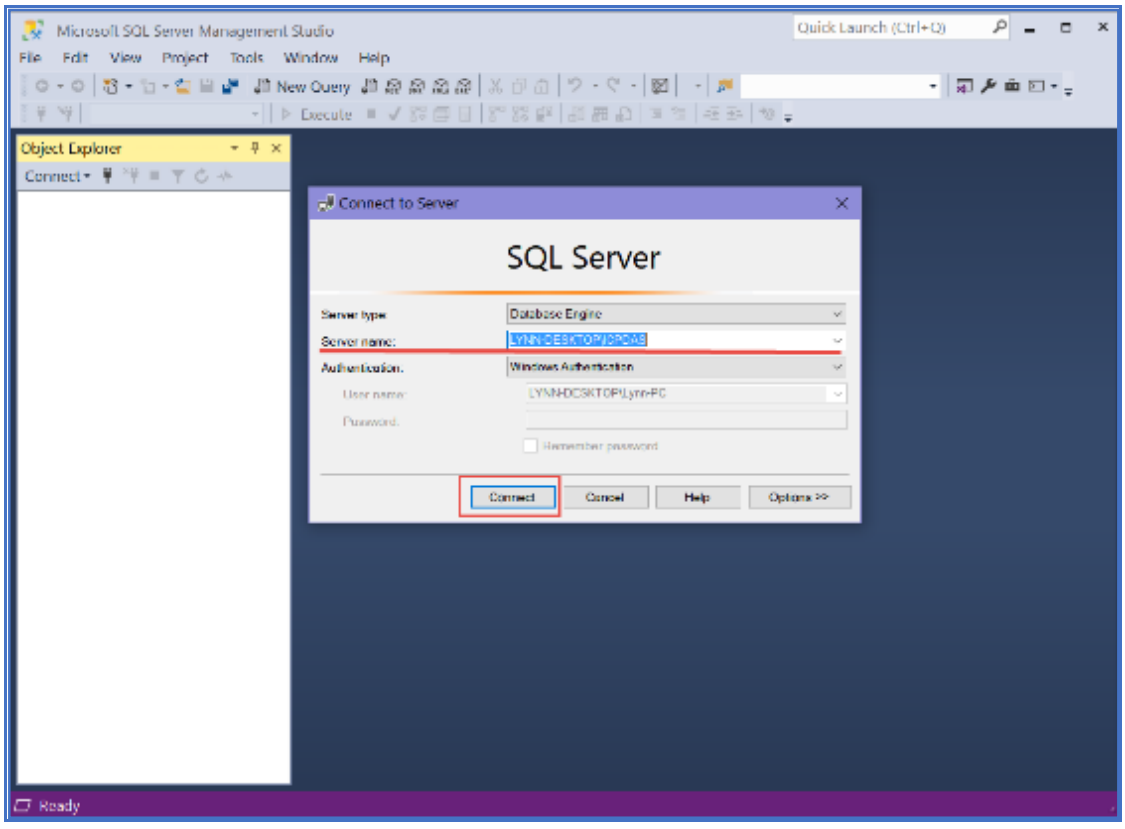
- **Connection Testing**



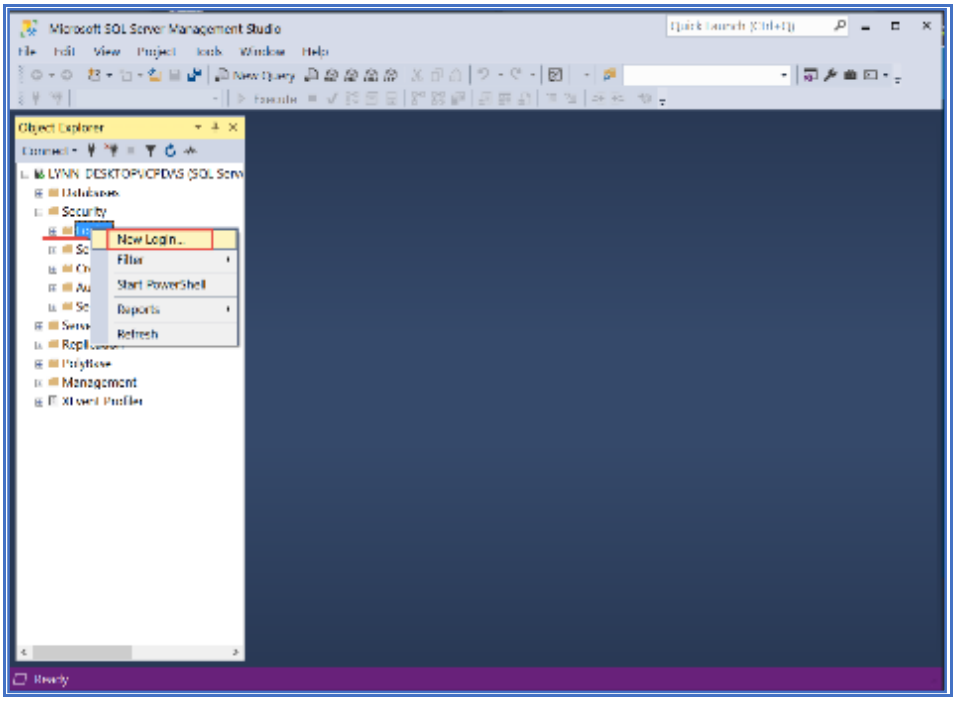


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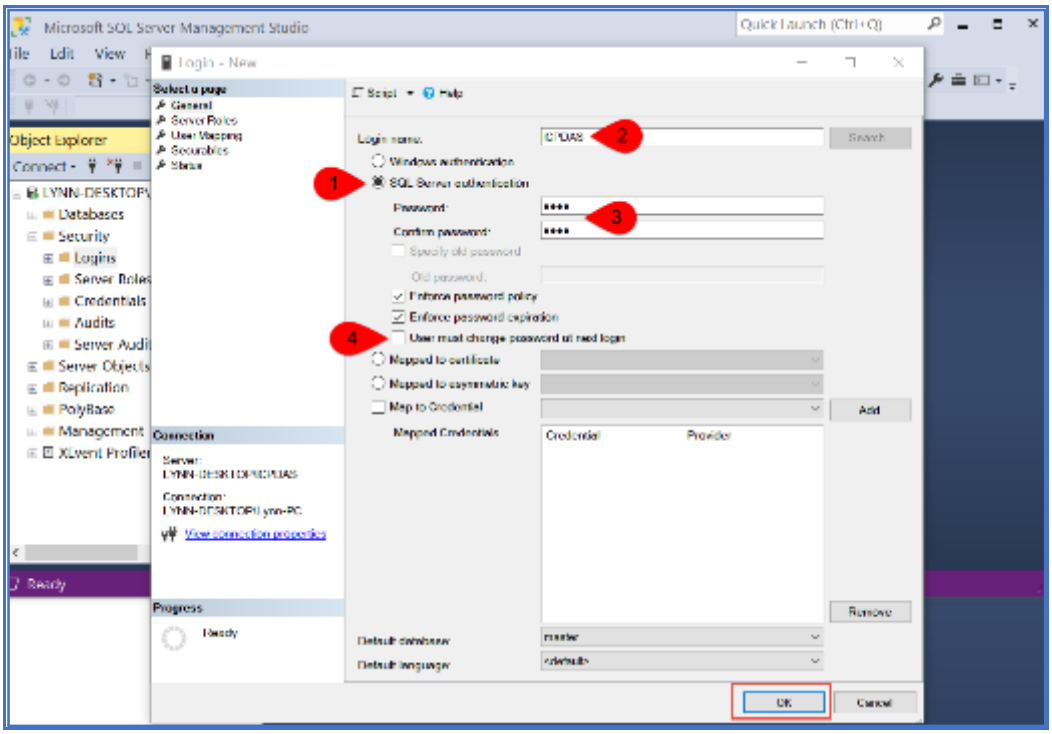




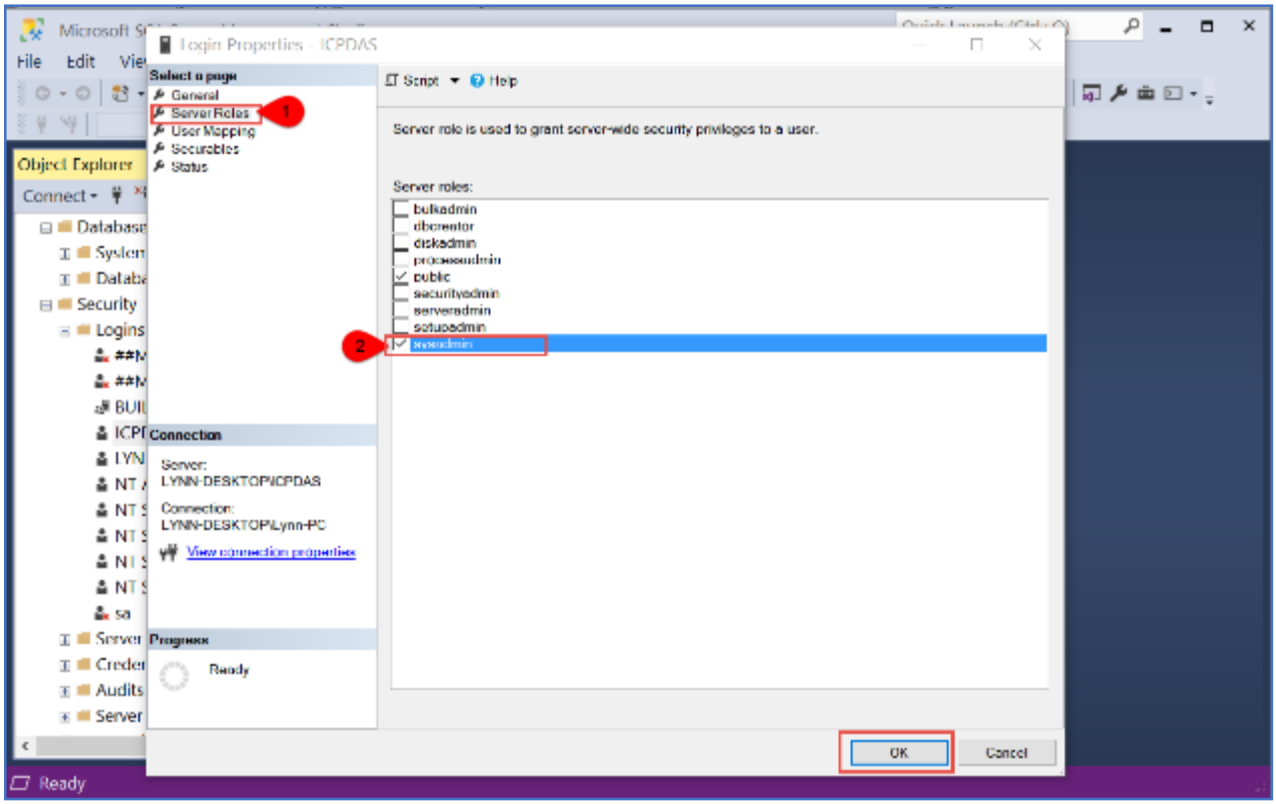
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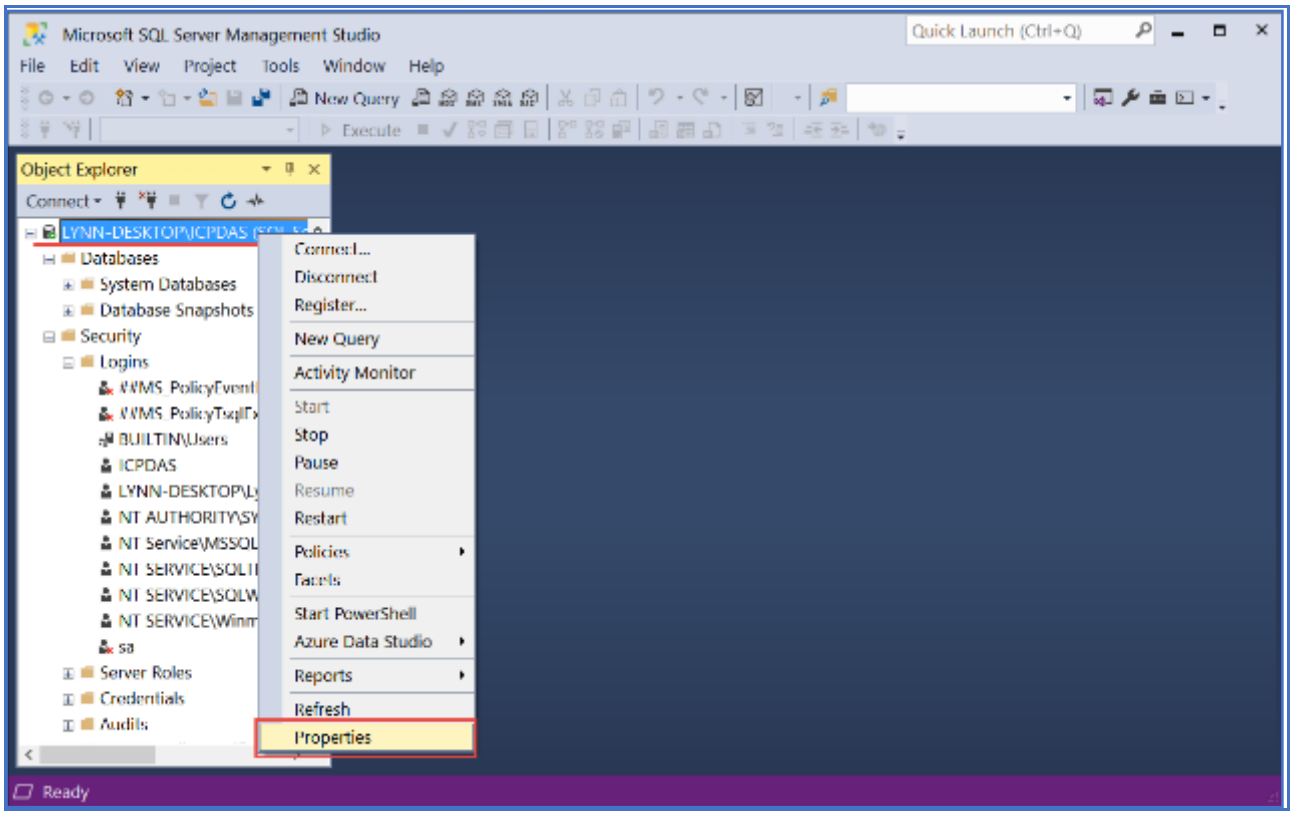


1. Choose SQL Server authentication.
2. Key in Login Name
3. Key in Password and Confirm Password
4. Cancel this checkbox.

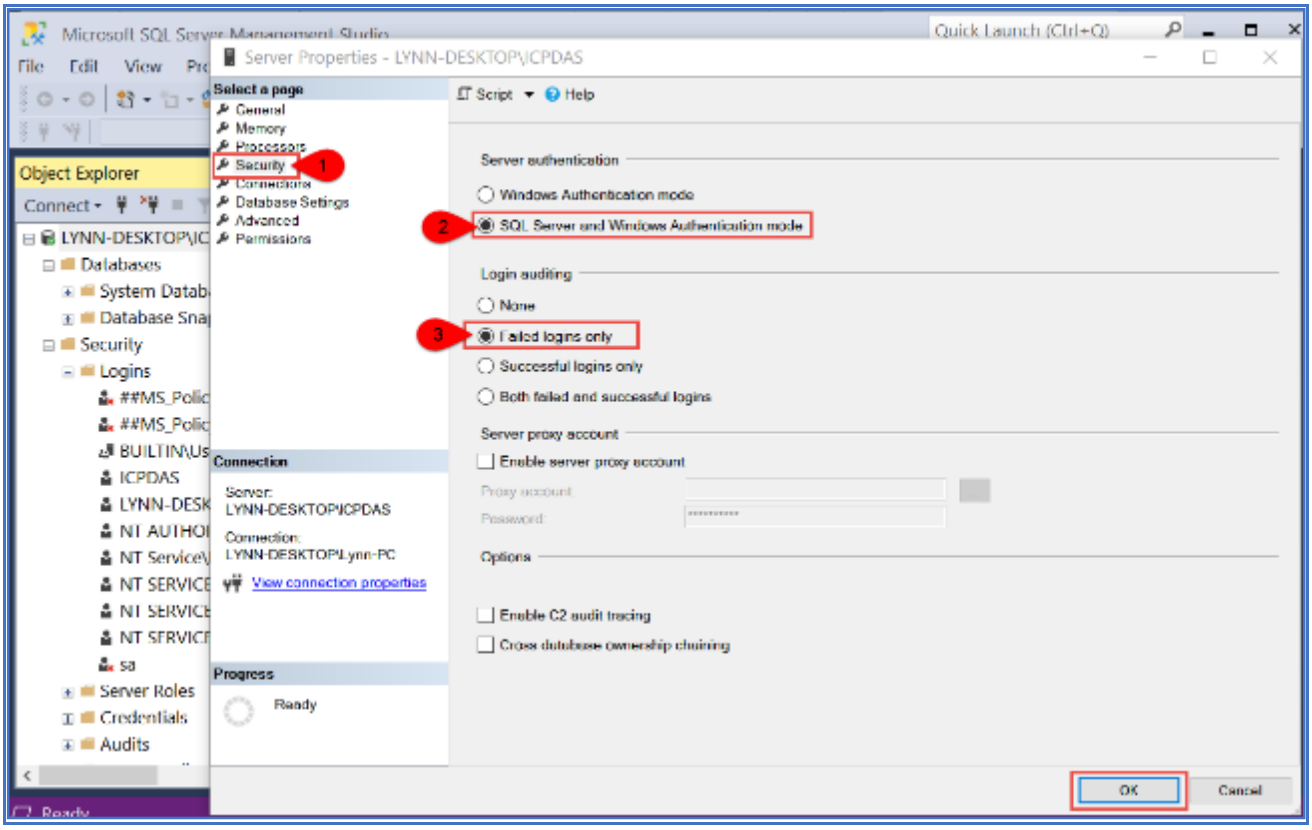


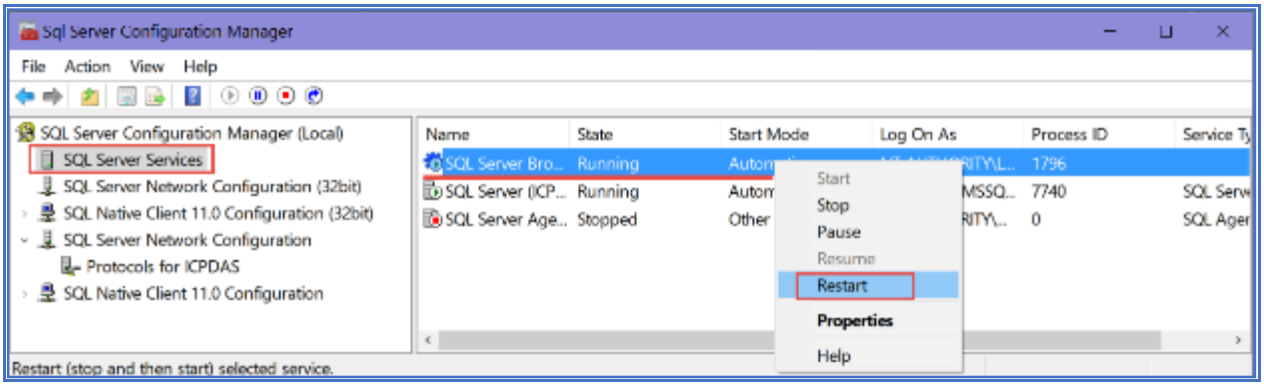
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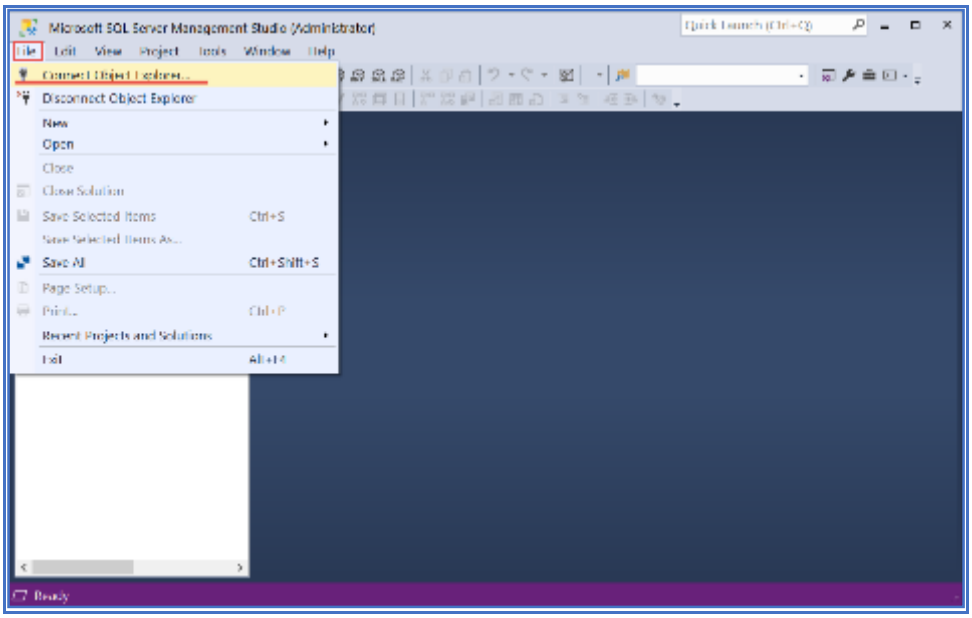




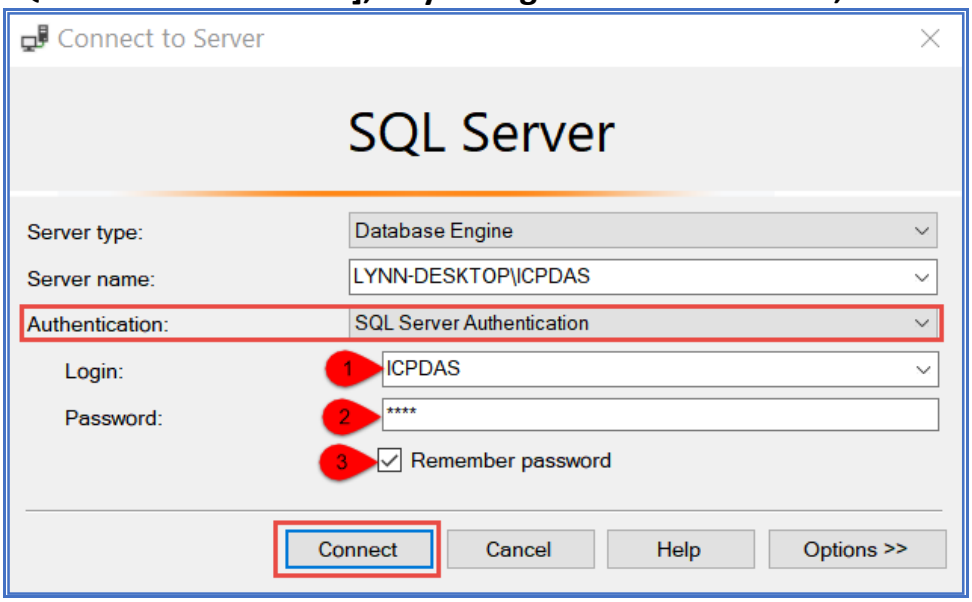
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- **Check if Database Setting is Success**

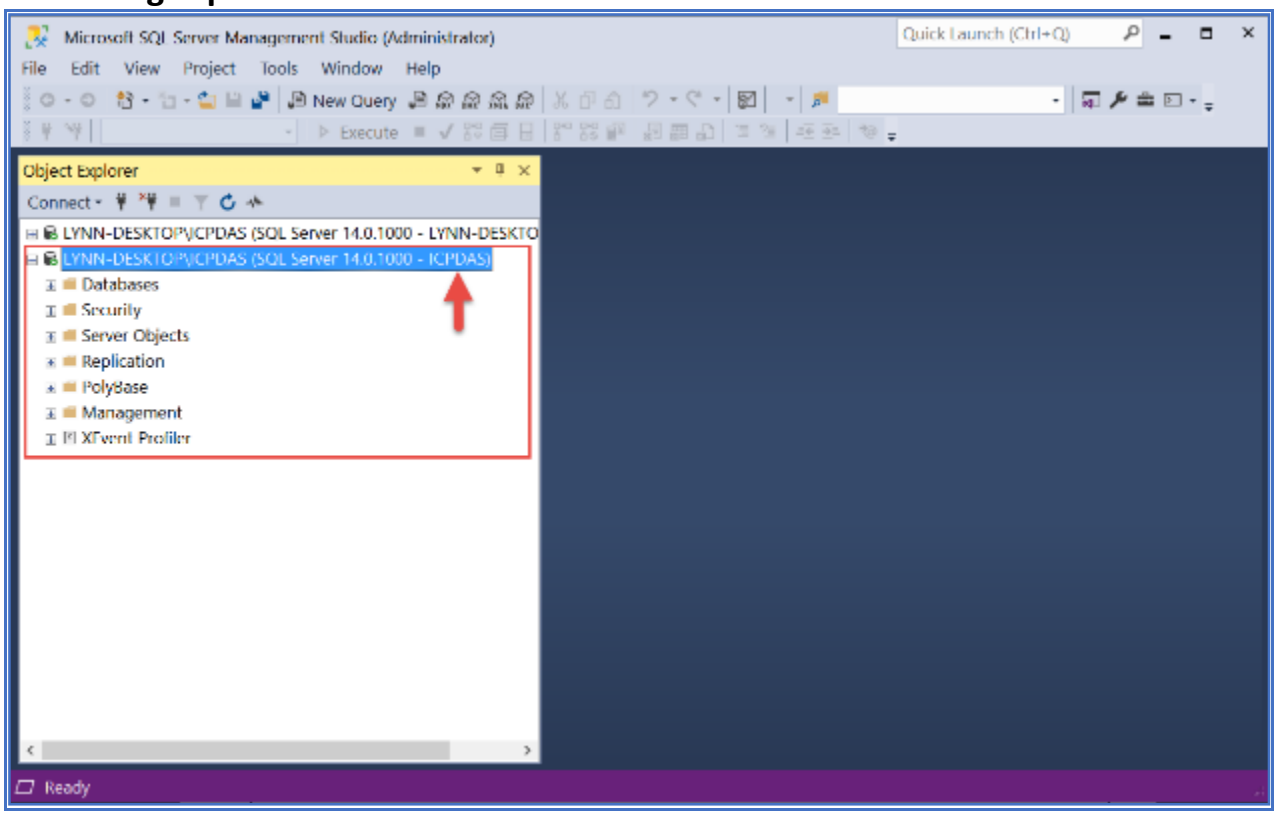


- **Choose [SQL Server Verification], Key in Login ID and Password, then Click Connect**



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- **Confirm the status of connection.**
- **Following capture shows successful connection:**



<End of this section>

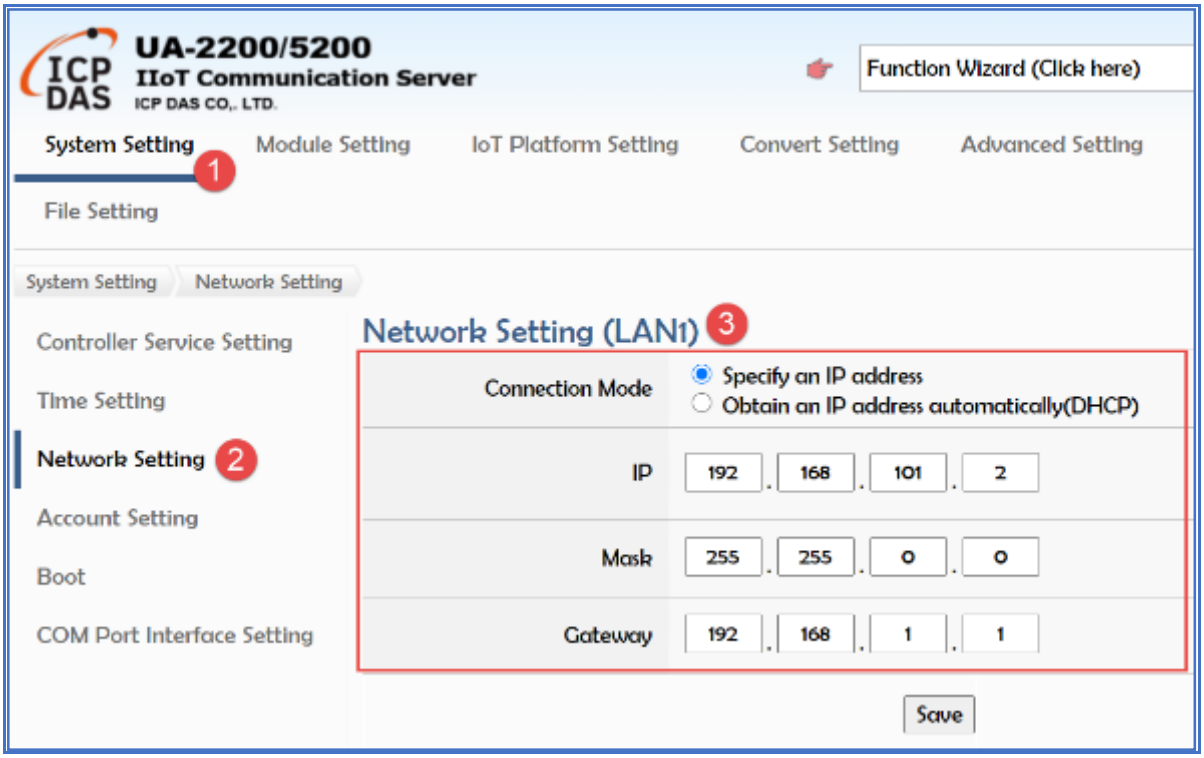
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How to set up UA products to save Modbus RTU data into SQL?

1. Key in following address in the URL bar: http://192.168.255.1
2. When the Web UI show up, key in default Username: root
3. Key in default Password: root



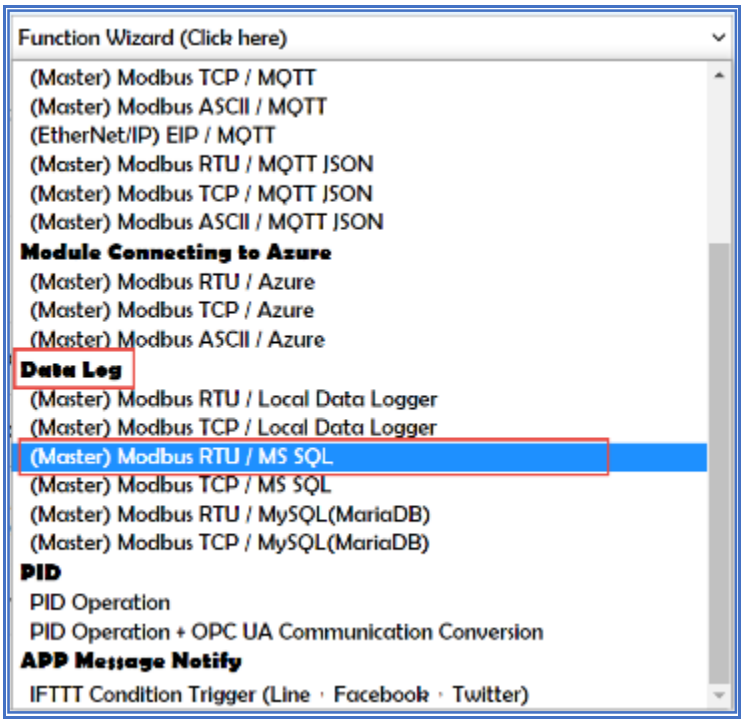
After successful Login, go to【System Setting】=>【Network Setting】=>【Network Setting (LAN1)】to change your IP Address, the mask, and the Gateway



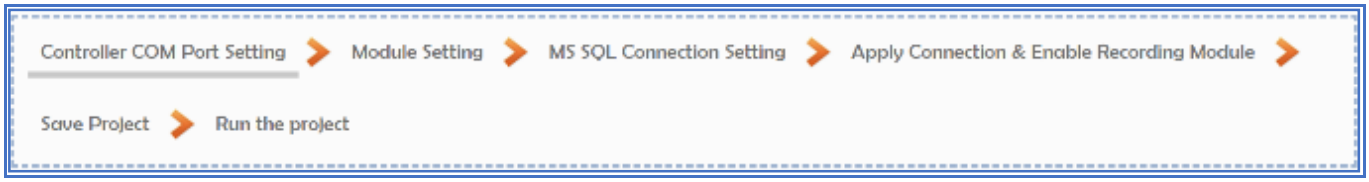
Then click "Save".

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After reload the Web UI page, find "Data Log" and choose "(Master) Modbus RTU/MS SQL" from the drop-down menu on the upper-right corner.



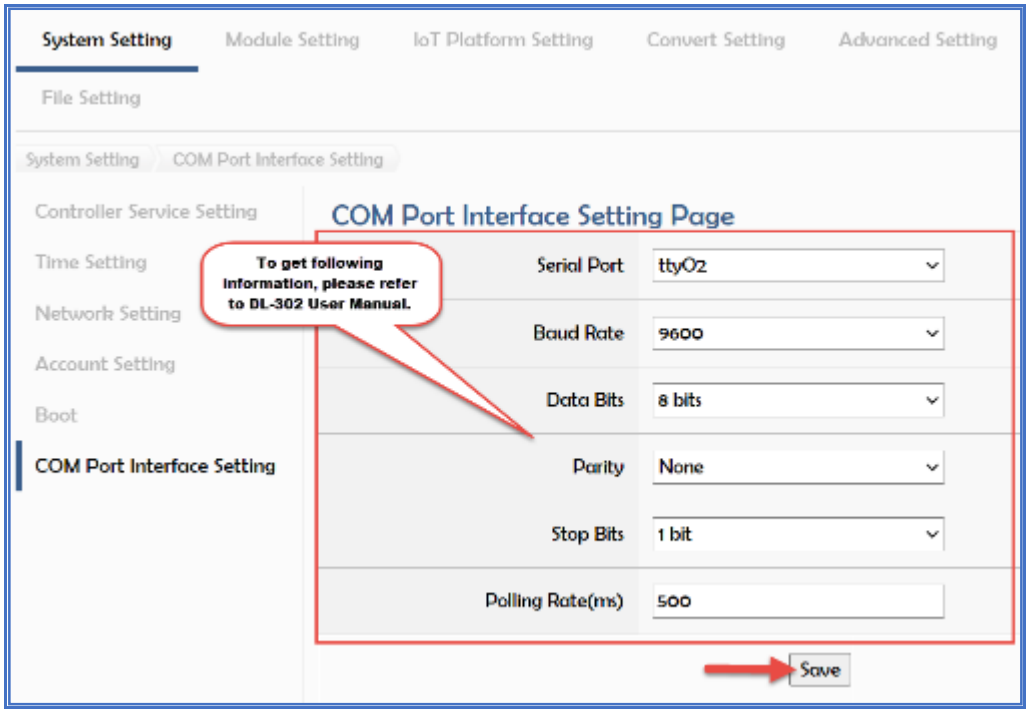
Follow the steps from the Wizard to finish this Project.



We will take DL-302 as an example to run all steps in following sections.

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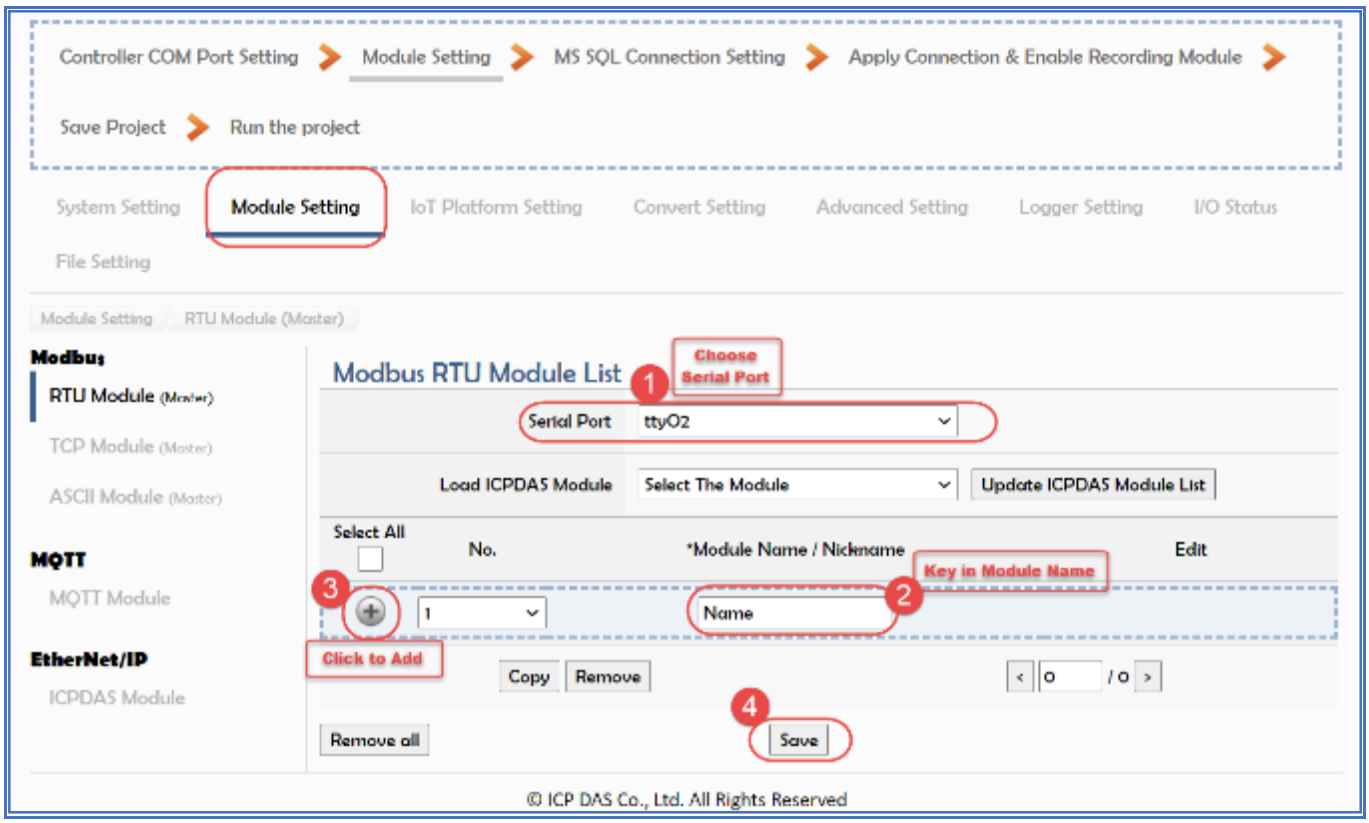
- **COM Port Interface Setting (DL-302)**

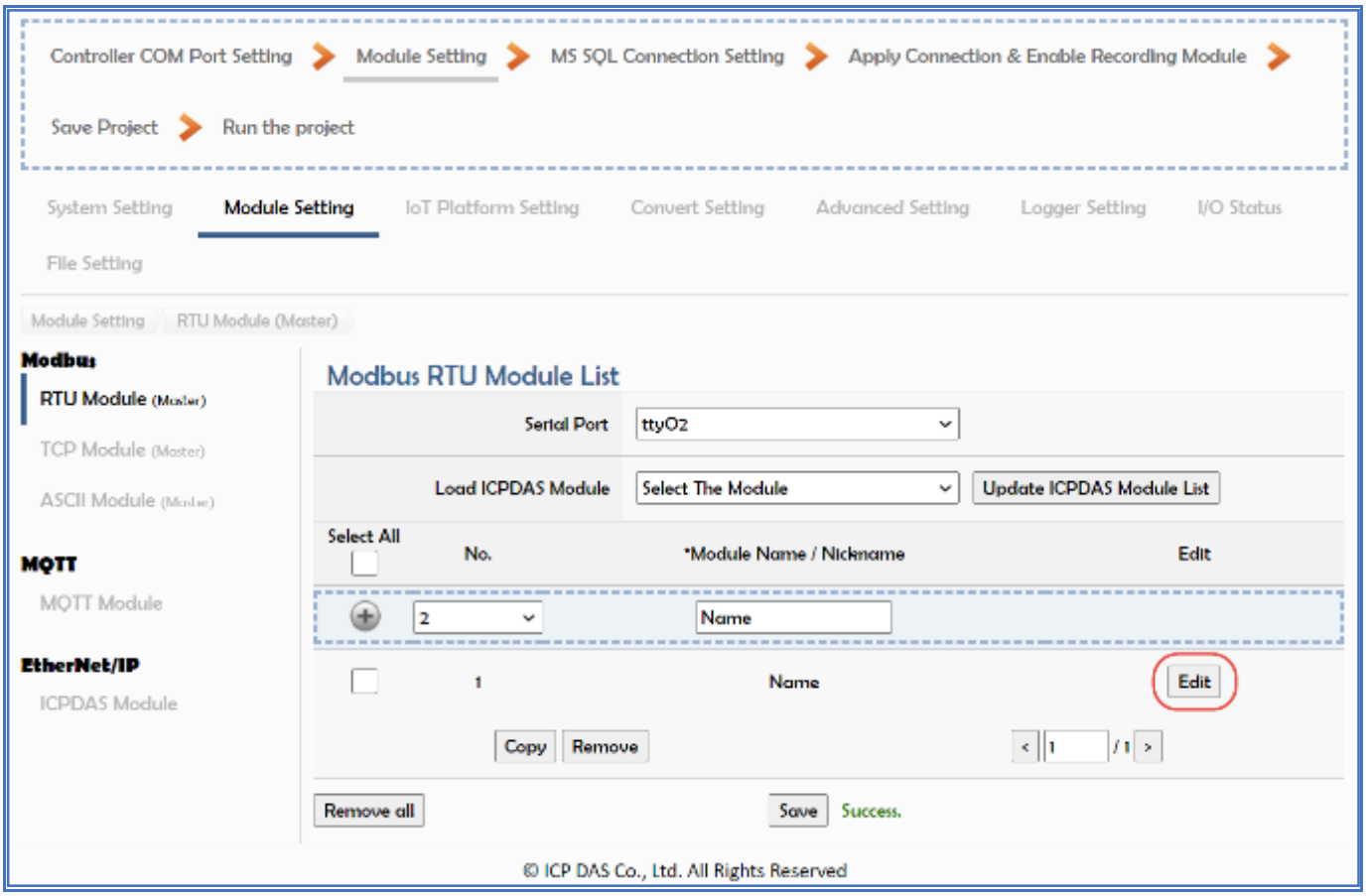


Capture from DL-302 User Manual

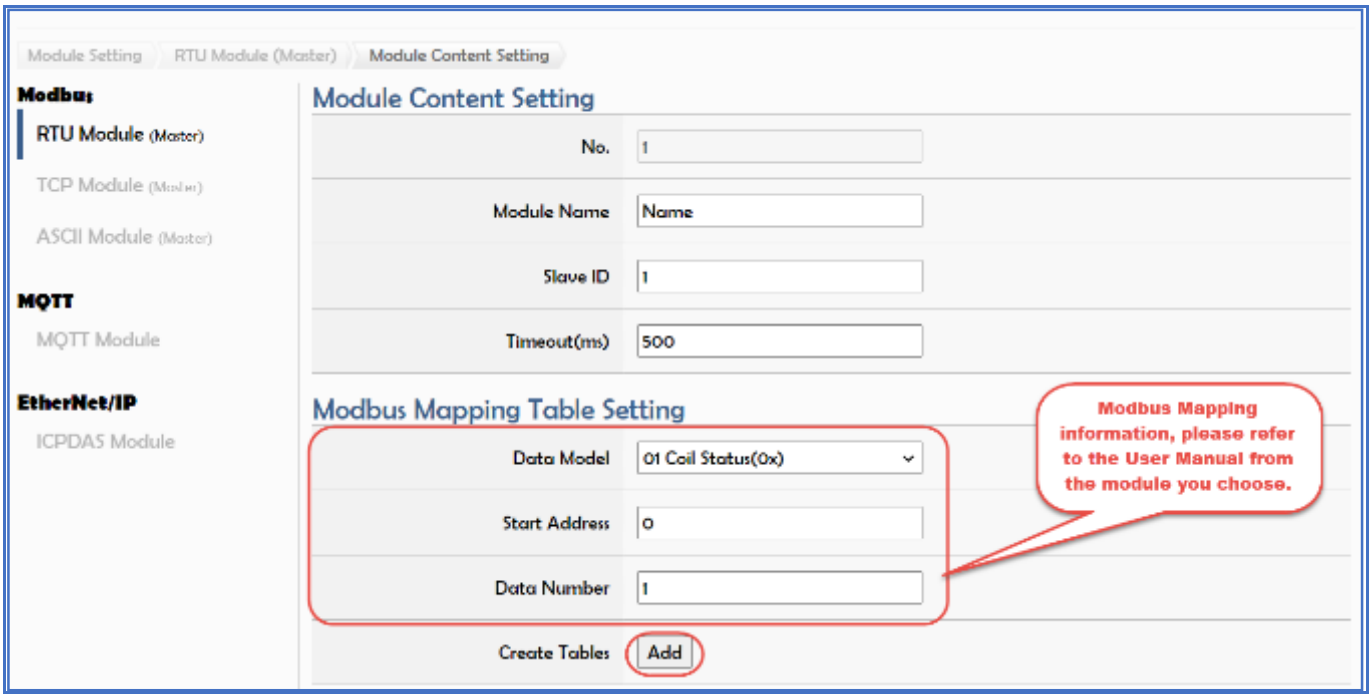
Address: Sets the address for a module.
Default: 1 Range: 0 ~ 255
Protocol: Sets the communication protocol.
- ModbusRTU (default) - DCON - DCONChkSum: uses DCON protocol and enables checksum validation feature
Baud Rate
Default: 9600 Support Baud Rate: 1200/ 2400/ 4800/ 9600/ 19200/ 38400/ 57600/ 115200 (unit: bps)
Parity
Default: N,8,1 Support format: N81, N82, E81, O81
Response Delay (ms): Sets the delay time between receiving the command and sending the data.
Default: 0 ms Range: 0 ~ 30 (unit: ms)
Save: Saves the modification and returns to the Settings menu. All the changes take effect immediately after saving changes.
Skip: Returns to the Settings menu without saving any changes.

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Module Content Setting	
No.	The module number in the module list (Not editable here)
Module Name	Give a name, e.g. model number or name. Default: Name.
Slave ID	Set the module Slave ID of the UA. (Range: 1 ~ 247)
Timeout	Set the timeout value for the module. Default: 500 ms
Modbus Mapping Table Setting	
Data Model	System provides 4 Modbus data models "01" ~ "04" for mapping to address of DO, DI, AO and AI. (ex. 01: DO channels, 02: DI, 03: AO, 04: AI) 01 Coil Status(0x) 02 Input Status(1x) 03 Holding Registers(4x) 04 Input Registers(3x)
Start Address	The start address of the Modbus command. **Note:** the Start Address of UA is bass on 0, even if some modules are bass on 1, here it needs to follow UA to set bass on 0.
Data Number	The number of the Modbus address. Need to give enough number for the DO, DI, AO, AI channels of the module. Default: 1.
Type	This item only when the data model is 03 or 04. Choose the suitable data type: 16-bit Short, 16-bit Unsigned Short, 32-bit Long, 32-bit Unsigned Long, 32-bit Float, 64-bit Double.
Create Tables	Click [Add] button, it will add a table in the Modbus mapping table.

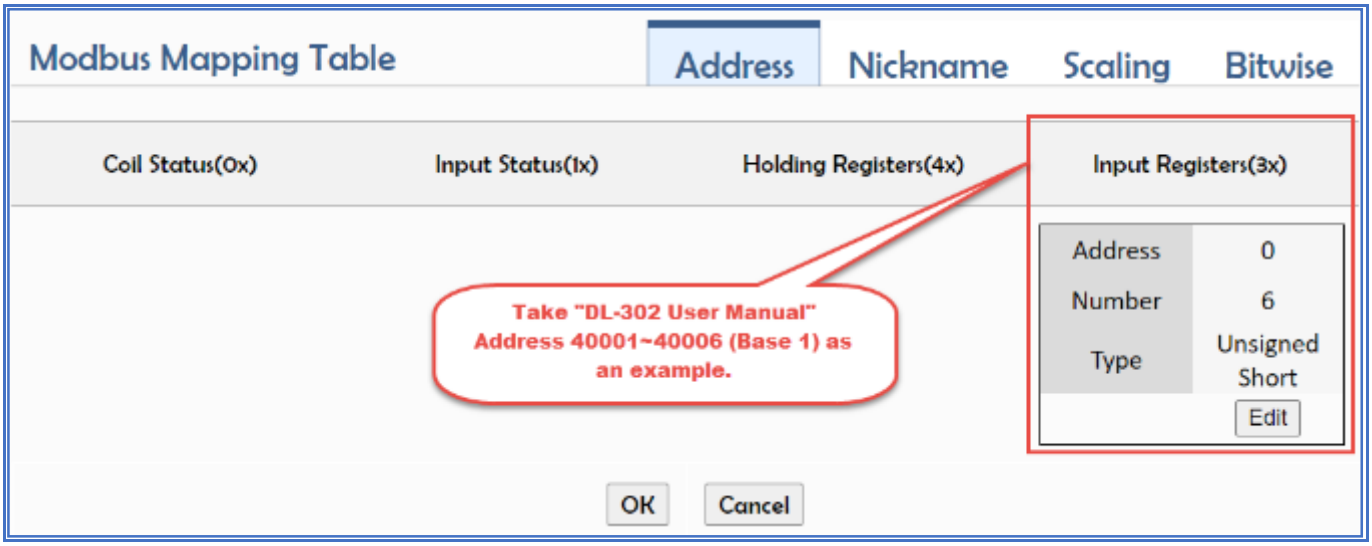
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DL-302 Modbus Address Mappings (Base 1)

Address	Description	Attribute
30001 ~ 30006 40001 ~ 40006	Analog input value of channel 0 to 5. channel 0: CO_2 in 1ppm, channel 1: relative humidity in 0.01%, channel 2: temperature in 0.01°C, channel 3:temperature in 0.01°F, channel 4: dew point temperature in 0.01°C, channel 5: dew point temperature in 0.01°F	R

Modbus Mapping Table Setting:

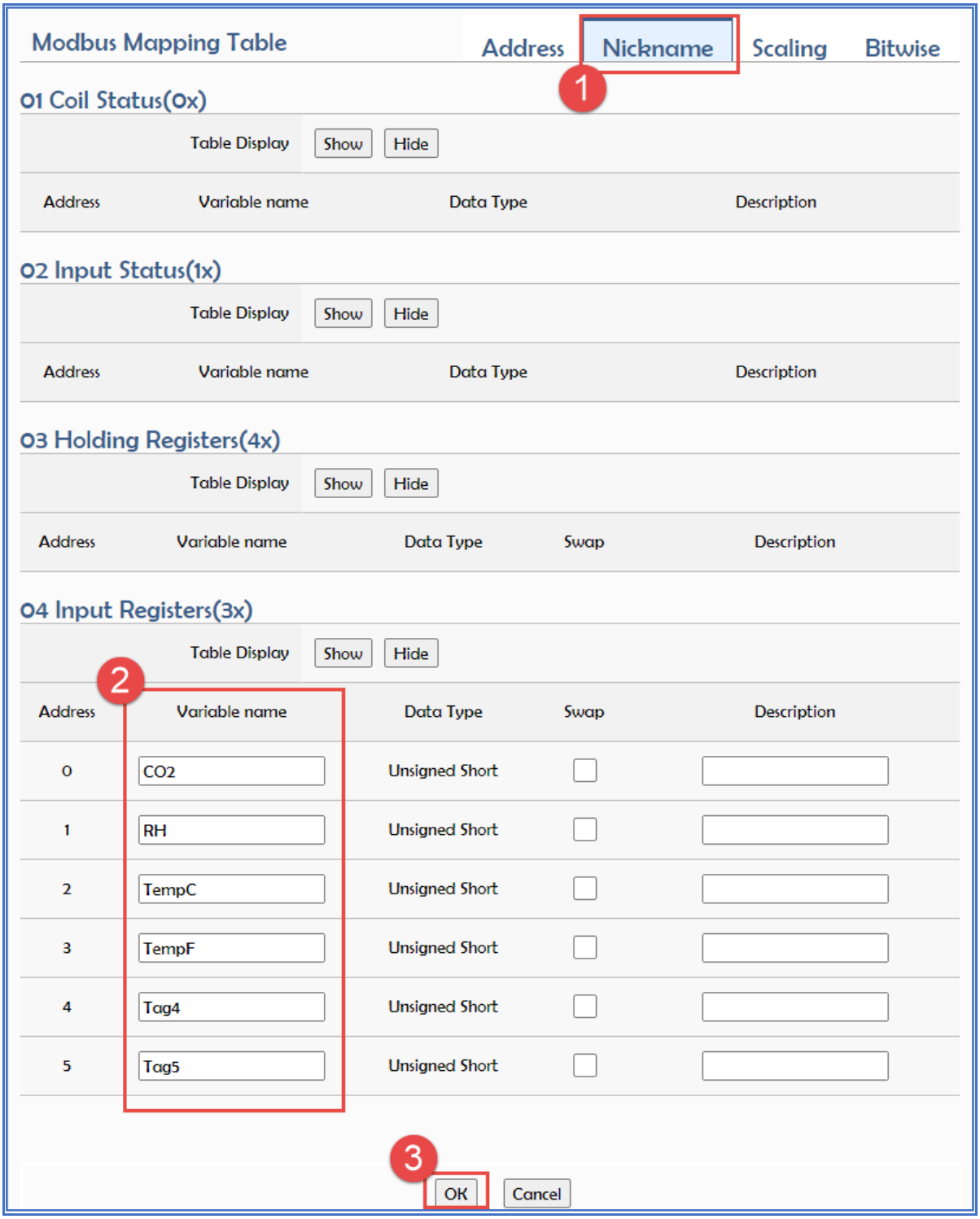
Modbus Mapping Table Display and Edit.



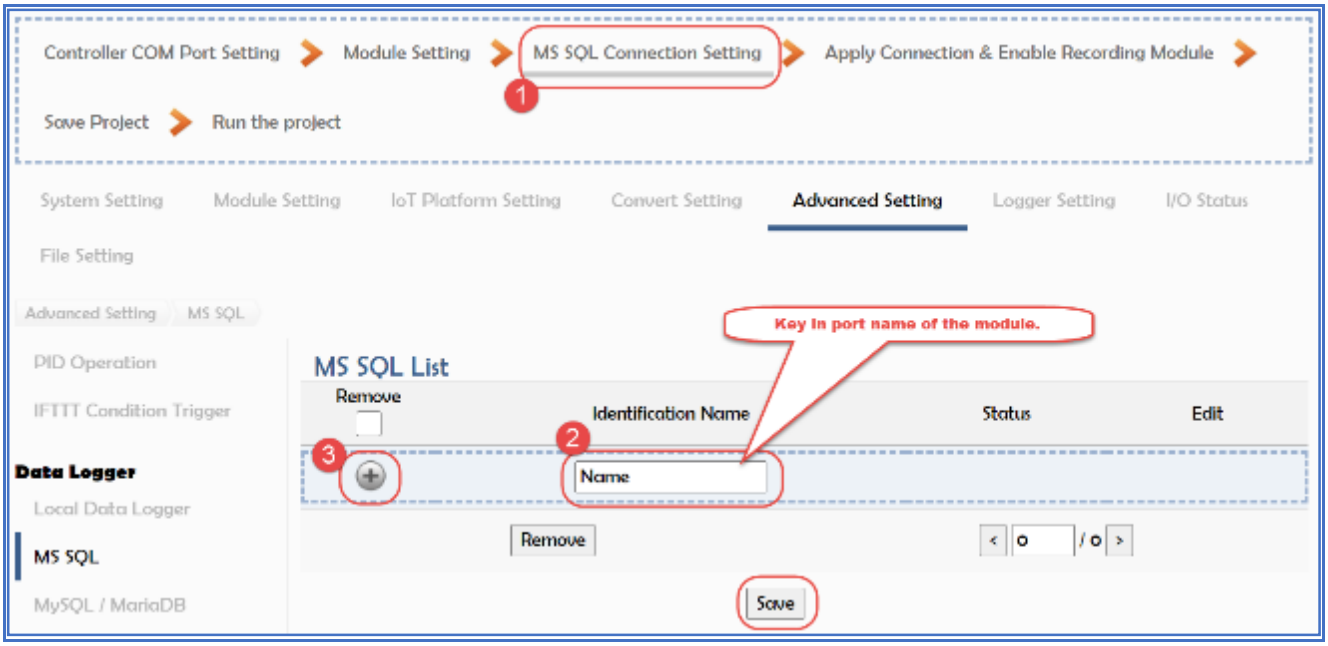
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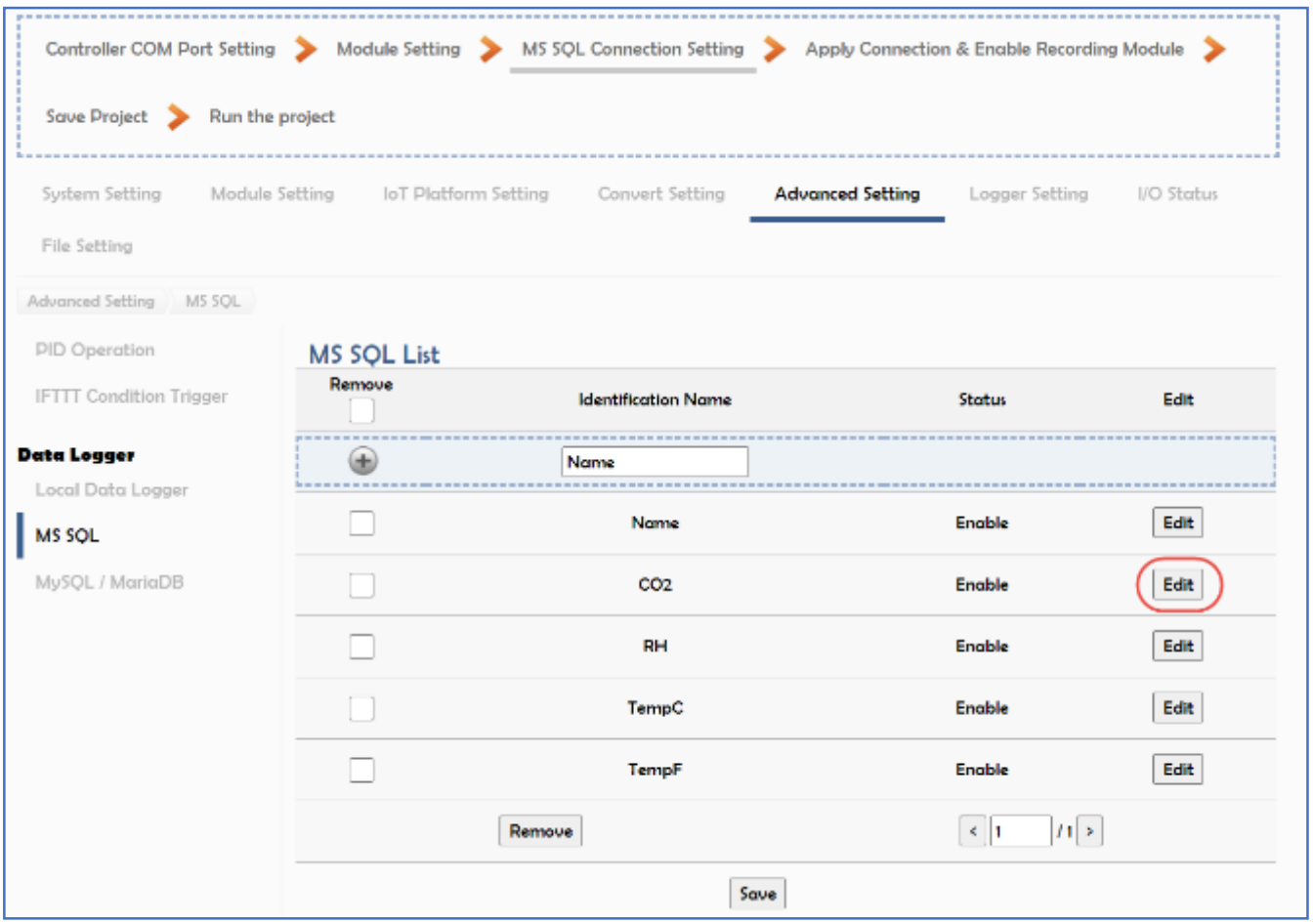
Nickname:

To set the variable name and the description, please click the “Nickname” to add the information.



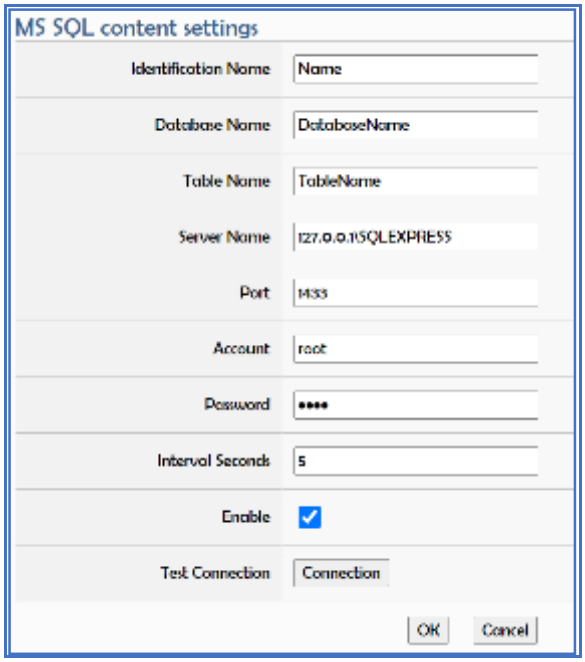
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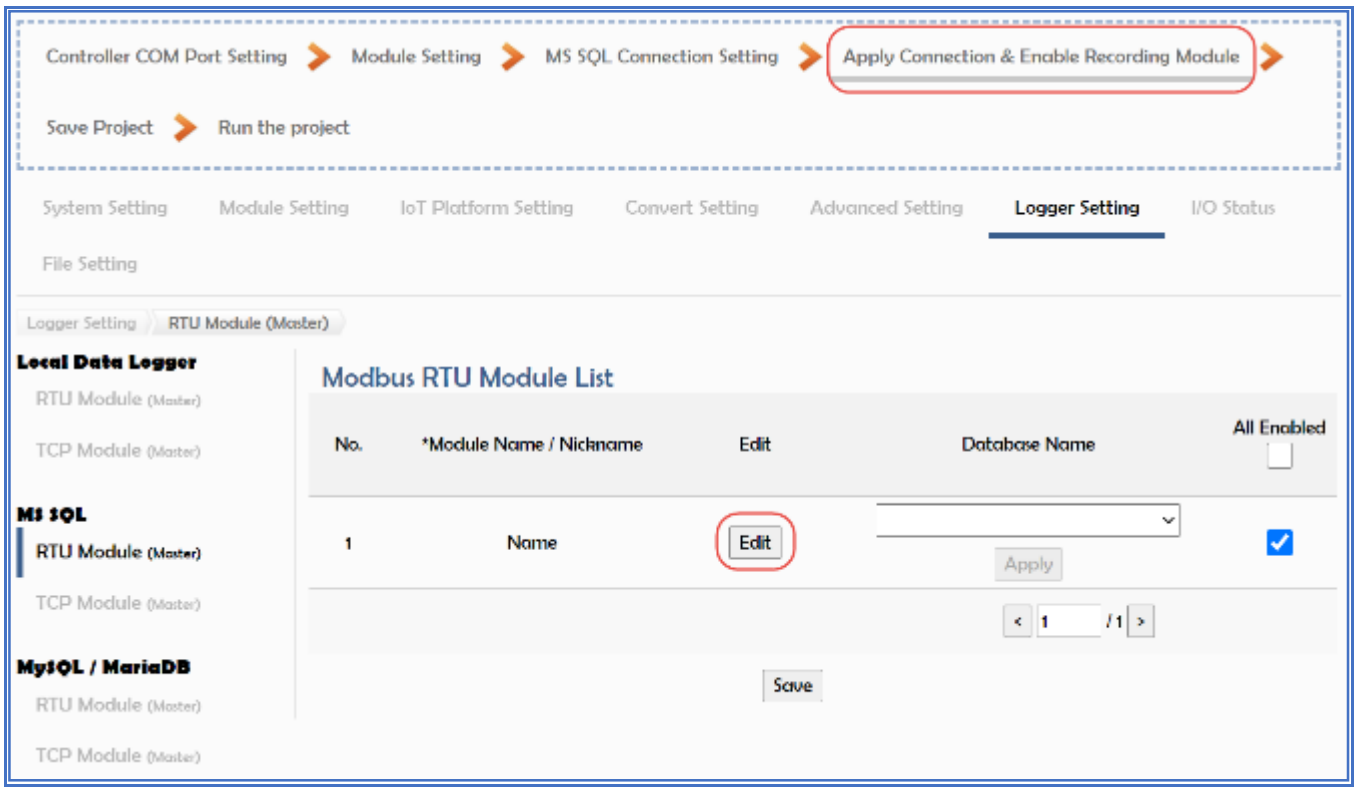
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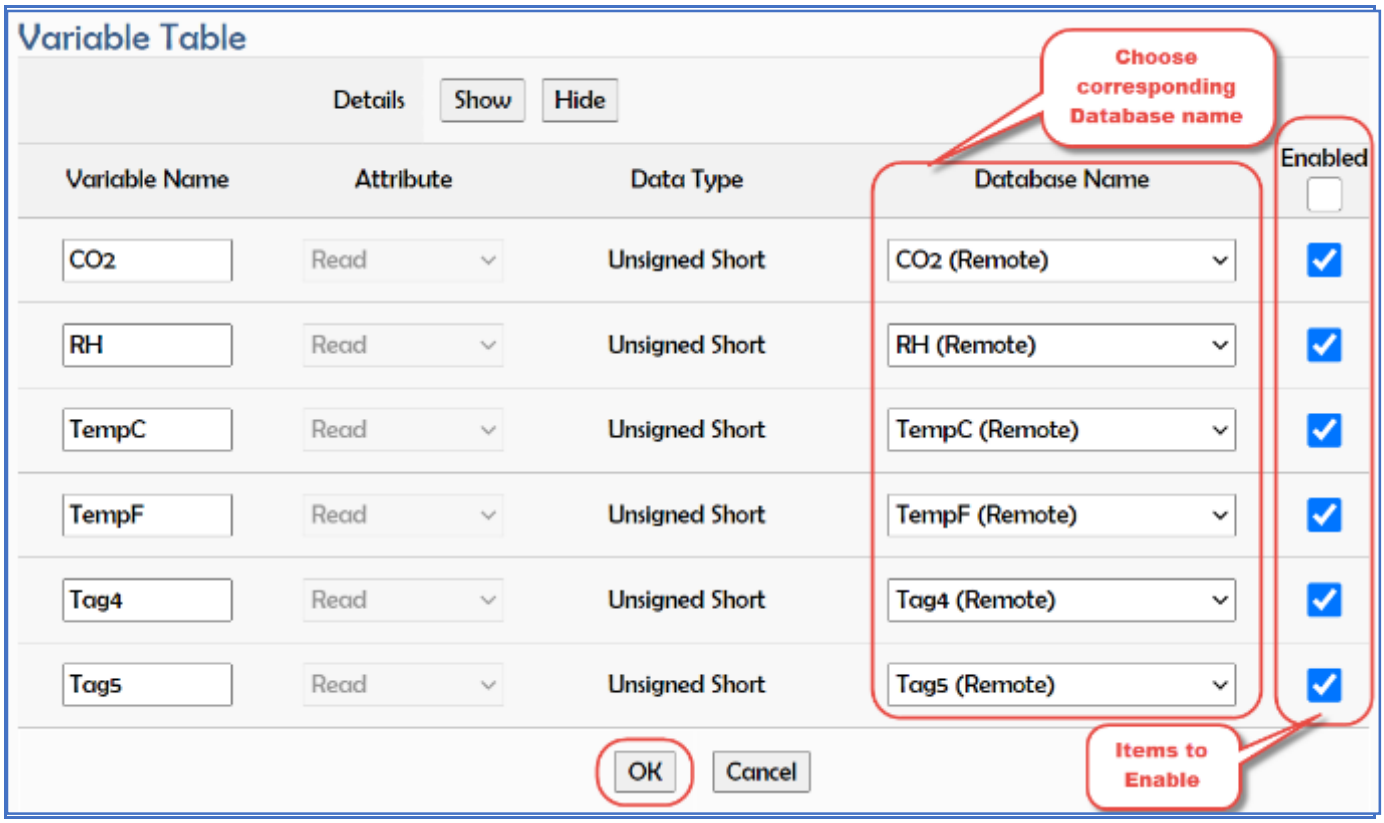
Key in all information that needs to write into DB and set the SQL content.



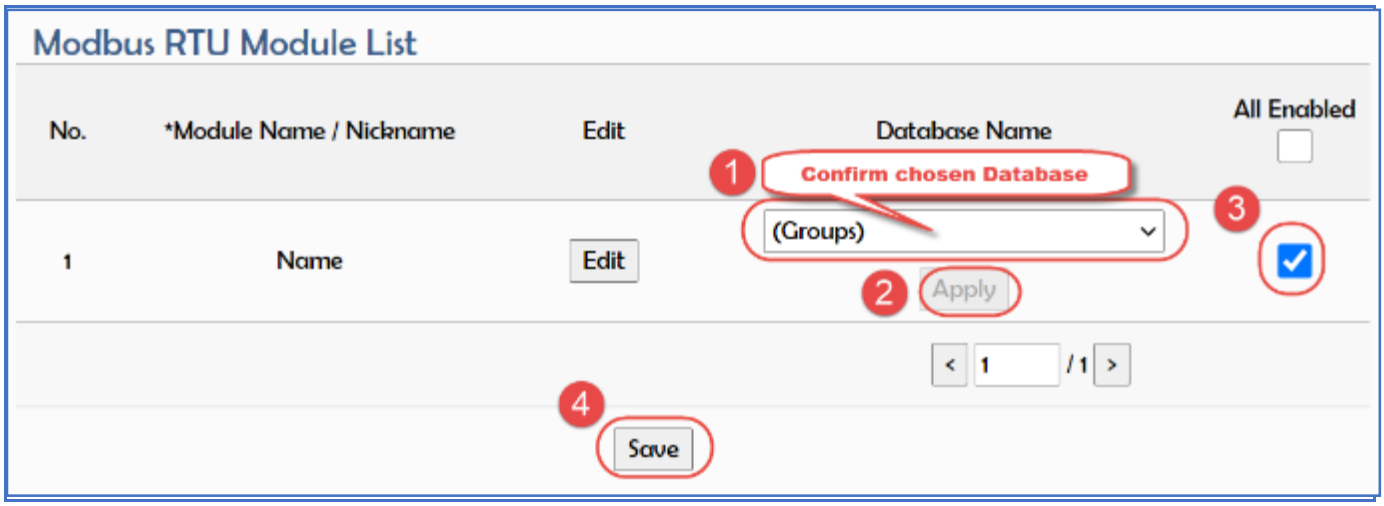
Advanced Setting > Data Logger > MS SQL – Content Setting	
Identification Name	User defined name to identify the database.
Database Type	Select the MSSQL type for the Microsoft SQL database.
Database Name	The name of the remote database.
Table Name	The table name of the remote database.
Server Name	The Server IP and name of the remote database.
Port	The port to link with database. Default: 1433 (for MS SQL)
Account	The login name of the remote database.
Password	The login password of the remote database.
Interval Seconds	Set up the interval time to save the I/O data to the remote database. Unit: Second.
Enable	Check to enable the data logger to the remote database. Default: check.
Test Connection	Click to test the connection to the remote database. Result: Success or Failure.
OK / Cancel	Click “OK” to save the settings of this page. Click “Cancel” to exit the setting page without saving.

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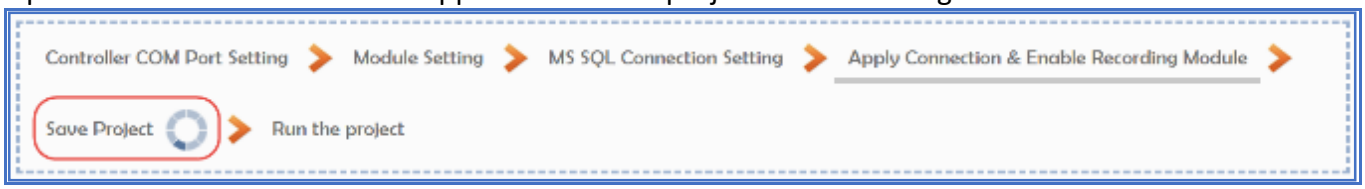




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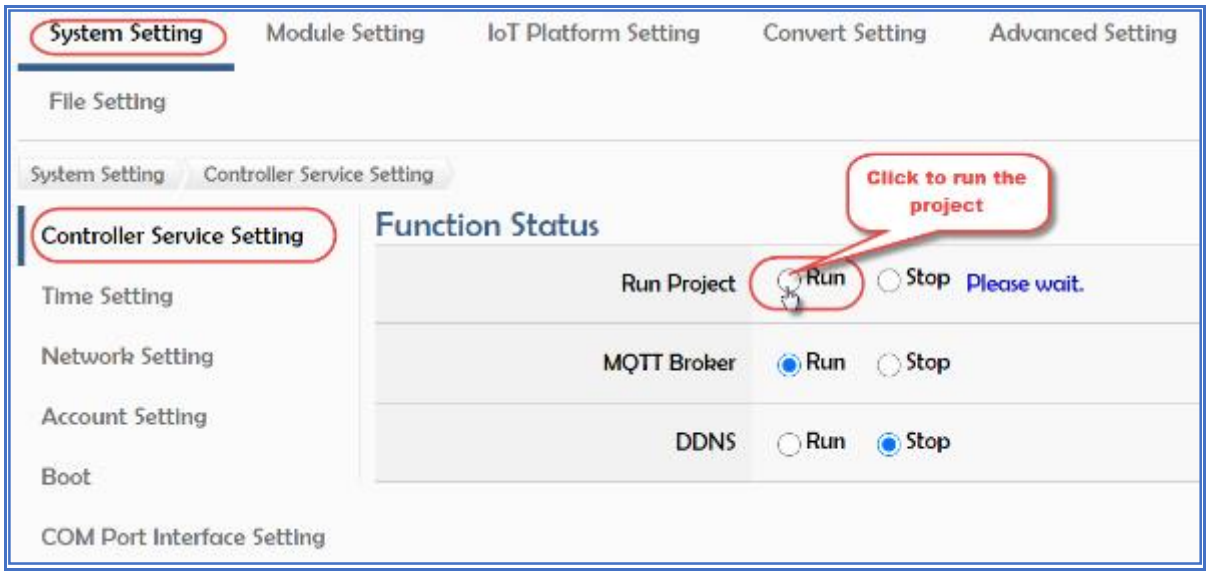


Click [Save Project], and then the step column will show up with a blue animation of savings as following capture. While the animation disappear means the project is finish saving.



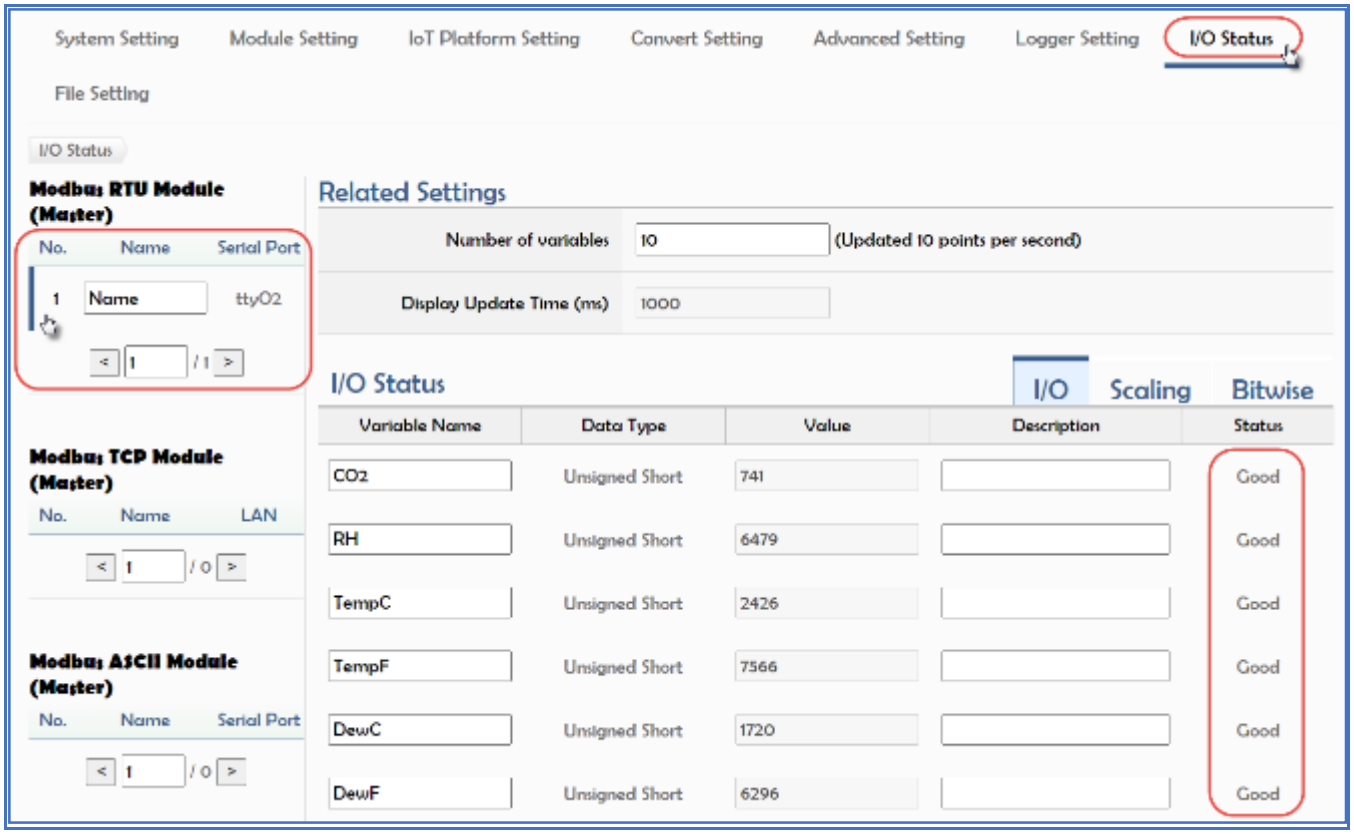
To run the new project, click the next step [Run the project] and wait until the step column disappear.

To set the project manually, go back to [System Setting] → [Controller Service Setting] → Click [Run / Stop Project].



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To check the I/O Status, click the “I/O status” and choose from the left-hand list. Confirm the connection value and status.

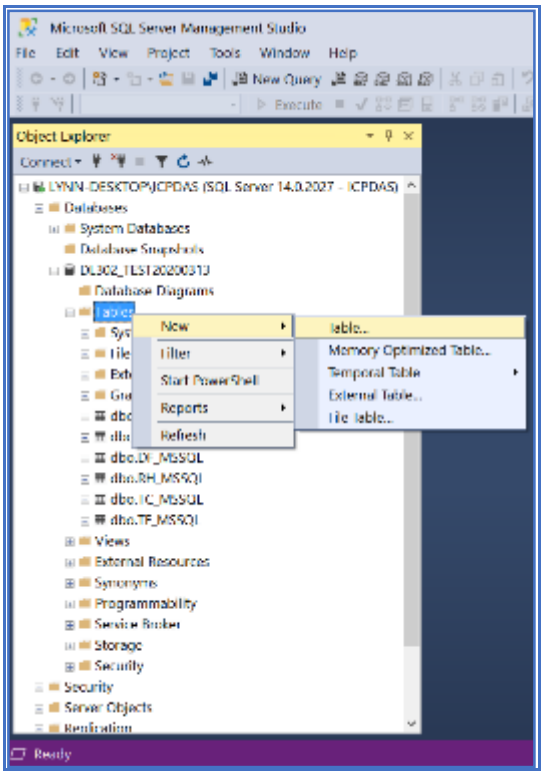


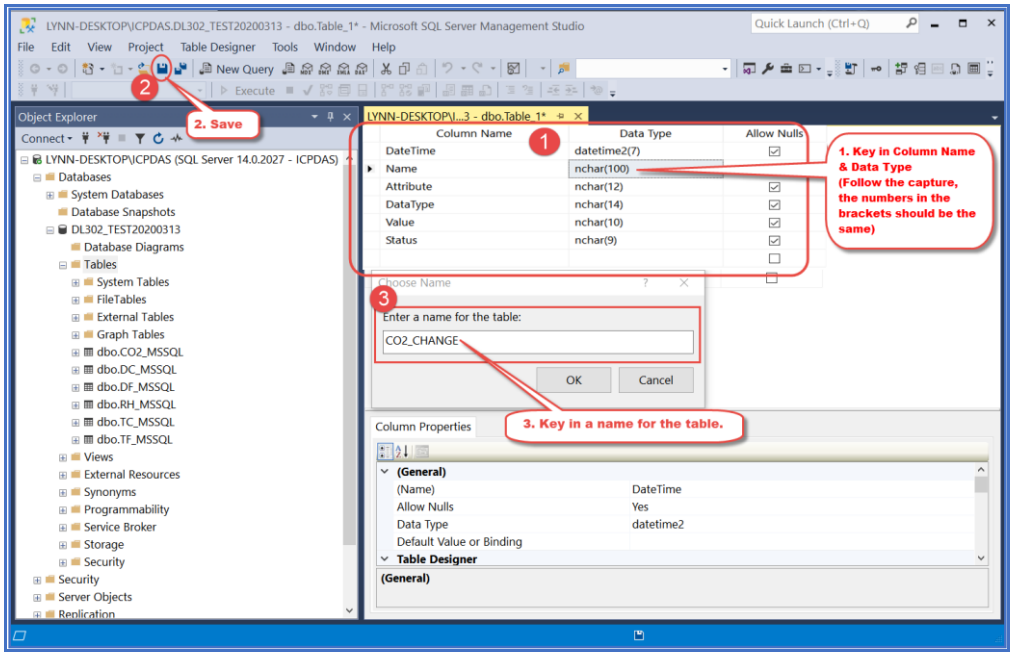
<End of this section>

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- **After transferring UA data into SQL Server, how to combine Date and Time column in the SQL Server?**

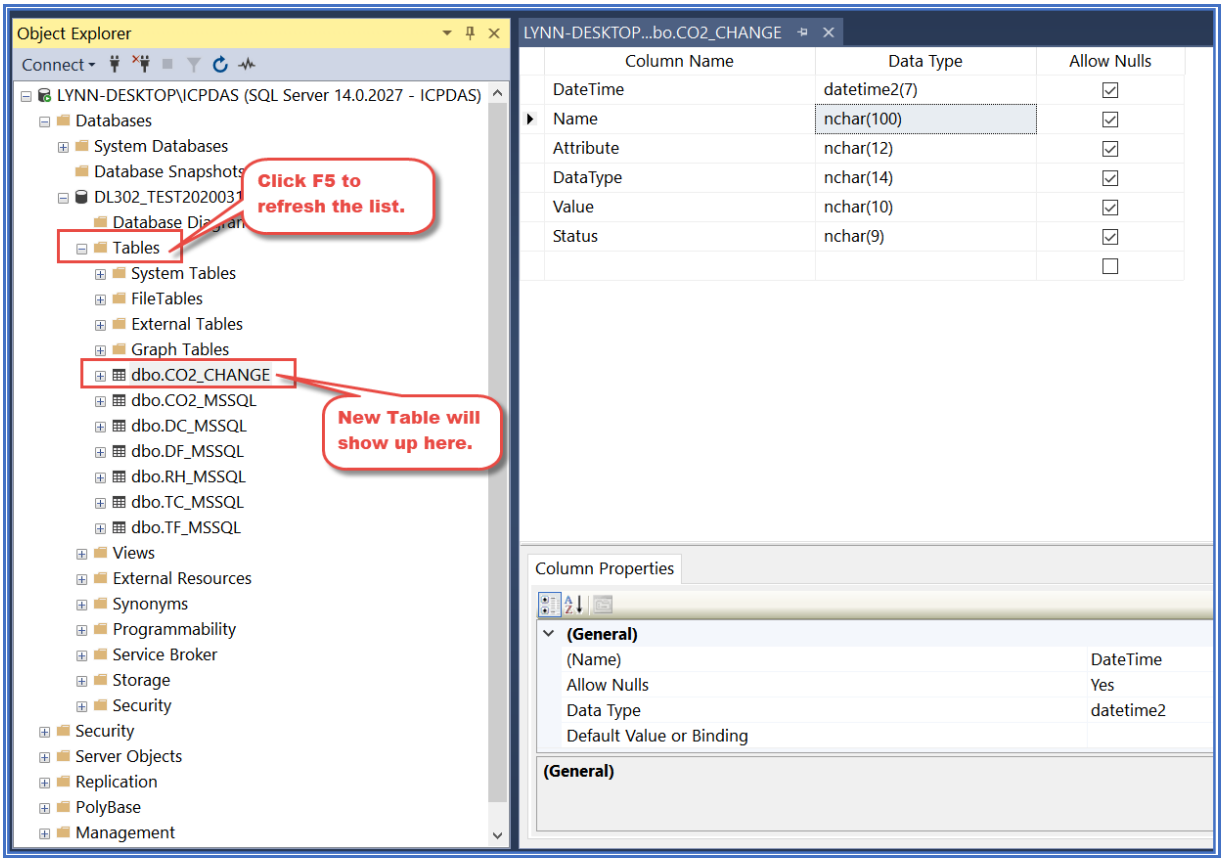
1. Right Click on the "Database" where UA data has transferred.
2. Choose "Tables" and choose "New" to create a new table and we will combine columns using this table.





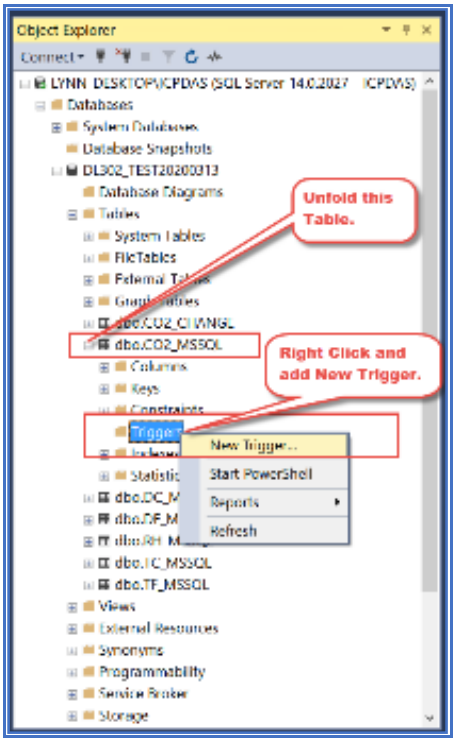
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After create the new Table, press "F5" to check if this table is successful created.



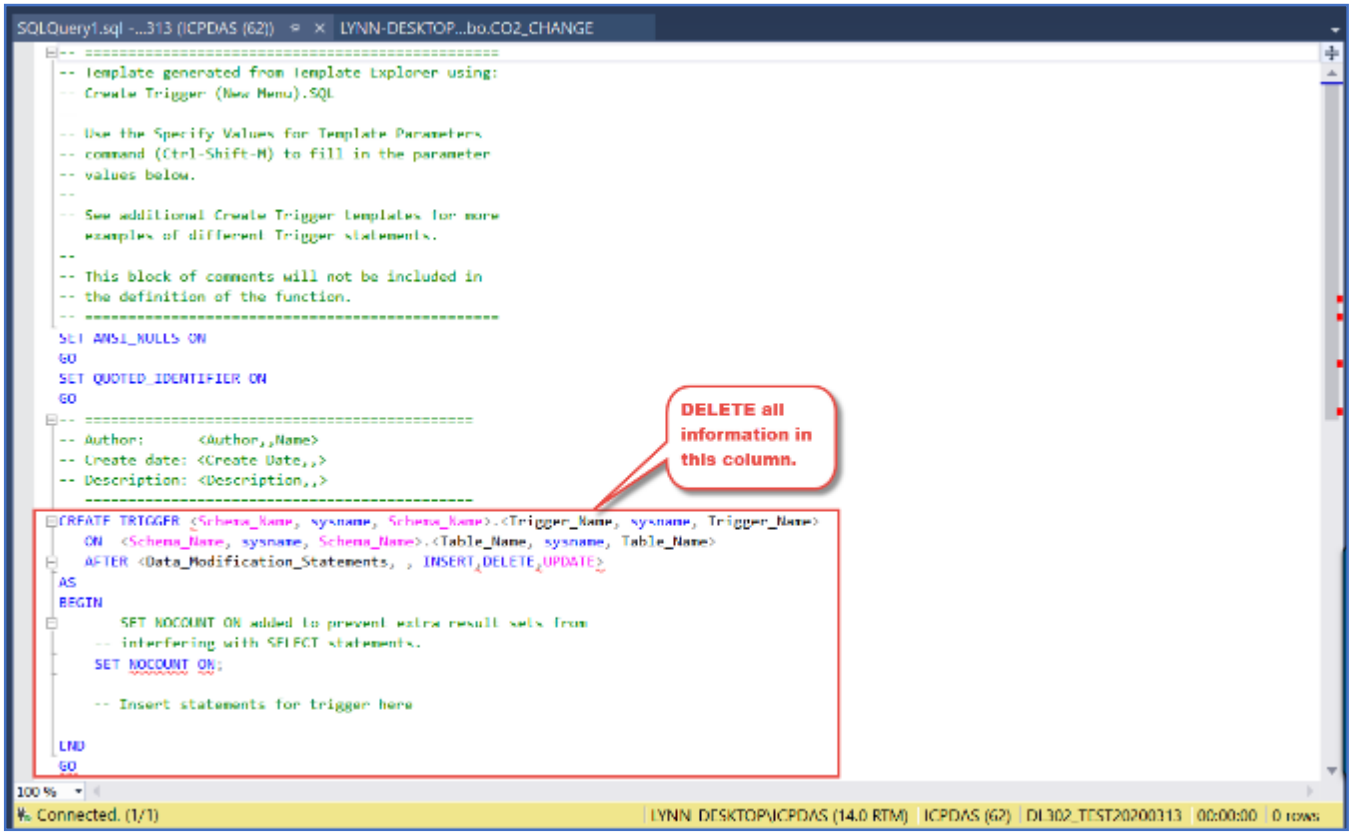
Unfold the table where UA transfer data in.

Right click on "Triggers" to add a "New Trigger".



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Delete all data in the circled red column.



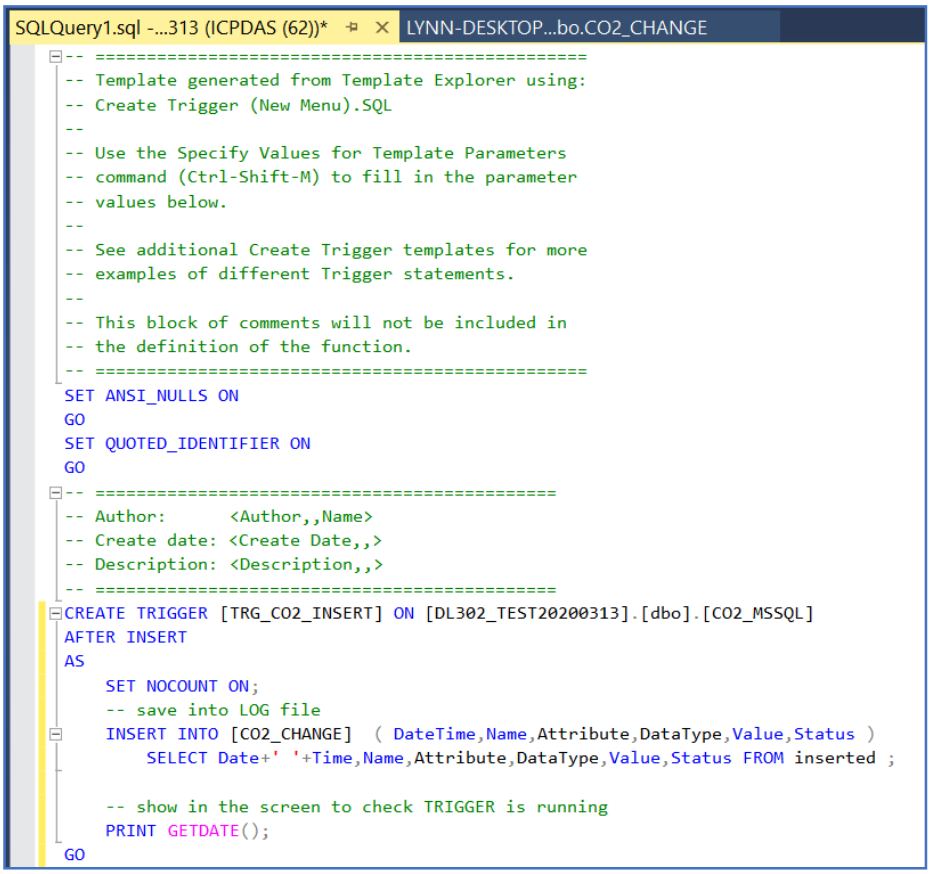
Then replace the deleted one with following code:

```
CREATE TRIGGER [TRG_CO2_INSERT] ON [DL302_TEST20200313].[dbo].[CO2_MSSQL]
AFTER INSERT
AS
    SET NOCOUNT ON;
    -- save into LOG file
    INSERT INTO [CO2_CHANGE]  ( DateTime,Name,Attribute,DataType,Value,Status )
        SELECT Date+' '+Time,Name,Attribute,DataType,Value,Status FROM inserted ;

    -- show in the screen to check TRIGGER is running
    PRINT GETDATE();
GO
```


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After Copy and Paste the code, the screen should be as following:



```
SQLQuery1.sql -...313 (ICPDAS (62))*   LYNN-DESKTOP...bo.CO2_CHANGE
-- ================================================
-- Template generated from Template Explorer using:
-- Create Trigger (New Menu).SQL
--
-- Use the Specify Values for Template Parameters
-- command (Ctrl-Shift-M) to fill in the parameter
-- values below.
--
-- See additional Create Trigger templates for more
-- examples of different Trigger statements.
--
-- This block of comments will not be included in
-- the definition of the function.
-- ================================================
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
-- =============================================
-- Author:      <Author,,Name>
-- Create date: <Create Date,,>
-- Description: <Description,,>
-- =============================================
CREATE TRIGGER [TRG_CO2_INSERT] ON [DL302_TEST20200313].[dbo].[CO2_MSSQL]
AFTER INSERT
AS
    SET NOCOUNT ON;
    -- save into LOG file
    INSERT INTO [CO2_CHANGE]  ( DateTime,Name,Attribute,DataType,Value,Status )
        SELECT Date+' '+Time,Name,Attribute,DataType,Value,Status FROM inserted ;

    -- show in the screen to check TRIGGER is running
    PRINT GETDATE();
GO
```

Description:

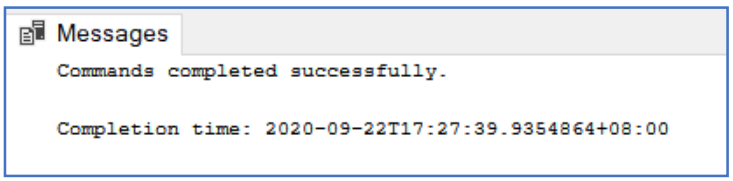
```
CREATE TRIGGER [TRG_CO2_INSERT] ON [DL302_TEST20200313].[dbo].[CO2_MSSQL]
```

[TRG_CO2_INSERT] the name of TRIGGER
[DL302_TEST20200313].[dbo].[CO2_MSSQL] the location of TRIGGER

```
INSERT INTO [CO2_CHANGE]  ( DateTime,Name,Attribute,DataType,Value,Status )
```

[CO2_CHANGE] (DateTime,Name,Attribute,DataType,Value,Status) Table and column the data write into
SELECT Date+' '+Time,Name,Attribute,DataType,Value,Status FROM inserted ;

This paragraph is to find the field of UA incoming data in the temporary storage data table.
After finishing settings, press "F5" to confirm if this command is success.

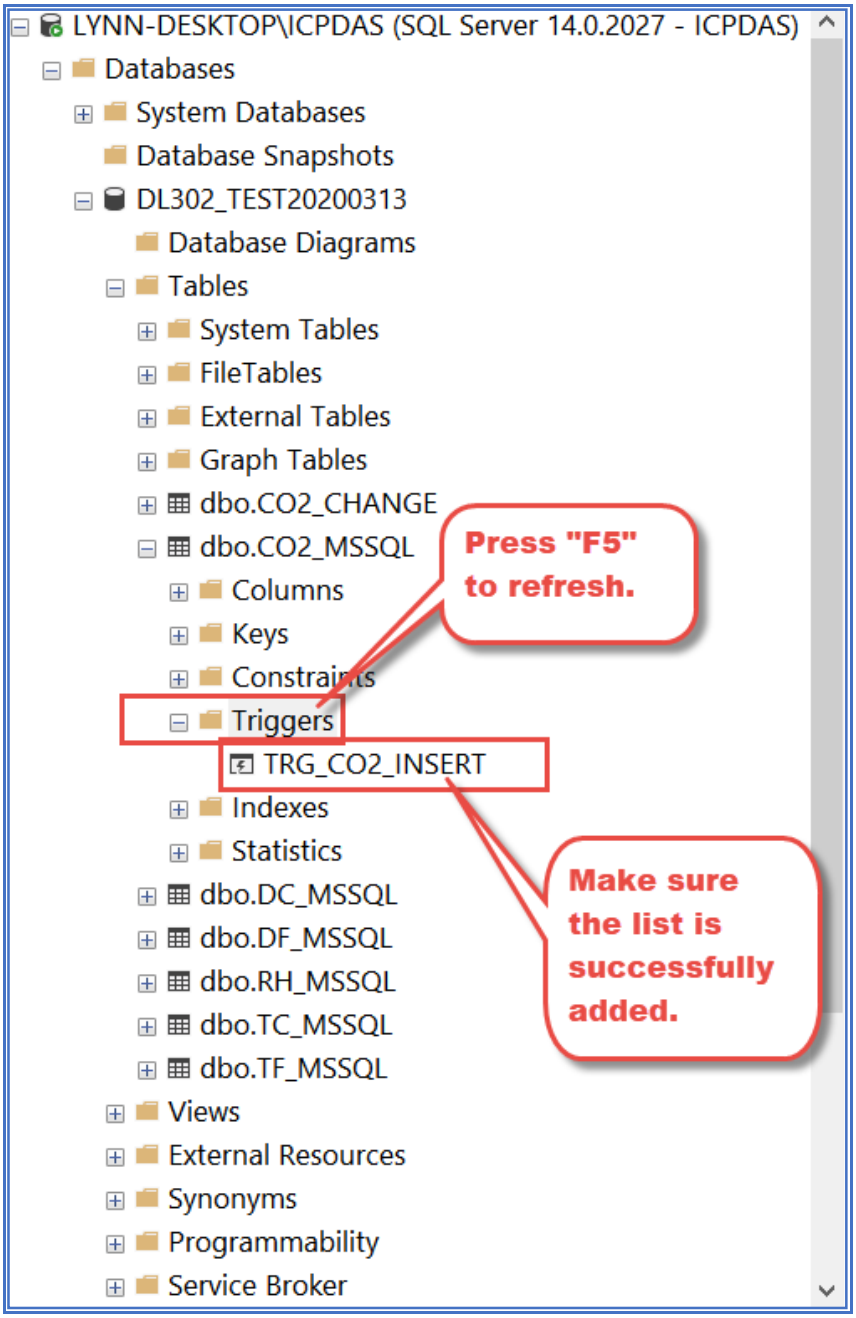


```
Messages
Commands completed successfully.

Completion time: 2020-09-22T17:27:39.9354864+08:00
```


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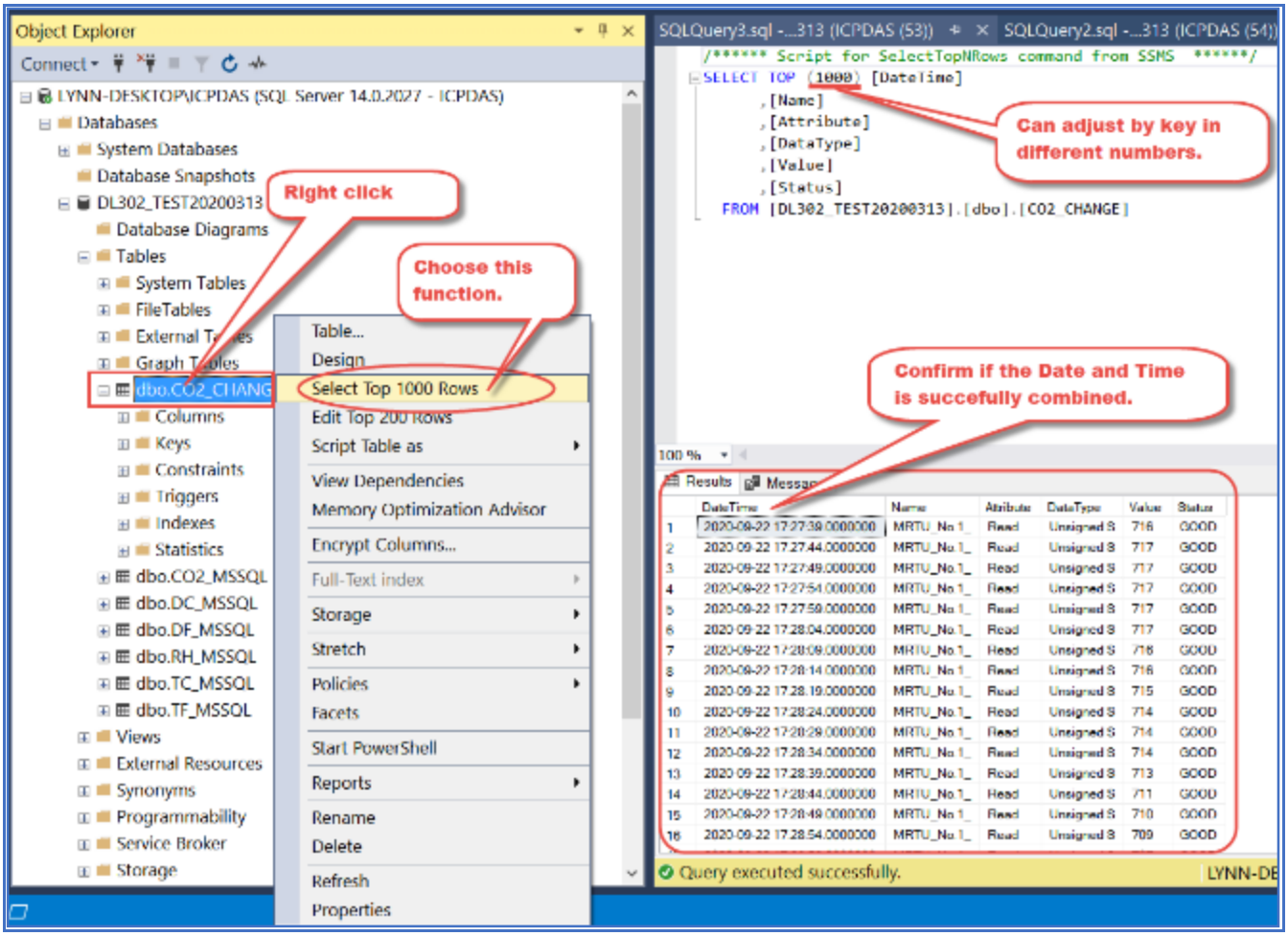
Click "Triggers" and press "F5" to refresh. Make sure the new trigger is added.



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Go back the new Table just created, right click and choose "Select Top 1000 Rows"

To confirm if the Columns Date and Time are combined into new Table.

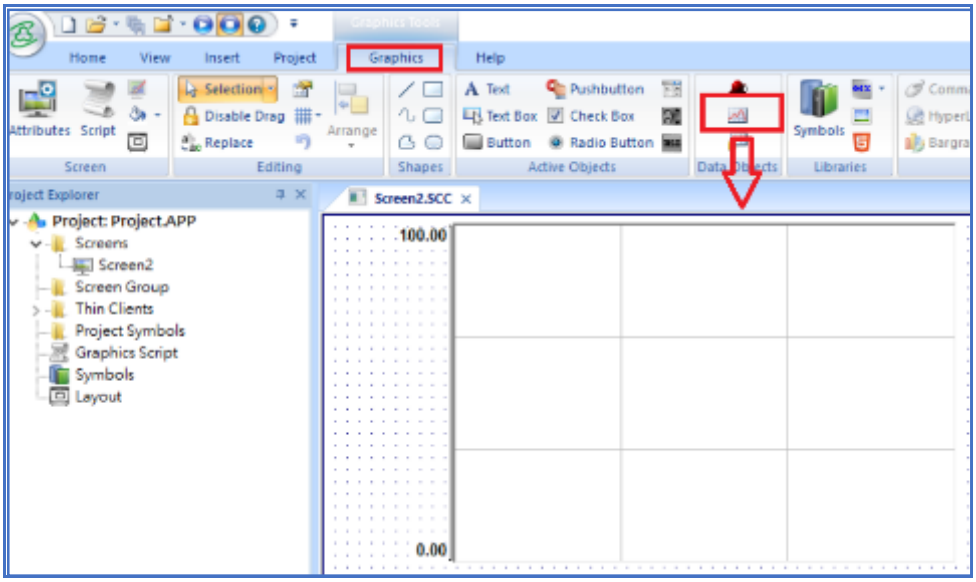


<End of this section>

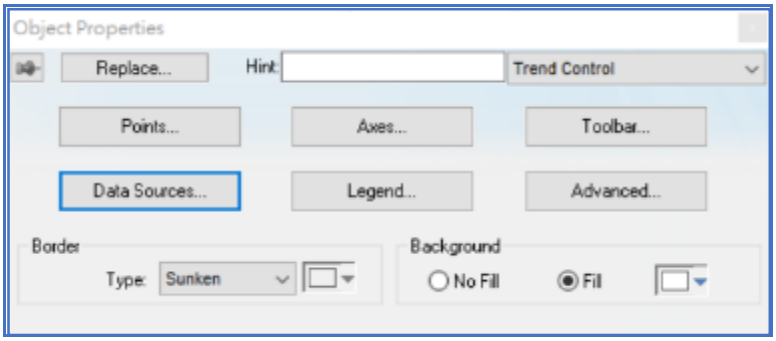
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How InduSoft read SQL?

Log in InduSoft, choose "Graphics" and in the Data Objects, select "Trend" icon.

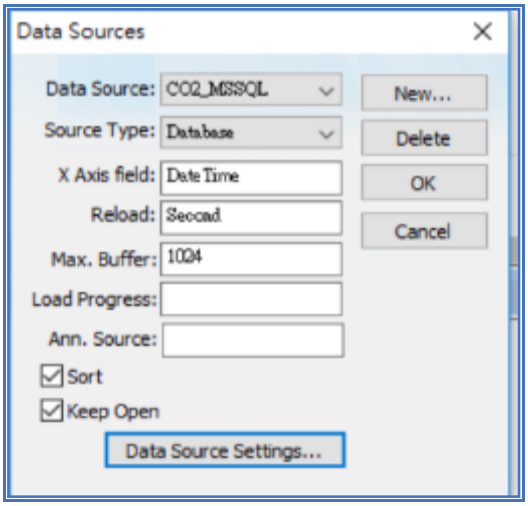


Double-click "Trend" to open the Object Properties.



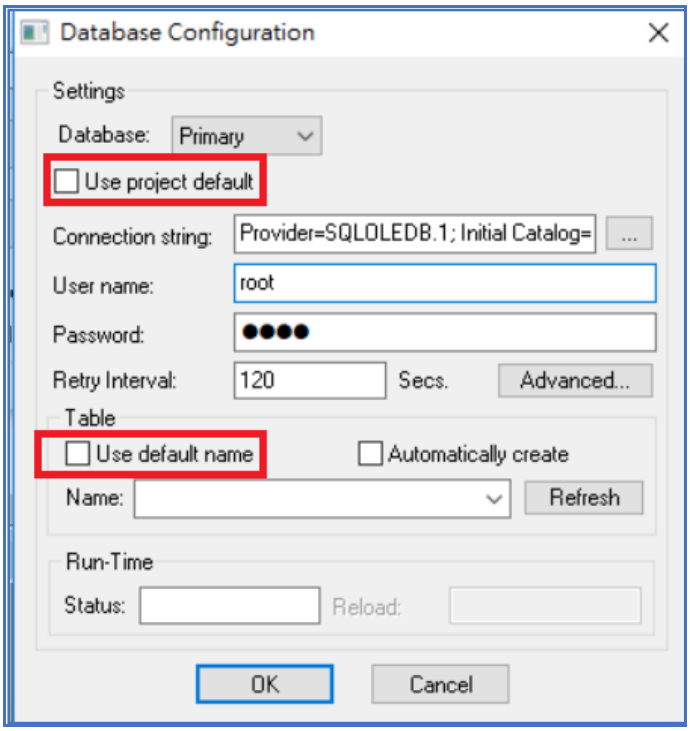
Press [Data Sources] and [New], key in the name and then press [Create] button.

In the blank of "X Axis field", key in the column name in SQL Server which records time.

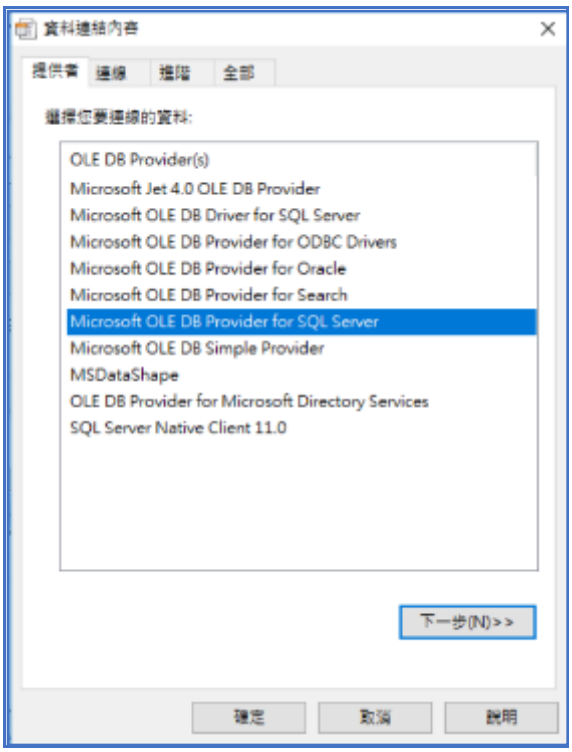


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Press [Data Source Settings], cancel the checkbox of [Use project default] and [Use default name], then click ... button.

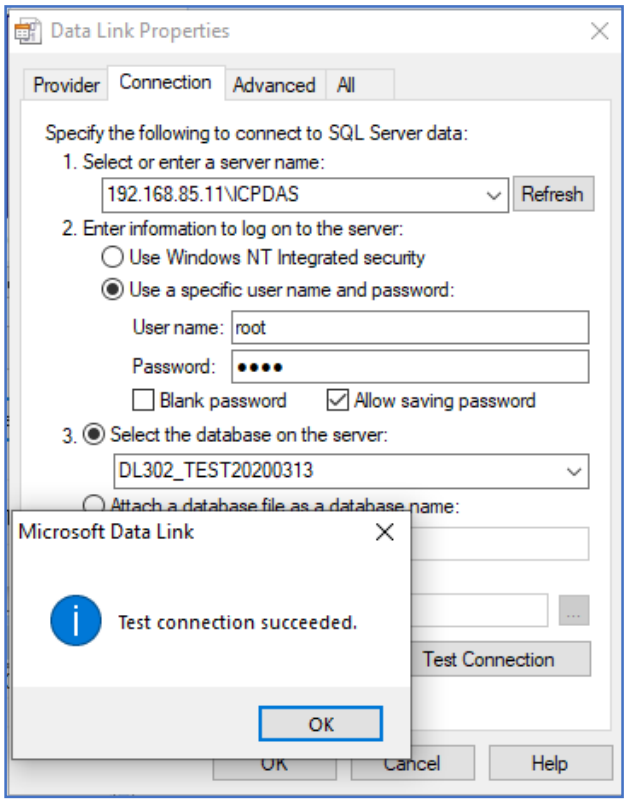


Select [Microsoft OLE DB Provider for SQL server] and click [Next].

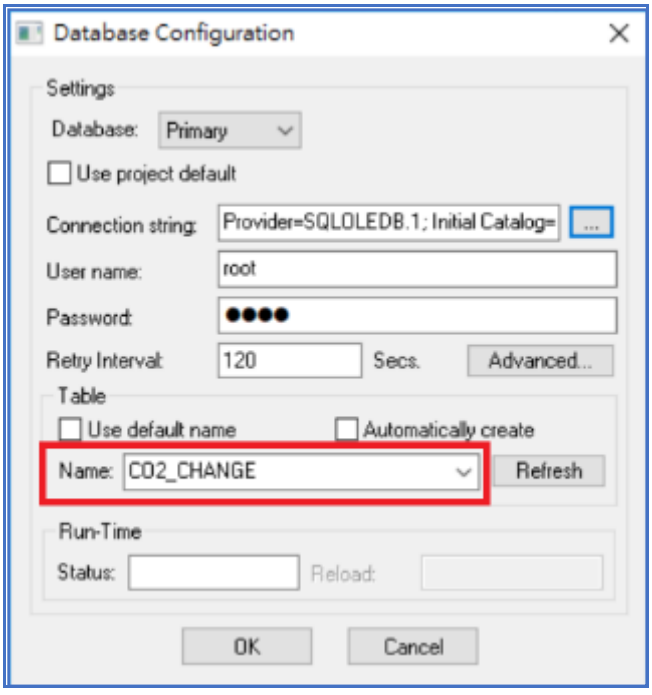


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Fill in the [Connection] content, test the connection, show up a dialog box with "success" message and click OK.

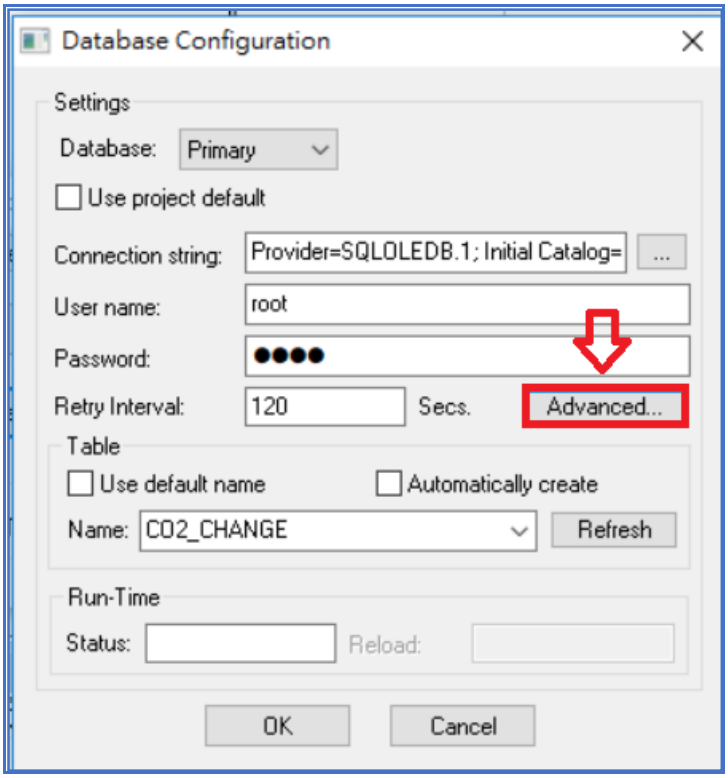


Choose the data to read, and click [OK].

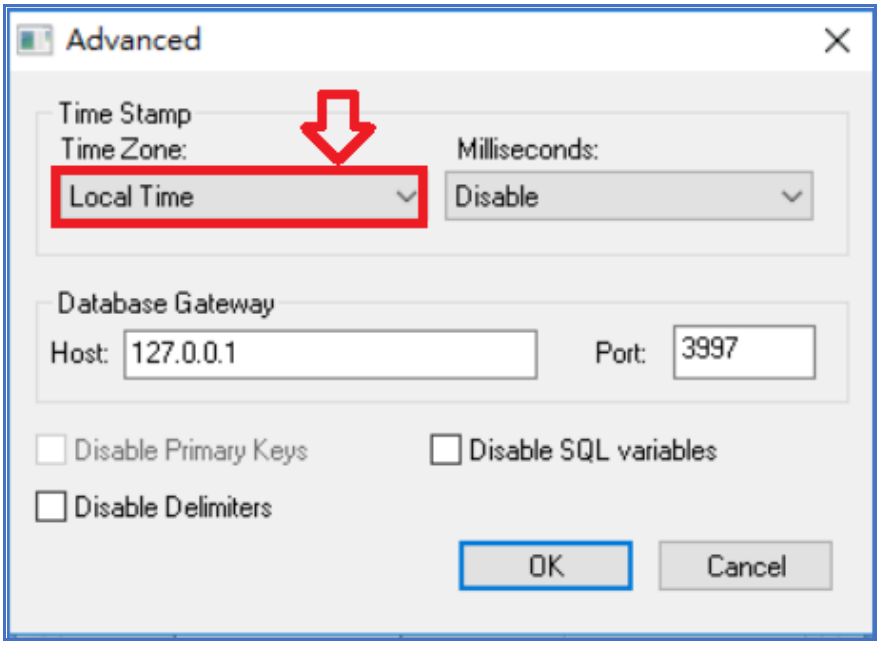


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Click [Advanced]

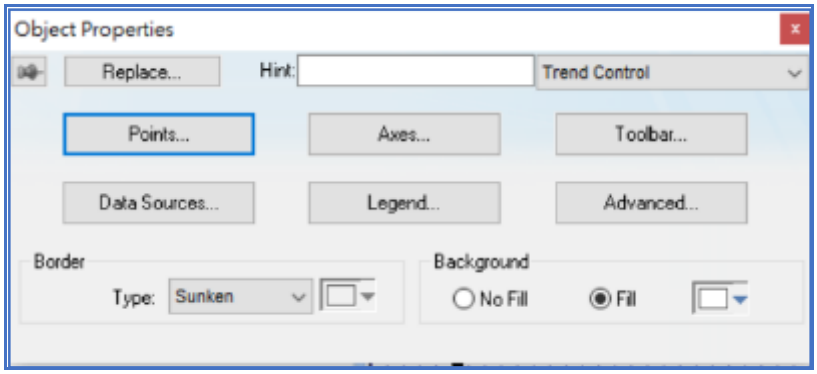


Set [Time Zone] to [Local Time] (Changeable according to different cases), and click [OK]

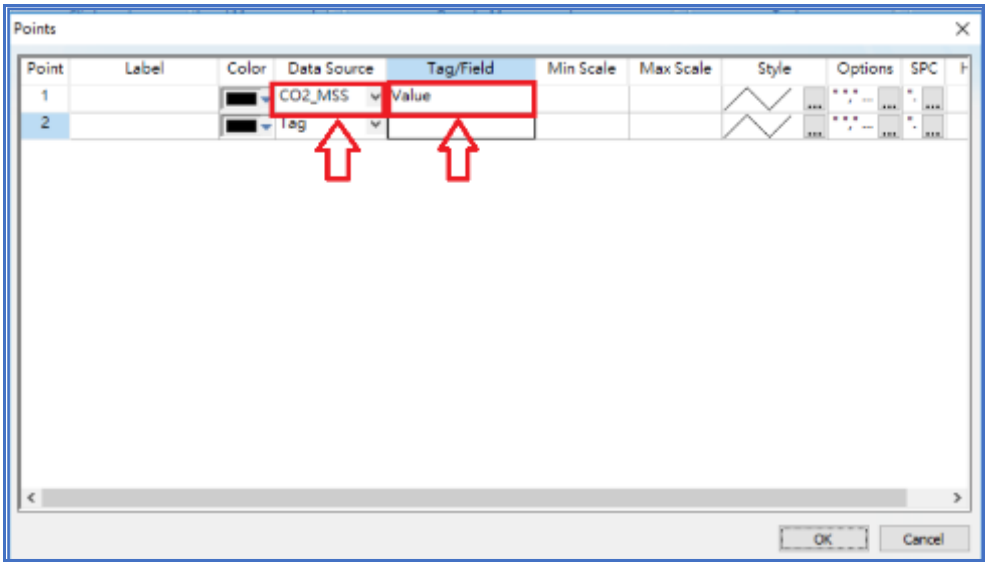


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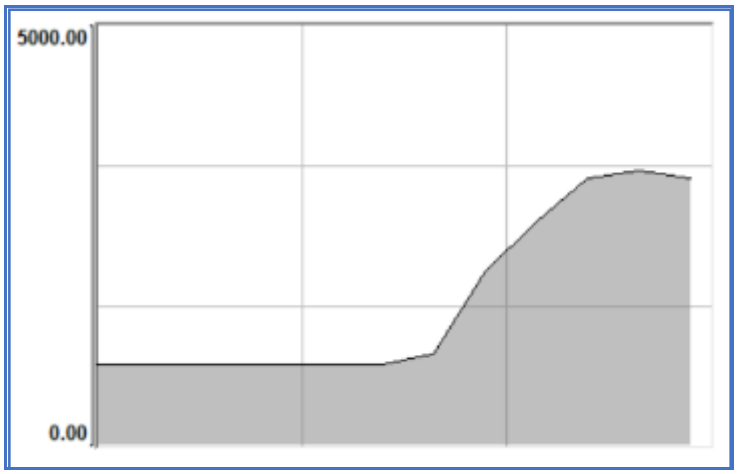
Double-click "Trend" to open the Object Properties, press [Points].



Select and fill in [Data Source] and [Tag/Field] used, click [OK].



Finish and the trend show up as below:



[End of this Section]

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