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# **Practical Example**

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## **Client, Server, IEC61850 communications**

<b>Practical session 1</b>	<b>Installation of 61850 Server/Client Suite</b>
<b>Practical session 2</b>	<b>Server</b>
<b>Practical session 3</b>	<b>Improved Client Graphical User Interface (GUI)</b>
<b>Practical session 4</b>	<b>Improved Client Graphical User Interface (GUI) Continued</b>

# Practical 1

## Installation of 61850 Server/Client Suite

### Objective:

To install 61850 Test suite software.

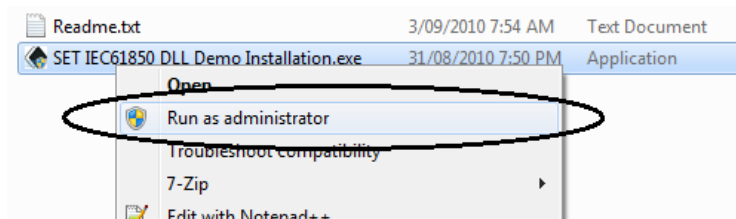
This software is provided by NettedAutomation and SystemCORP

**IGNORE THIS SECTION IF YOU WILL BE USING THE REMOTE LABS!  
The software will have been installed on the remote lab PC already. Simply skip ahead to Practical 2.**

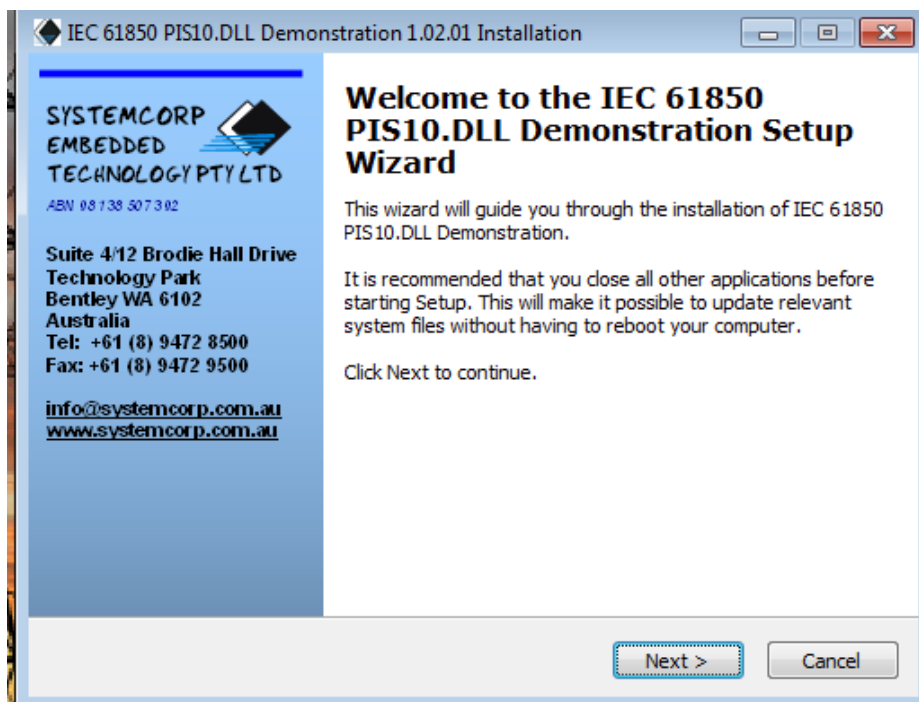
### Procedure:

#### Step 1:

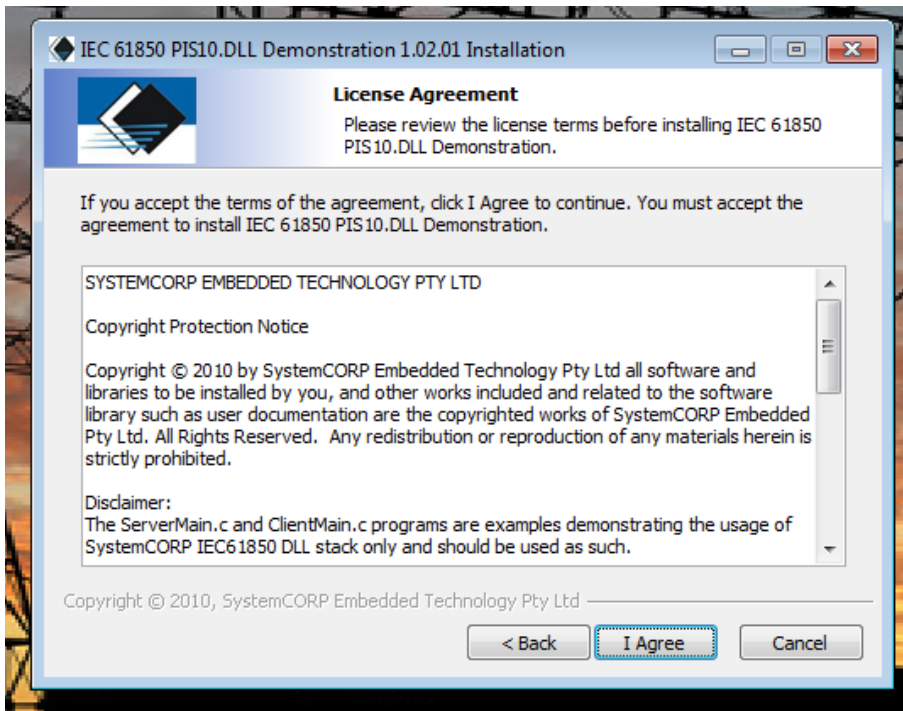
- Download the following files from the server:
  - Console-Server-Client\_2010-08-31.zip
  - DotNet-Client\_executable\_2011-02-23.zip
  - (A post installed version of the IEC server/client is available under the “IEC61850 CLIENT SERVER DEMO”)
- Extract the files from the .zip files.
- Right click the “SET IEC61850 DLL Demo Installation.exe” and click on Run as administrator.



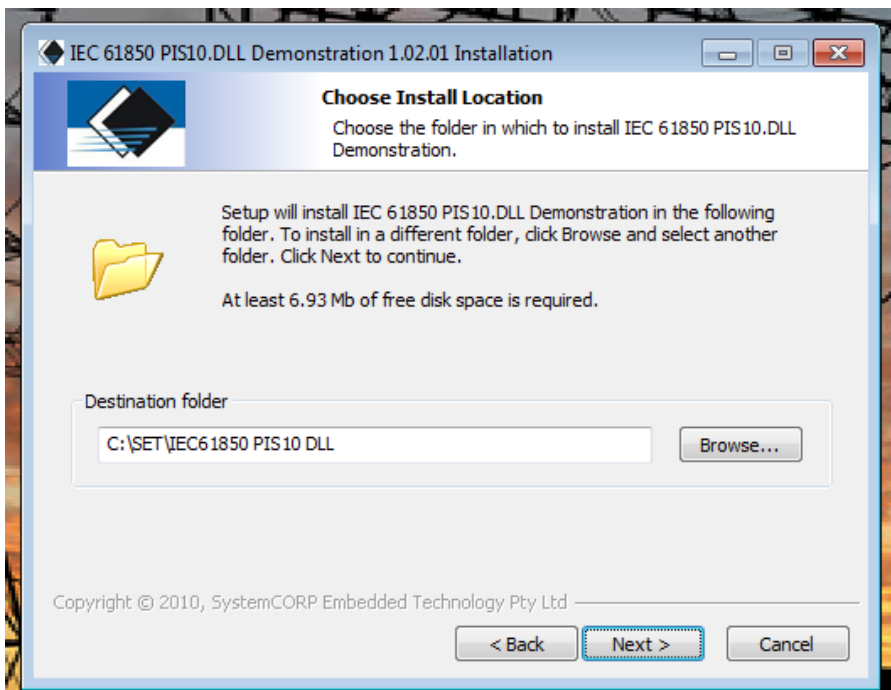
**Step 2:** Click on “Next” to continue.



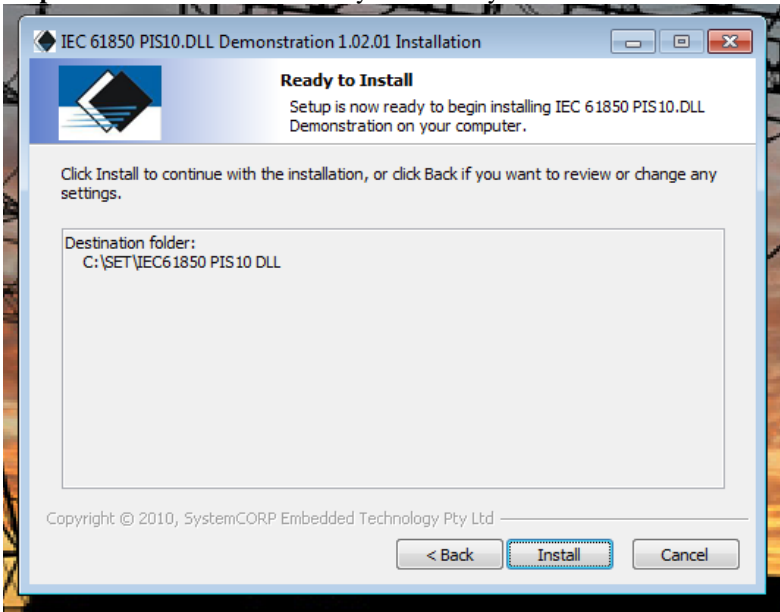
**Step 3:** Accept the license agreement and click on “I Agree”.



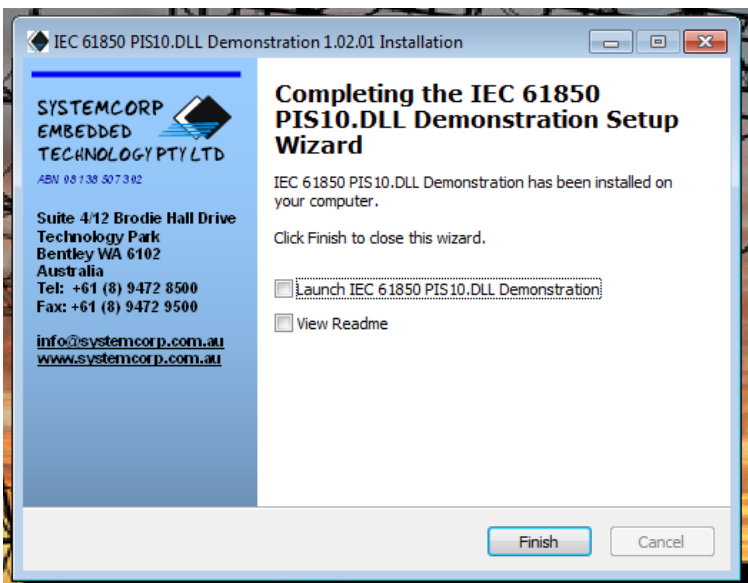
**Step 4:** Select the destination folder for the program to install and click on “Next”.  
By default the software will be installed in C:\SET\... (On the remote Labs, it will be installed to the Desktop)  
You can change the destination folder path if you wish to.



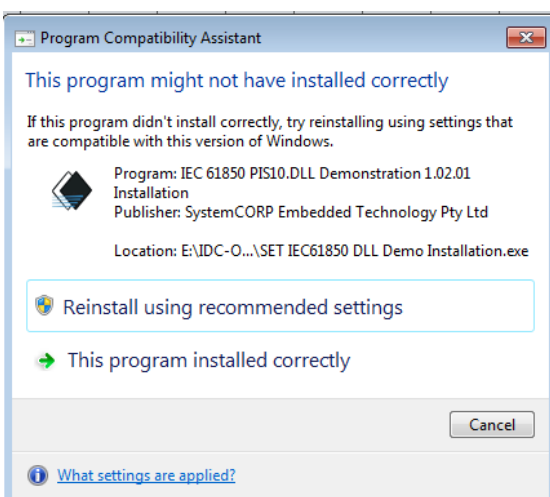
**Step 5:** Click on “Install” when you are ready.



**Step 6:** Untick the Launch IEC... and the View Readme checkboxes. Click on “Finish” to Complete.

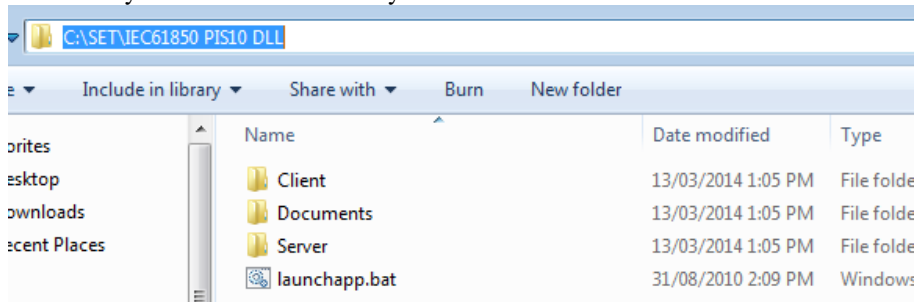


**Step 7:** If a compatibility assistant menu appears, simply click the “This program installed correctly” button.

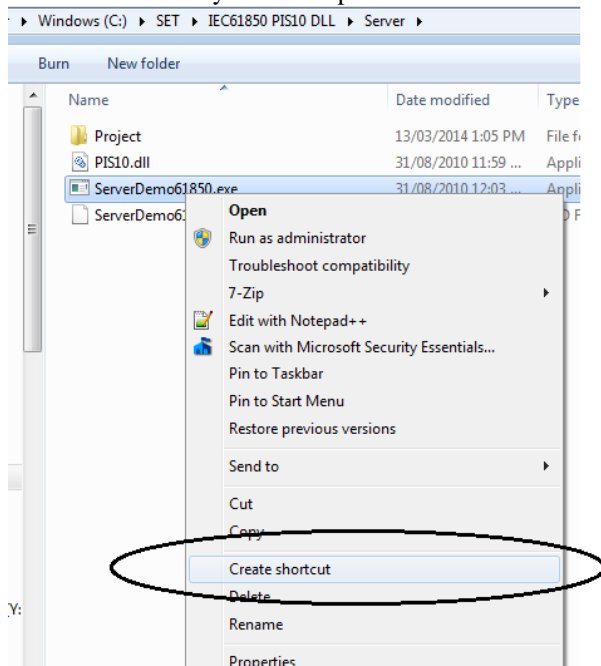


**Step 7:** The software has successfully installed on your PC. The software does not create shortcuts on your desktop. To do this:

- a. Browse to your installation directory:

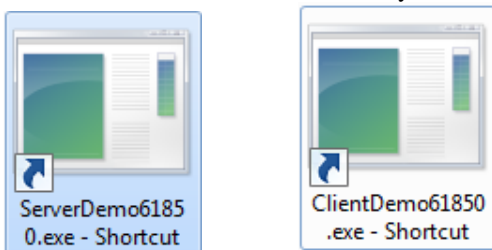


- b. First go to the Server folder. Right click the ServerDemo61850.exe and click “Create shortcut”. Drag and drop the created shortcut to your desktop.



- c. Repeat the same procedure for the ClientDemo61850.exe and move the shortcut to your desktop

You should have 2 new shortcuts on your desktop.



# Practical 2

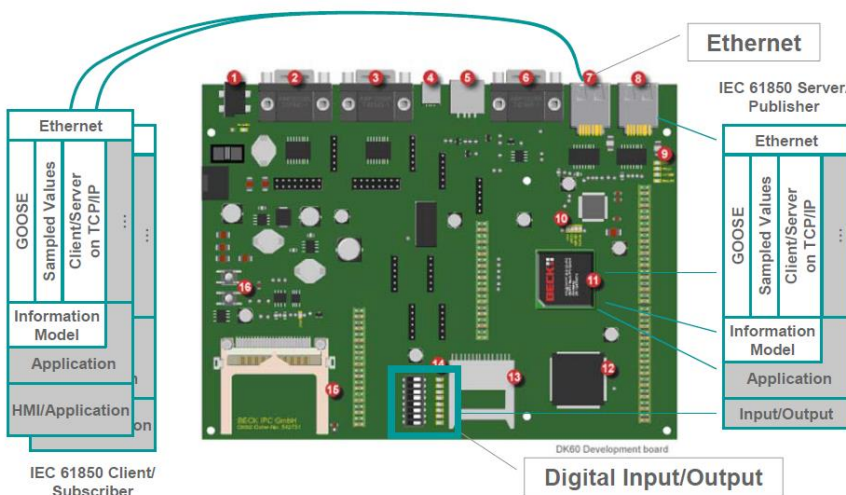
## Server

### Objective:

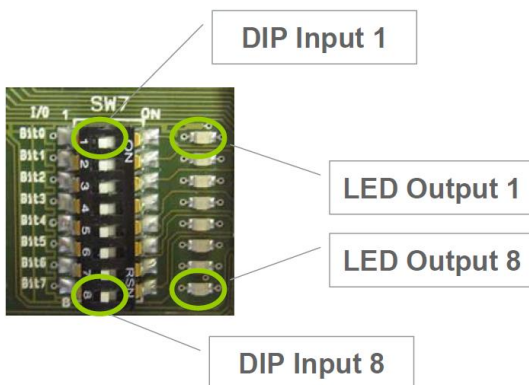
The objective is to start and configure an IEC61850 server and client. (Available on Remote Lab 8)

### Description:

The purpose of the server is to showcase the starting of an IEC61850 server and client. Both the Server and the Client will be run on the same, local machine (localhost = IP 127.0.0.1). The software is provided by NettedAutomation and SystemCORP. The demo is based on the system explained in “IEC 61850 (IEC 61400-25) DLL Getting Started using SystemCORP Embedded Technology” shown below.



The Server is the main board with the Digital inputs configured using DIP switches representing “Indicators” and “Alarms”. The client is an external HMI, allowing the user to set the alarm temperature and toggle virtual LEDs, which will send messages back to the server, which in turn will physically toggle the LEDs next to the DIP switches.



Thus the Server Outputs to the client are:

- Indicator 1 – 4 (Represented by the top four DIP switches 1-4)
- Alarm 5 – 6 (Represented by the bottom four DIP switches 5-8)
- Temperature

The Client receives the messages from the server, and allows the following user configurations to be sent back to the server:

- Alarm max temperature (This will initiate an alarm message at the client side, whenever the temperature exceeds the limit on the server side)
- LED toggles (representing input from the end user HMI)

**Note:**

Additional information on the IEC61850 Demo software can be found in the attached 09&10\_EXAMPLE\_IEC61850\_NA.pdf in your course material files.

**Server - Step 1:**

Open the ServerDemo61850.exe from the shortcut created on the desktop. The following window will open:

```

ServerDemo61850.exe - Shortcut
-----
IEC61850 Server DLL Demo from SystemCORP Pty Ltd
Suite 4/12 Brodie Hall Drive, Bentley, Technology Park, Western Australia, 6102
email: info@systemcorp.com.au Telephone: +61 (0) 8 9472 8500
http://www.systemcorp.com.au
-----

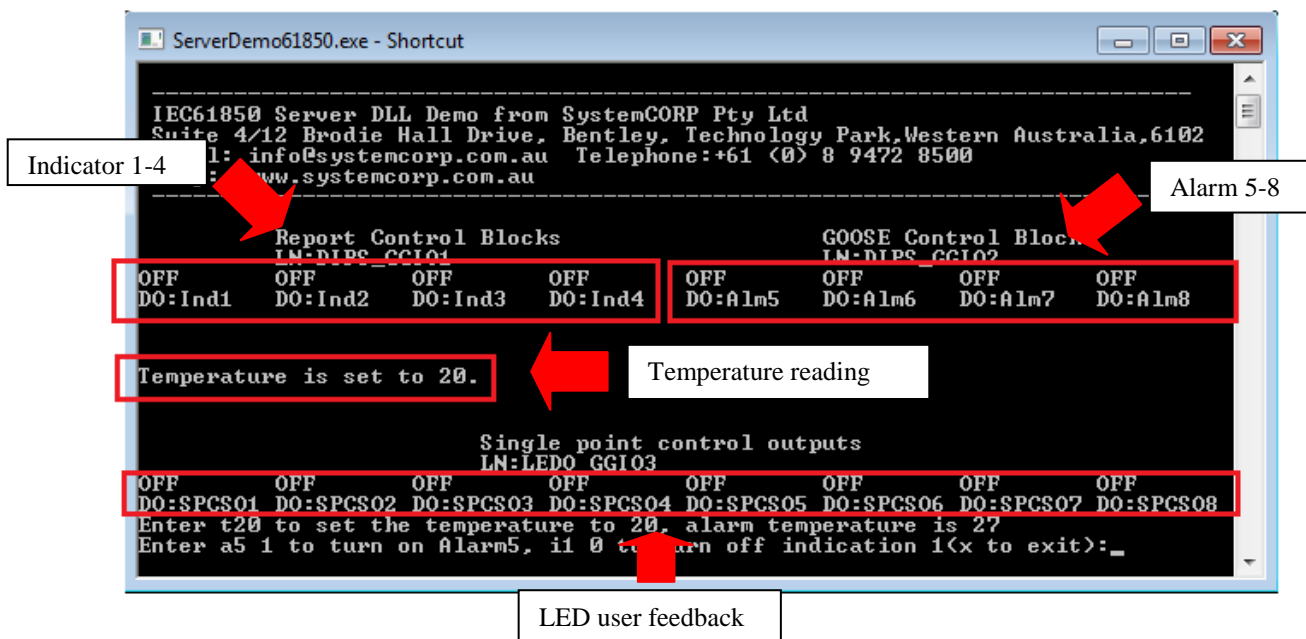
Report Control Blocks
LN:DIPS_GGI01
DO:Ind1  OFF  DO:Ind2  OFF  DO:Ind3  OFF  DO:Ind4  OFF  DO:Alm5  OFF  DO:Alm6  OFF  DO:Alm7  OFF  DO:Alm8  OFF

GOOSE Control Blocks
LN:DIPS_GGI02
DO:Alm6  OFF  DO:Alm7  OFF  DO:Alm8  OFF

Single point control outputs
LN:LEDO_GGI03
DO:SPCS01 OFF  DO:SPCS02 OFF  DO:SPCS03 OFF  DO:SPCS04 OFF  DO:SPCS05 OFF  DO:SPCS06 OFF  DO:SPCS07 OFF  DO:SPCS08 OFF
Enter t20 to set the temperature to 20, alarm temperature is 27
Enter a5 1 to turn on Alarm5, i1 0 to turn off indication 1(x to exit):_

```

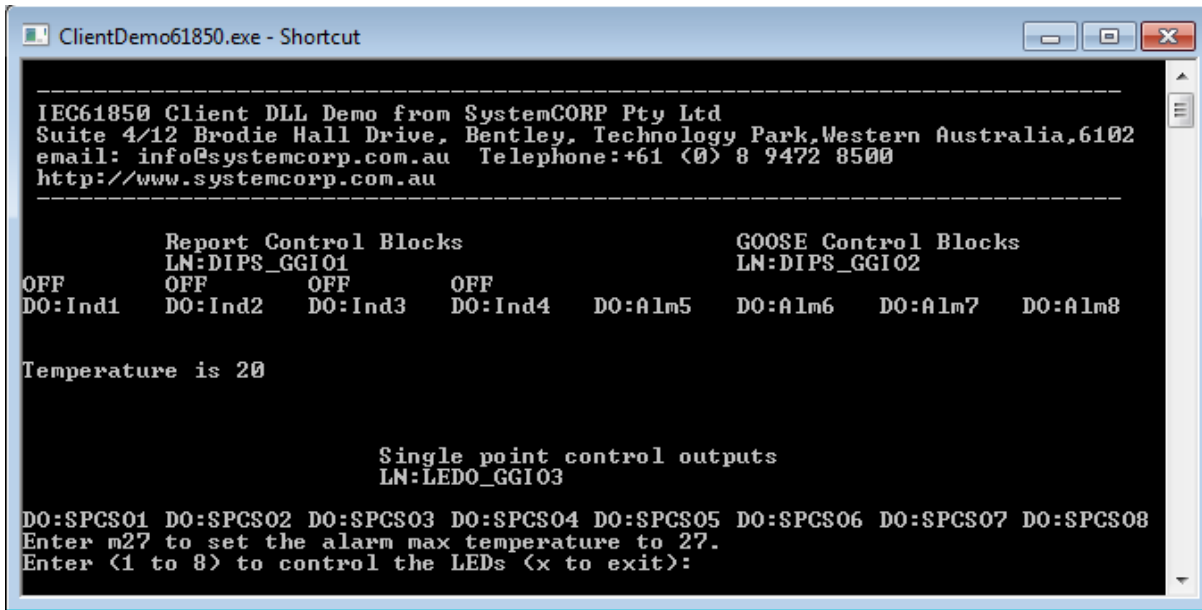
This window represents the Server. The server shows the four indicators (Ind1-4), the alarms (Alm5-8), the LED feedback from the user (SPCS01-08) and the alarm temperature setting from the client, and the temperature measurement.

**Server - Step 2:**

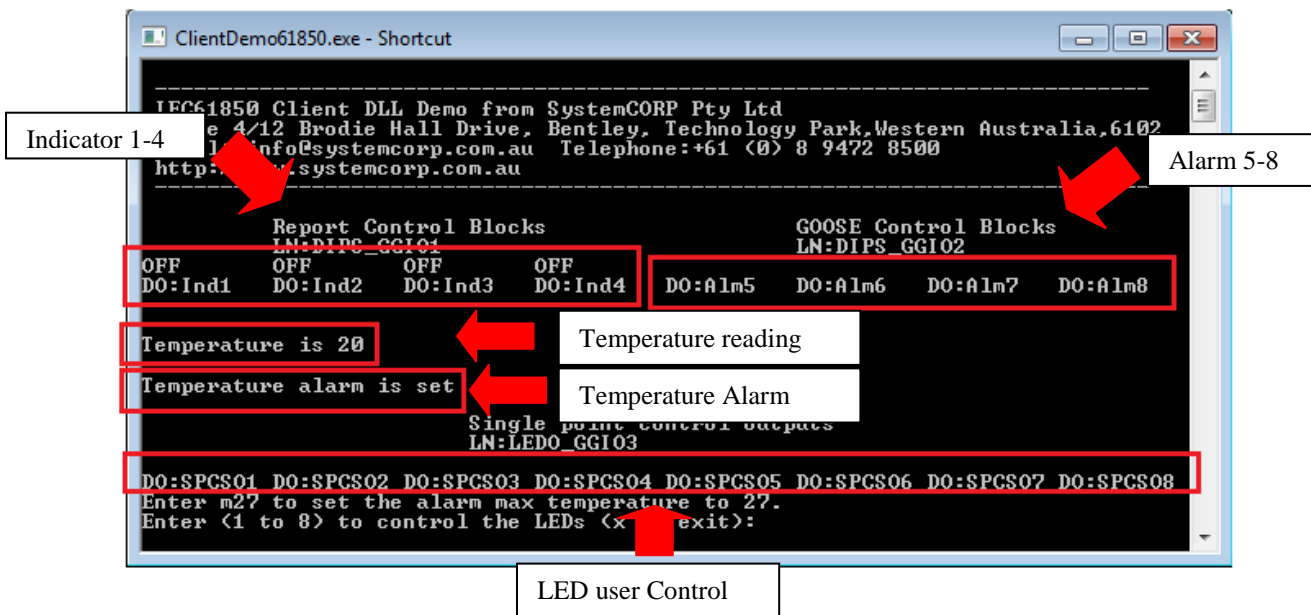
The temperature can be set to 20°C by typing **t20** in the window. The Indicators could be toggled by typing **i1 1** to switch on and **i1 0** to switch off. The same holds for the Alarms by typing **a5 1** or **a8 0**.

**Client - Step 1:**

Open the ServerDemo61850.exe from the shortcut created on the desktop. The following window will open:



This window represents the Client. The Client shows the four indicators (Ind1-4), the alarms (Alm5-8), the LED control from the user (SPCS01-08), the temperature measurement sent from the Server. It also allows the alarm max temperature value to be configured by the User, and shows a notification when the measured temperature received from the server exceeds the max threshold.



**Client - Step 2:**

The temperature alarm threshold can be set to 25°C by typing **m25** in the window. The LEDs can be toggled by repeatedly typing **1** to switch LED 1 on or off. The same holds for LEDs 2-8. Any changes made on the Server DIP switches, such as the Indicators, or temperature reading, will be reflected in the Client window.

**Server/Client - Step 3:**

In the Server: Change the Temperature, Switch on any of the Indicators and Alarms.

In the Client: Toggle any of the LEDs and change the Temperature Alarm Threshold. (Be sure to try and obtain the “Temperature alarm is set” message in the Client side.



# Practical 3

## Improved Client Graphical User Interface (GUI)

### Objective:

To install version of the Client with an improved GUI.

This GUI software is provided by NettedAutomation and SystemCORP

### Description:

The GUI provides a Test Client in order to exercise Client/Server implementations.

**IGNORE THIS SECTION IF YOU WILL BE USING THE REMOTE LABS!**

**The software will have already been installed on the Remote Lab PC. Simply skip ahead to Practical 4.**

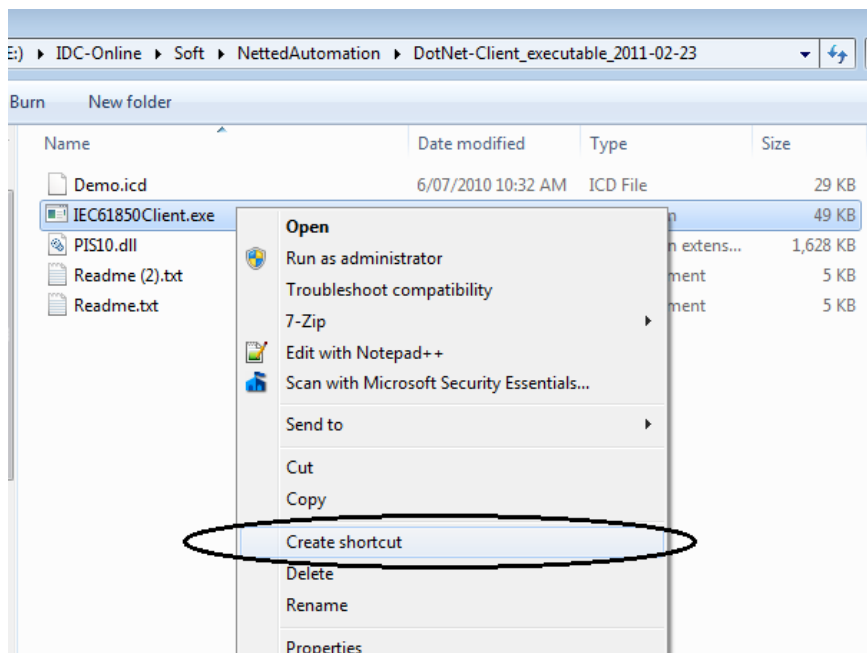
### Procedure:

#### Step 1:

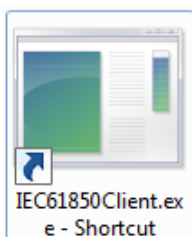
- a. Download the following files from the server:
  - DotNet-Client\_executable\_2011-02-23.zip
- b. Extract the files from the .zip files to your preferred directory.

**Step 2:** The software will be extracted to your PC. The software does not create a shortcut on your desktop. To do this:

- a. Browse to your installation directory. Right click the IEC61850Client.exe and click "Create shortcut". Drag and drop the created shortcut to your desktop:
- b.



You should have 1 new shortcuts on your desktop.



# Practical 4

## Improved Client Graphical User Interface (GUI) Continued

**Objective:**

To connect to the Server hosted in Practical 2 through an improved Client with a graphical interface.

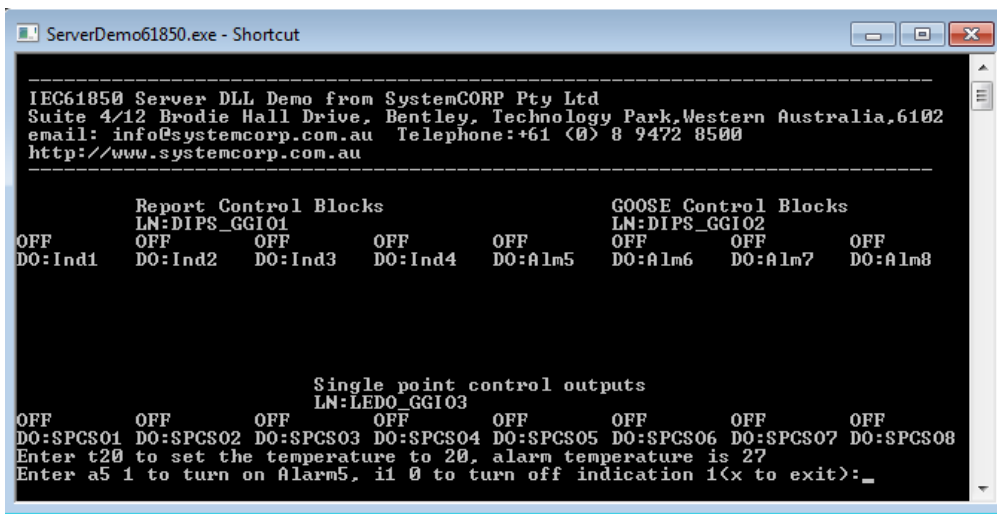
**Description:**

The GUI provides a Test Client in order to exercise Client/Server implementations. It is similar to the Command Prompt version used in Practical 2, with prettier pictures...

**Step 1:**

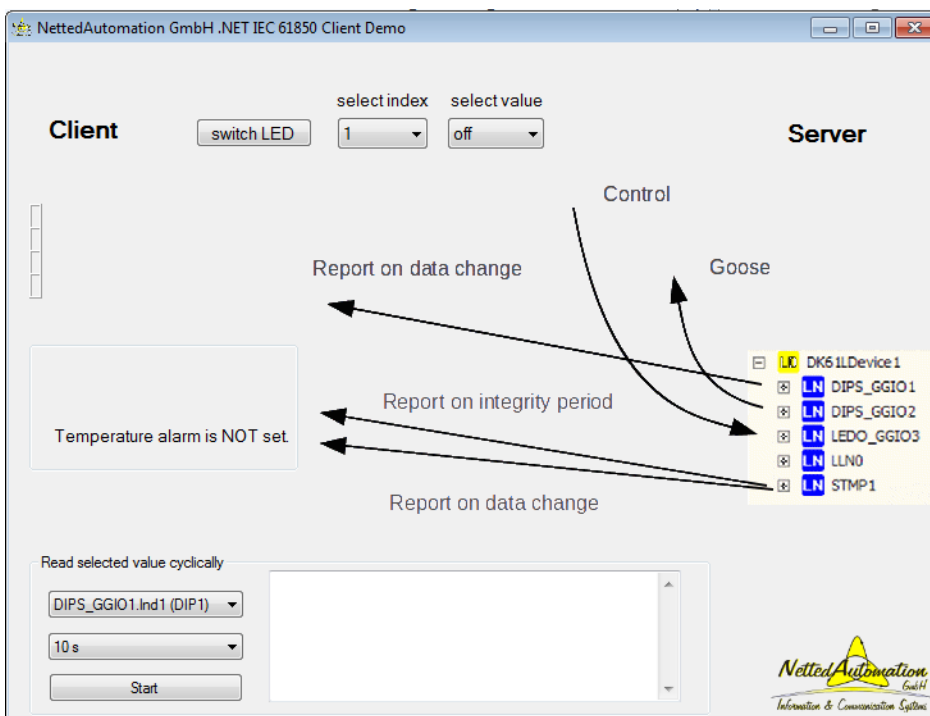
Ensure the Server as explained in Practical 2 is active by:

Open the ServerDemo61850.exe from the shortcut created on the desktop. The following window will open

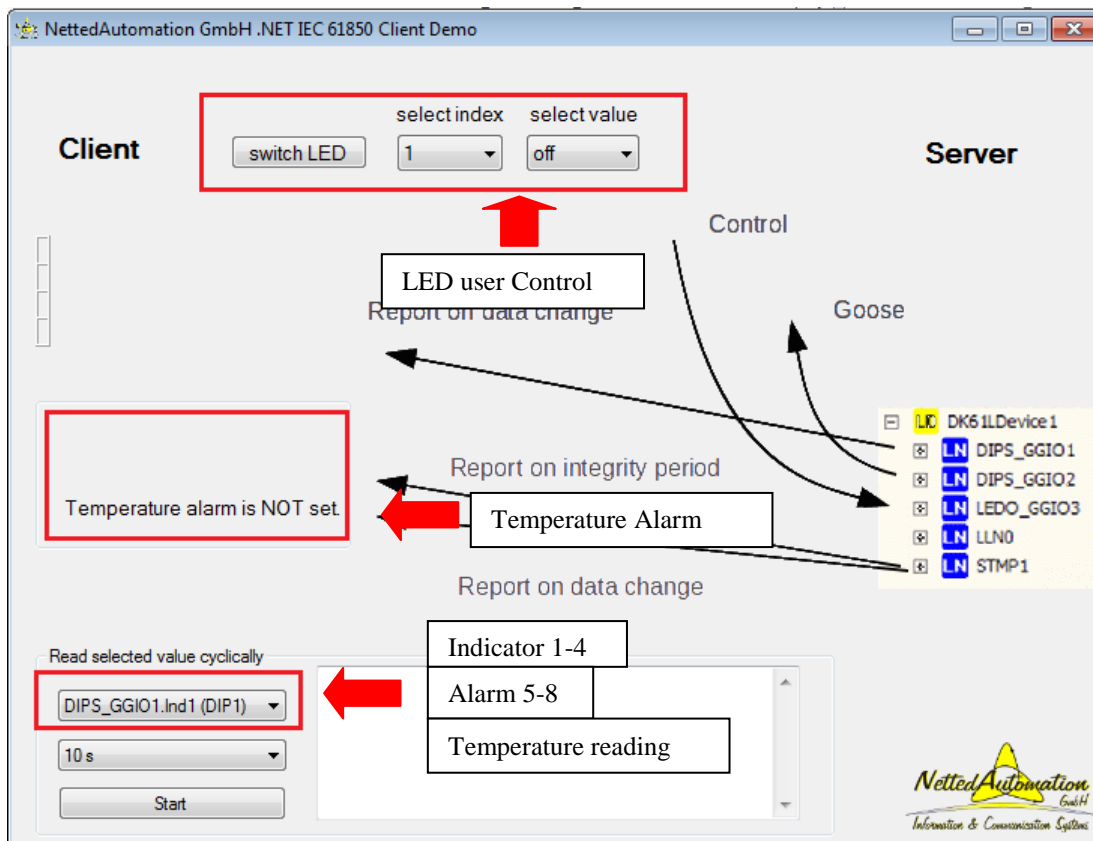


**Step 2:**

Open the new IEC61850Client.exe from the shortcut created on the desktop. The following window will open:

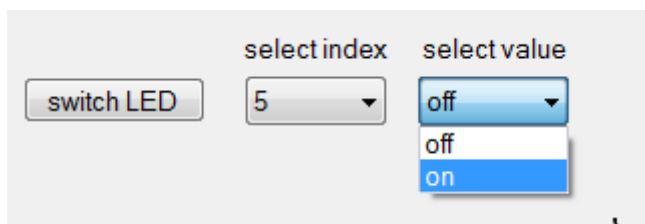
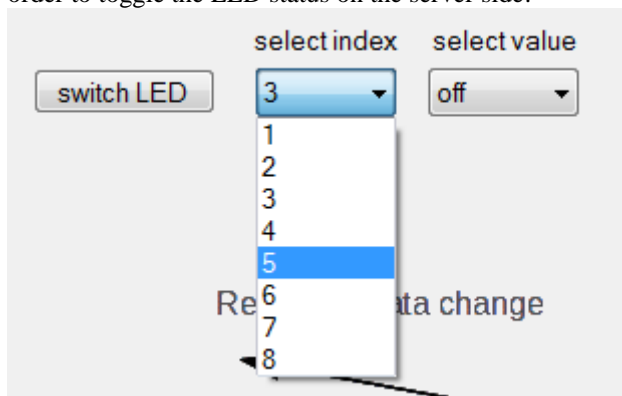


This window contains the same Client values as seen in Practical 2. The Temperature Alarm state reading is visible in addition to a few controls for the LEDs. Further, the GUI includes a cyclic reading function, to request three values: the Indicator 1 DIP, Alarm 5 DIP, and the Temperature Reading.



**Step 3:**

Open the LED selection index dropdown and select LED 5. Toggle the value of the LED to the “on” or “off” position in order to toggle the LED status on the server side:



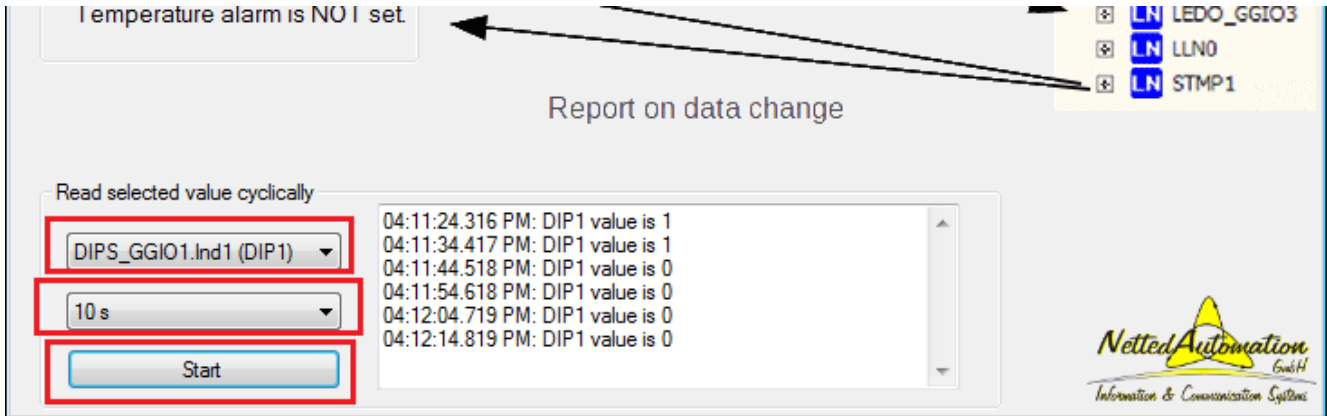
You should be able to see the changes to the LED values on the Server side:

```

Single point control outputs
LN:LEDO_GGIO3
OFF      OFF      OFF      OFF      ON      OFF      OFF      OFF
DO:SPCS01 DO:SPCS02 DO:SPCS03 DO:SPCS04 DO:SPCS05 DO:SPCS06 DO:SPCS07 DO:SPCS08
Enter t20 to set the temperature to 20, alarm temperature is 28
Enter a5 1 to turn on Alarm5, i1 0 to turn off indication 1(x to exit):
    
```

**Step 4:**

Cyclically read the DIP for Indicator 1, every 10 seconds by selecting the following the Client GUI:  
 Press start in order to read the values.



**Step 5:**

Change the values for Indicator 1 on the Server side, and observe the value change on the Client GUI side: (The Server side should reflect show changes in the marked areas)

```

ServerDemo61850.exe - Shortcut
-----
IEC61850 Server DLL Demo from SystemCORP Pty Ltd
Suite 4/12 Brodie Hall Drive, Bentley, Technology Park, Western Australia, 6102
email: info@systemcorp.com.au Telephone: +61 (0) 8 9472 8500
http://www.systemcorp.com.au
-----
Report Control Blocks
LN:DIPS_GGIO1
OFF      OFF      OFF      OFF      OFF
DO:Ind1  DO:Ind2  DO:Ind3  DO:Ind4  DO:Alm5
GOOSE Control Blocks
LN:DIPS_GGIO2
OFF      OFF      OFF      OFF      OFF      OFF      OFF
DO:Alm6  DO:Alm7  DO:Alm8
-----
Temperature is set to 19.

Single point control outputs
LN:LEDO_GGIO3
OFF      OFF      OFF      OFF      ON      OFF      OFF      OFF
DO:SPCS01 DO:SPCS02 DO:SPCS03 DO:SPCS04 DO:SPCS05 DO:SPCS06 DO:SPCS07 DO:SPCS08
Enter t20 to set the temperature to 20, alarm temperature is 28
i1 0r a5 1 to turn on Alarm5, i1 0 to turn off indication 1(x to exit):i1 0_
    
```

A similar cyclical reading exercise can be repeated for the Temperature readings:

