

USG Engineering Digital Transformation

IOT PLC Demonstrator

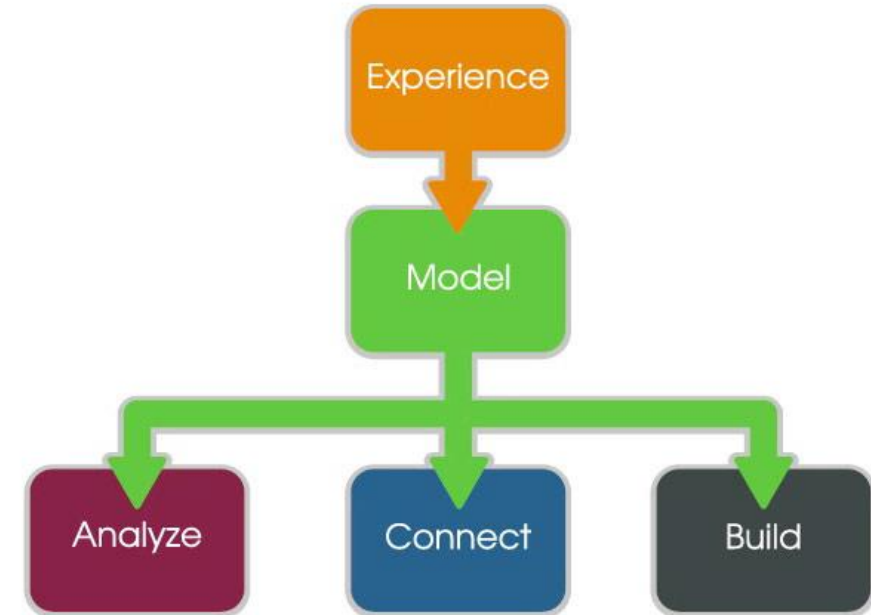
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- Demo
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- Q & A

PLC Demonstrator use case & approach

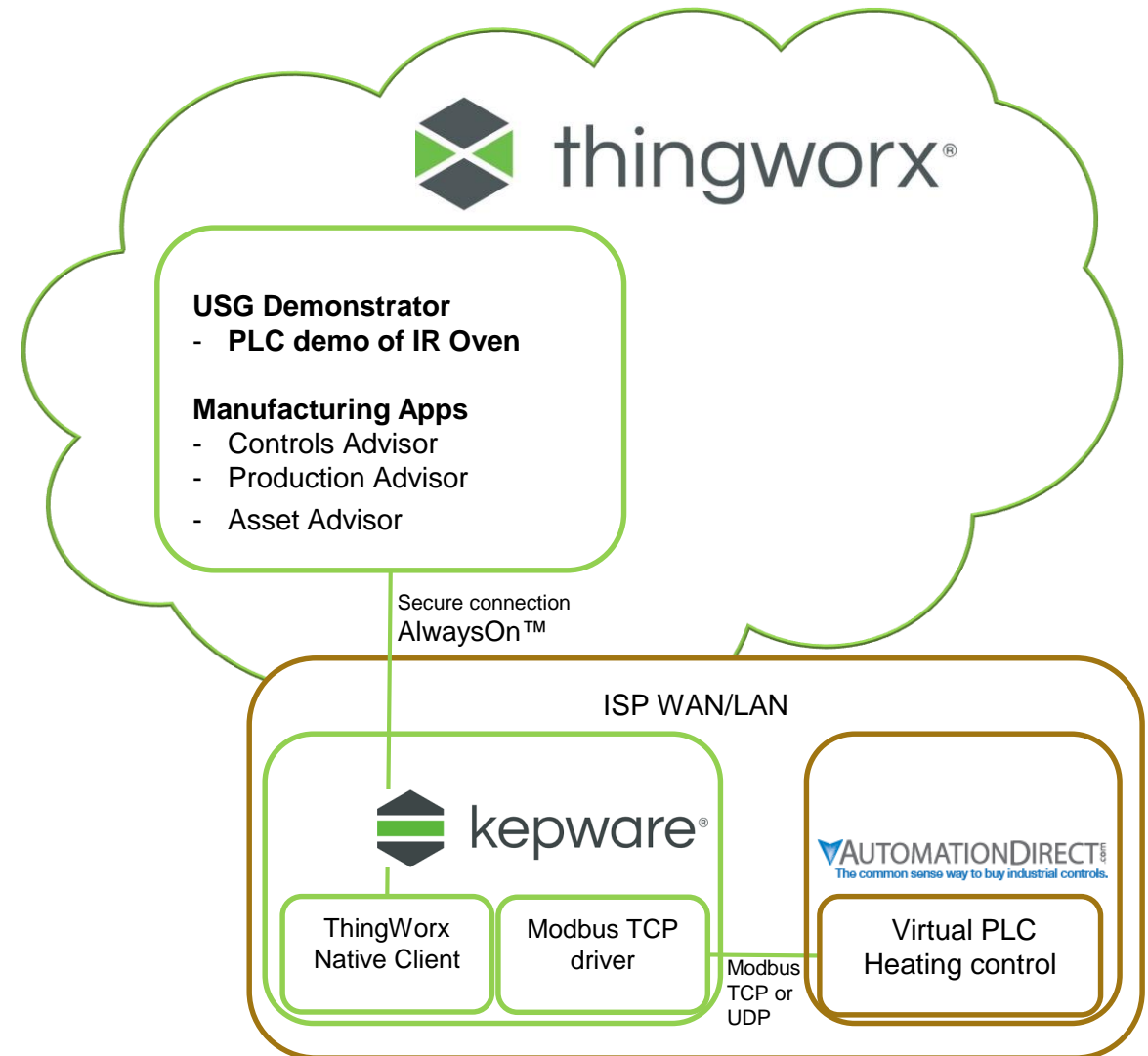
Use Case: PLC demonstrator of a simple oven

ID:	PLCDemo2018
Title:	Using a simple PLC program using a virtual PLC to show the heating of an oven
Description:	Using a simple PLC ladder program loaded into a virtual PLC we will show what is needed to connect and control a machine to ThingWorx
Primary Actor:	Service Manager
Preconditions:	PLC program available and loaded into a virtual PLC ThingWorx and KepServerEX available
Postconditions:	A mashup that controls and shows the actual, minimum and maximum temperature of the heating element of the oven
Main Success Scenario:	The oven's temperature values are shown live in the TWX mashup The oven can be stopped and started from the TWX mashup
Extensions:	Connect oven to TWX Asset Advisor app
Frequency of Use:	Demo use
Status:	Prototype
Owner:	R. Schmale
Priority:	2



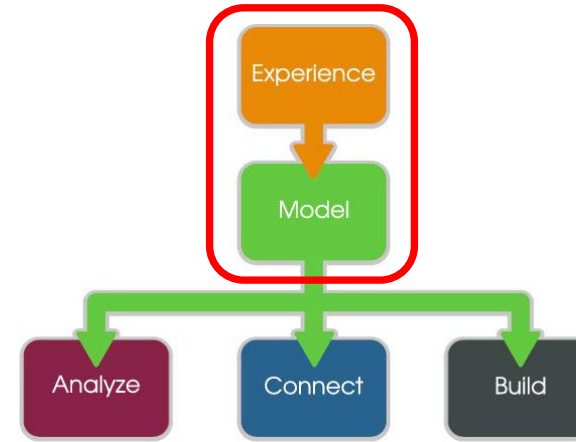
Components used for demonstrator

- Experience: **PTC Thingworx**
- Connectivity: **PTC Kepware**
- IR Oven: Expose data using **Automation Direct Do-More Virtual PLC** (Programmable logic controller)



Thingworx

- ThingWorx is the only platform that offers all of the capabilities needed to build and extract value from smart, connected operations.
- With rapid development tools and support for on-premise or cloud deployments, ThingWorx is the best IoT choice for companies serious about industrial innovation



Power on by Thingworx
 Power off by Thingworx
 Reset by Thingworx

Set Min Temp
 590

Set Max Temp
 602

Min.Temperatur

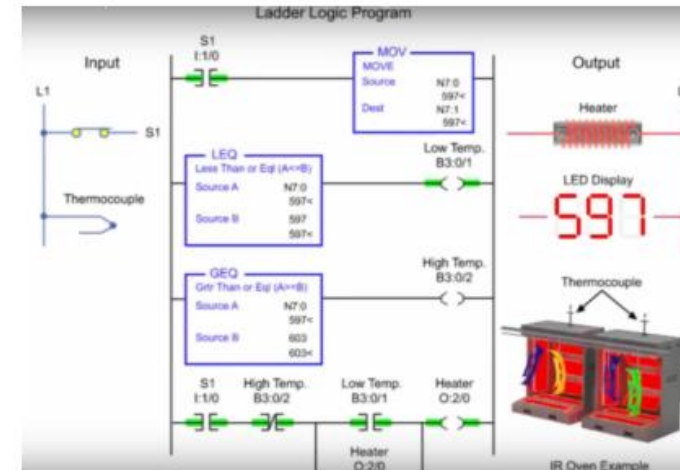
590.00

Max. Temperatur

602.00

Current Temperatur

595.00



Power On Status

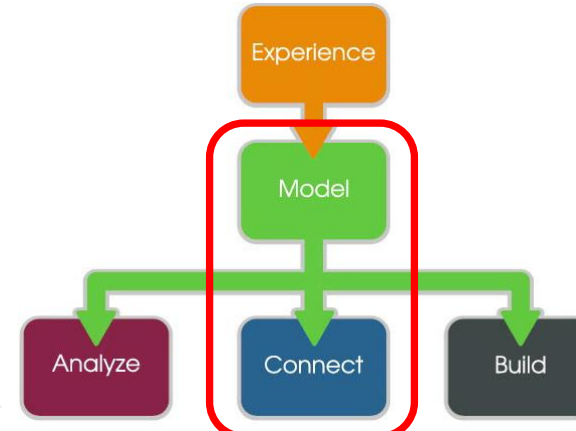
PLC Reset Button Pushed

Heating Status

Digital Transformation

Kepware

- KEPServerEX is the industry's leading connectivity platform that provides a single source of industrial automation data to all of your applications.
- The platform design allows users to connect, manage, monitor, and control diverse automation devices and software applications through one intuitive user interface.
- KEPServerEX leverages OPC (the automation industry's standard for interoperability) and IT-centric communication protocols (such as SNMP, ODBC, and web services) to provide users with a single source for industrial data.



KEPServerEX 6 Configuration [Connected to Runtime]

File Edit View Tools Runtime Help

Tag Name	Address	Data Type	Scan Rate	Scaling	Description
Power on	000001	Boolean	100	None	
Reset	000002	Boolean	100	None	
Heating	000005	Boolean	100	None	
Thingworx Reset Button	000006	Boolean	100	None	
Thingworx Power On	000007	Boolean	100	None	
Thingworx Power Off	000008	Boolean	100	None	
Min Temp	400001	Short	100	None	
Max Temp	400002	Short	100	None	
Current Temperature	400003	Short	100	None	

OPC Quick Client - Untitled *

File Edit View Tools Help

Item ID	Data Type	Value	Timestamp
PLC.PLC Device.Current Temperature	Short	18	11:17:52.009
PLC.PLC Device.Heating	Boolean	0	11:17:52.009
PLC.PLC Device.Max Temp	Short	24	11:17:52.009
PLC.PLC Device.Min Temp	Short	16	11:17:52.009
PLC.PLC Device.Power on	Boolean	1	11:17:52.009
PLC.PLC Device.Reset	Boolean	0	11:17:52.009
PLC.PLC Device.Thingworx Power Off	Boolean	0	11:17:52.009
PLC.PLC Device.Thingworx Power On	Boolean	0	11:17:52.009
PLC.PLC Device.Thingworx Reset Button	Boolean	0	11:17:52.009

Date Time Source Ready

28/11/2018	10:12:31	ThingWorx Native Interface	
28/11/2018	10:12:32	Modbus TCP/IP Ethernet	
28/11/2018	10:12:37	KEPServerEX.Runtime	
28/11/2018	10:13:31	Modbus TCP/IP Ethernet	

Connected to ThingWorx. | Platform = plmcad-ppn:8090/Thingworx/WS, Thing name = 'PTC.MfgSegment.Kepware_Simulator-GW'.
 Created memory for slave device. | Slave device ID = 0.
 REST server 'Agent' started at 'http://127.0.0.1:39320/iotgateway/'
 PLC | Starting unsolicited communication. | Protocol = 'TCP', Port = 502.

Item Count: 899

Do-More Virtual PLC

- Company: Automation Direct
- Virtual: a PLC simulator running on a Windows computer
- Easy to create a PLC ladder diagram and simulate
- Program can easily be deployed to a physical PLC

The screenshot displays the Do-more Simulator interface. On the left is a ladder logic diagram with rungs numbered 6 through 13. Rung 6 shows a reset button (X1) controlling a reset coil (C10). Rung 7 shows a power-on button (X1) controlling a power-on coil (C10). Rung 8 shows a temperature sensor (Modbus 0001) controlling a power-on coil (MC1). Rung 9 shows a temperature sensor (Modbus 0003) controlling a power-on coil (MC1). Rung 10 shows a local sensor (Y1) controlling a power-on coil (MC1). Rung 11 shows a temperature sensor (Modbus 0004) controlling a power-on coil (MC4). Rung 12 shows a temperature sensor (Modbus 0003) controlling a power-on coil (MC3). Rung 13 shows a power-on button (X1) controlling a power-on coil (MC1).

The control panel on the right includes the following sections:

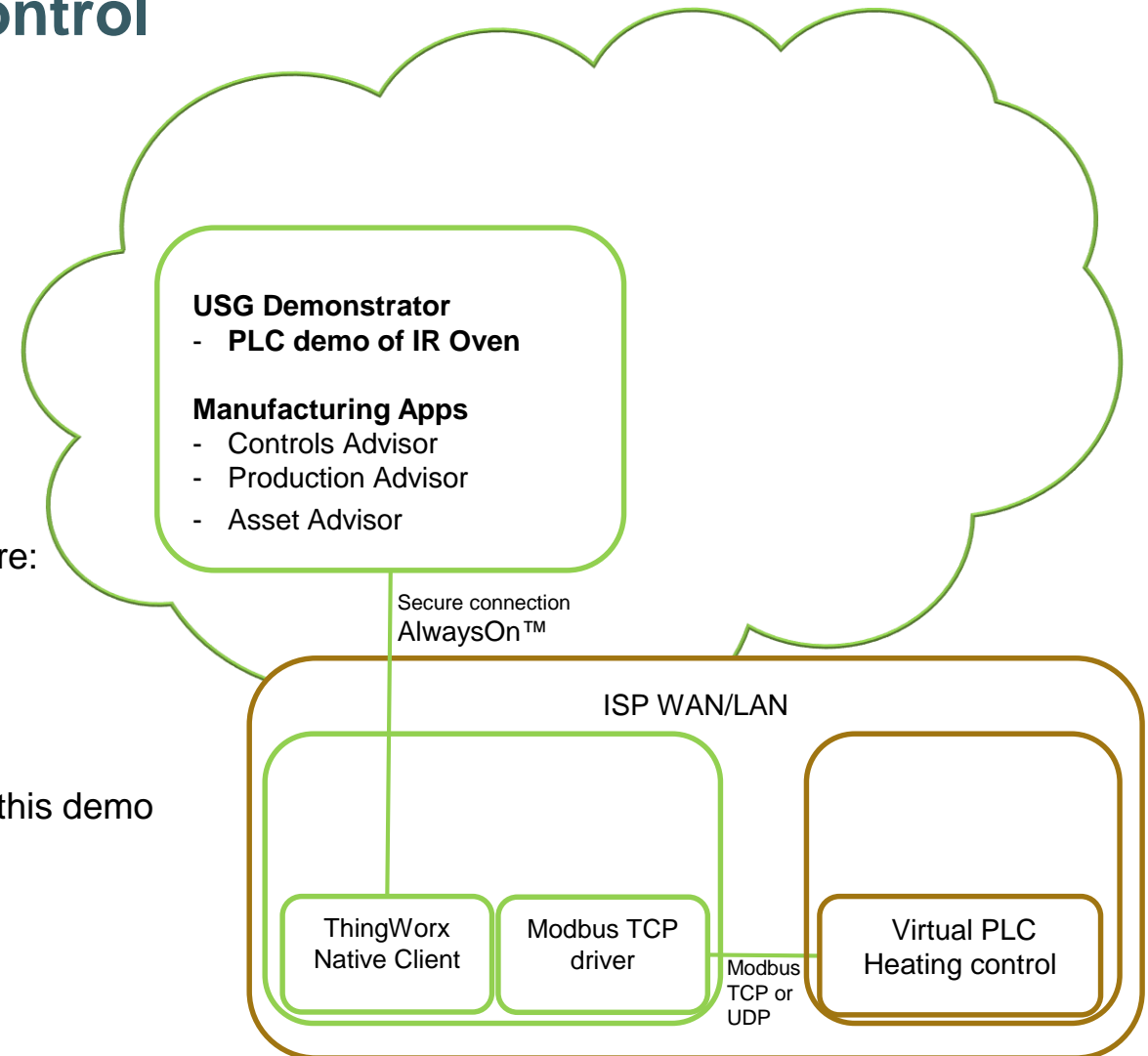
- Do-more Sim:** DM v2.3.0, Sim v2.3.0. Buttons for RUN, STOP, ROM, ERR, SerRX, SerTX, EthRX, EthTX.
- 16 DI:** X0-X15.
- 16 DO:** Y0-Y15.
- 8 Analog Inputs:** WX0-WX7.
- 8 Analog Outputs:** WY0-WY7.
- C Memory:** C0-C23.
- Counters:** CT0, CT1, CT2.
- Timers:** T0, T1, T2.
- V Memory:** V0-V7.
- D Memory:** D0-D7.
- R Memory:** R0-R7.
- Strings:** MSG, ERR, SS0-SS3, SL0.

A Modbus Network Write dialog box is open in the bottom right corner, showing the following details:

- Device: @IntModTCPClient
- IP Address: 127.0.0.1
- TCP Port Number: 502
- Unit ID: 0
- Function Code: 16 - Write Multiple Registers
- To Modbus Address: 4
- To Modbus Offset Address: 1
- Number of Modbus Registers: 1
- From Do-more Memory Address: 1000
- Do-more Range: MinTemp - ActualTemp
- Continuous at Interval: 1000
- On Success, Set bit: [checked]
- On Error, Set bit: [checked]

Demonstrator: Connect - Monitor - Control

- In this demo we use Modbus TCP protocol
- Modbus is a serial communication protocol
 - uses coils & registers
 - can be used to read or write
- Modbus is a pretty standard widely used protocol. A few other are:
 - OPC UA / DA
 - Ethernet TCP/IP
 - Profinet
- Kepware has built-in Modbus server and client which is used in this demo
- (Virtual) PLC is sending/receiving data to/from Kepware
- Thingworx is connected to Kepware
- KepWare is sending/receiving data to/from ThingWorx
- Thingworx provides the Experience



Live demo

Power on by Thingworx

Power off by Thingworx

Reset by Thingworx



Min. Temperatur

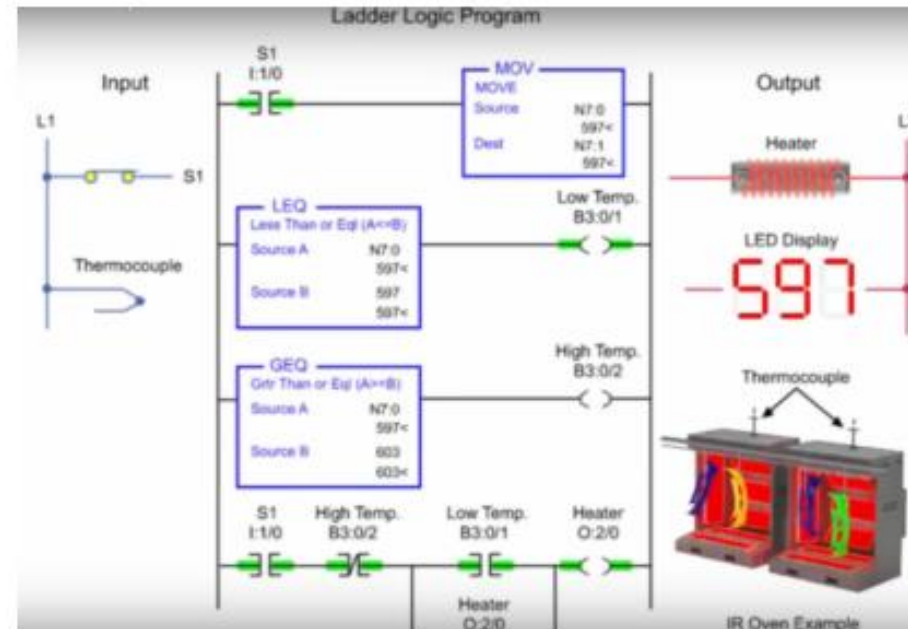
590.00

Max. Temperatur

602.00

Current Temperatur

595.00



Power On Status

PLC Reset Button Pushed

Heating Status

What did we learn (until now)?

- Almost unlimited technical possibilities to connect products to the internet can make it overwhelming
- Starting work from the experience you want to create works well....if you know what you want to achieve
- Knowing what you want to achieve with is often not so clear....often customers ask what is possible and why they need this
 - Understanding today's developments is often not understood by (higher) management
- Starting with a (simple) proof of concept will help to find out what is possible and what it can bring
 - Start small and agile
 - Demo
- A proof of concept will help to create a business case
- Choose a trusted partner to work with, do not invent everything yourselves

Q & A

- What do you want to connect?

- Contact:

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