

Remote Access to PLC

Operator Interface

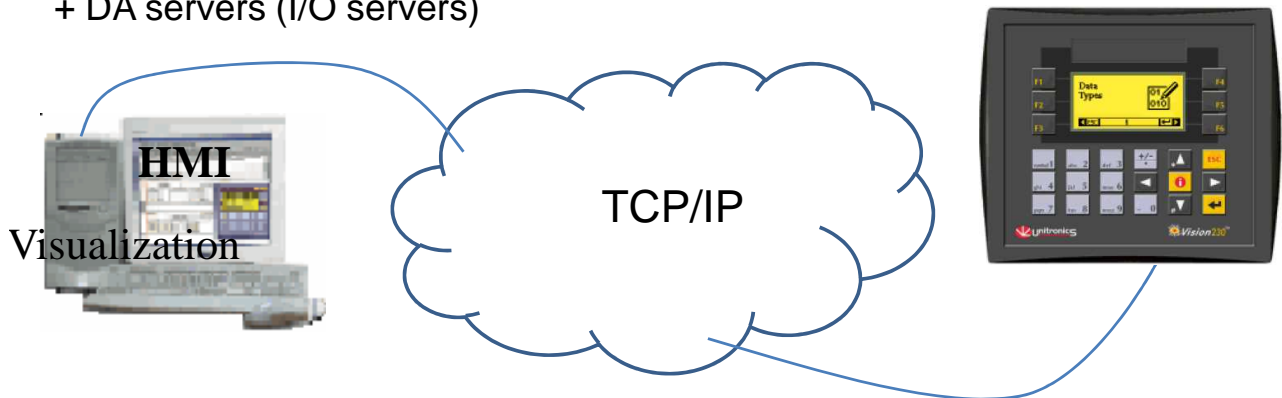
a Graphic User Interface (GUI) for control system

also HMI - Human Machine Interface

above SCADA – Supervisory Control and Data Acquisition software

(term history: <https://youtu.be/bfxr5DikdP0>)

+ DA servers (I/O servers)

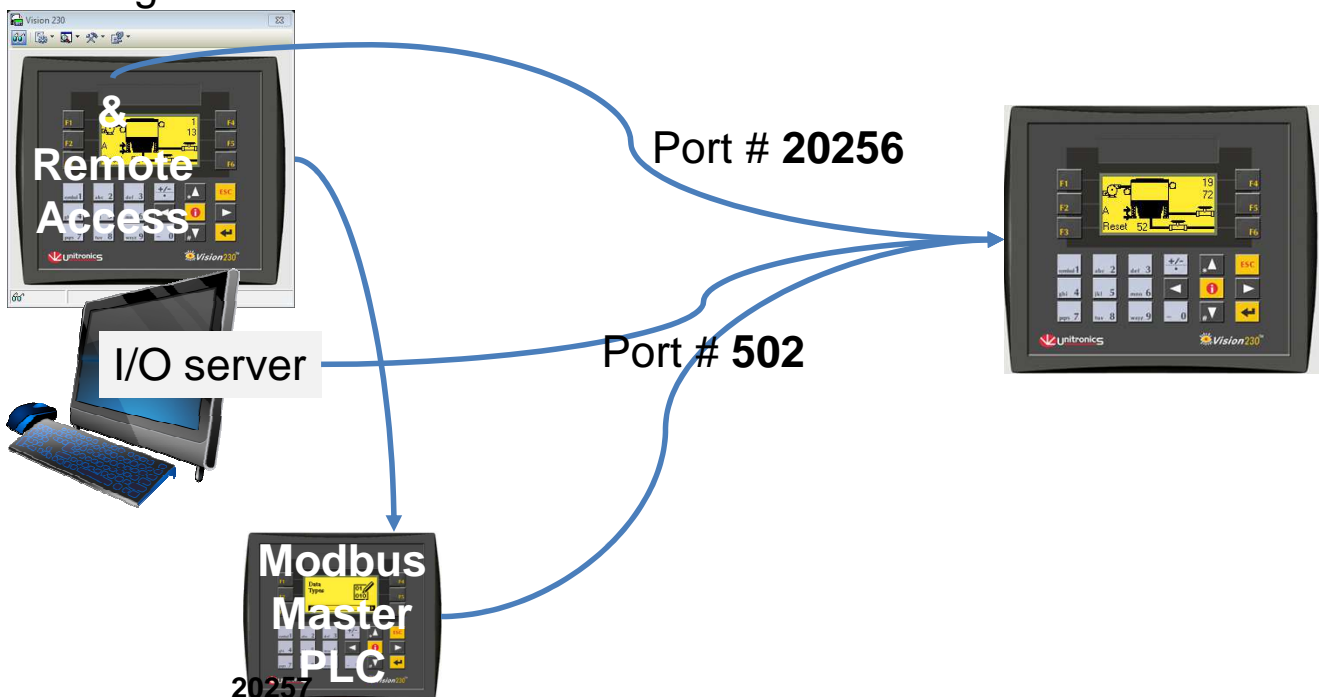


HT set up Ethernet connection to Vision: <https://youtu.be/iaS86-e2QZg?list=PL9DDA12C26452DFA3>

Reserved port numbers

TCP/IP

VisiLogic sw



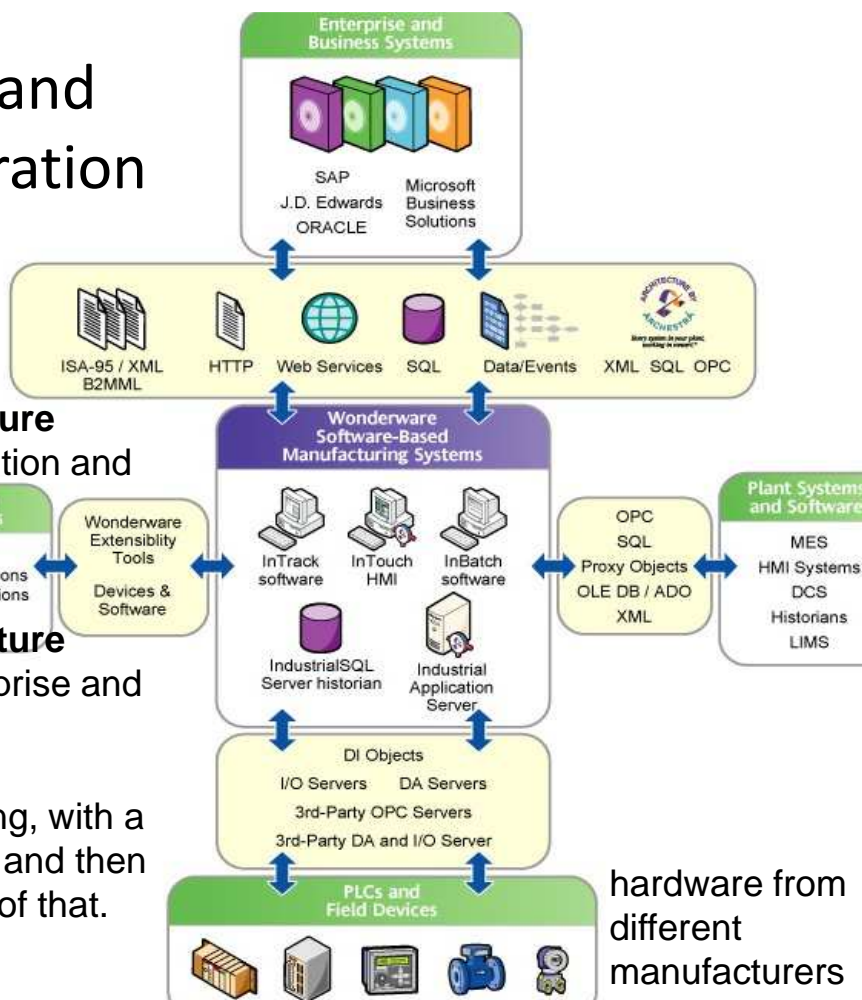
Connectivity and Software Integration

A modern plant

open network infrastructure
all the way up to the execution and business levels

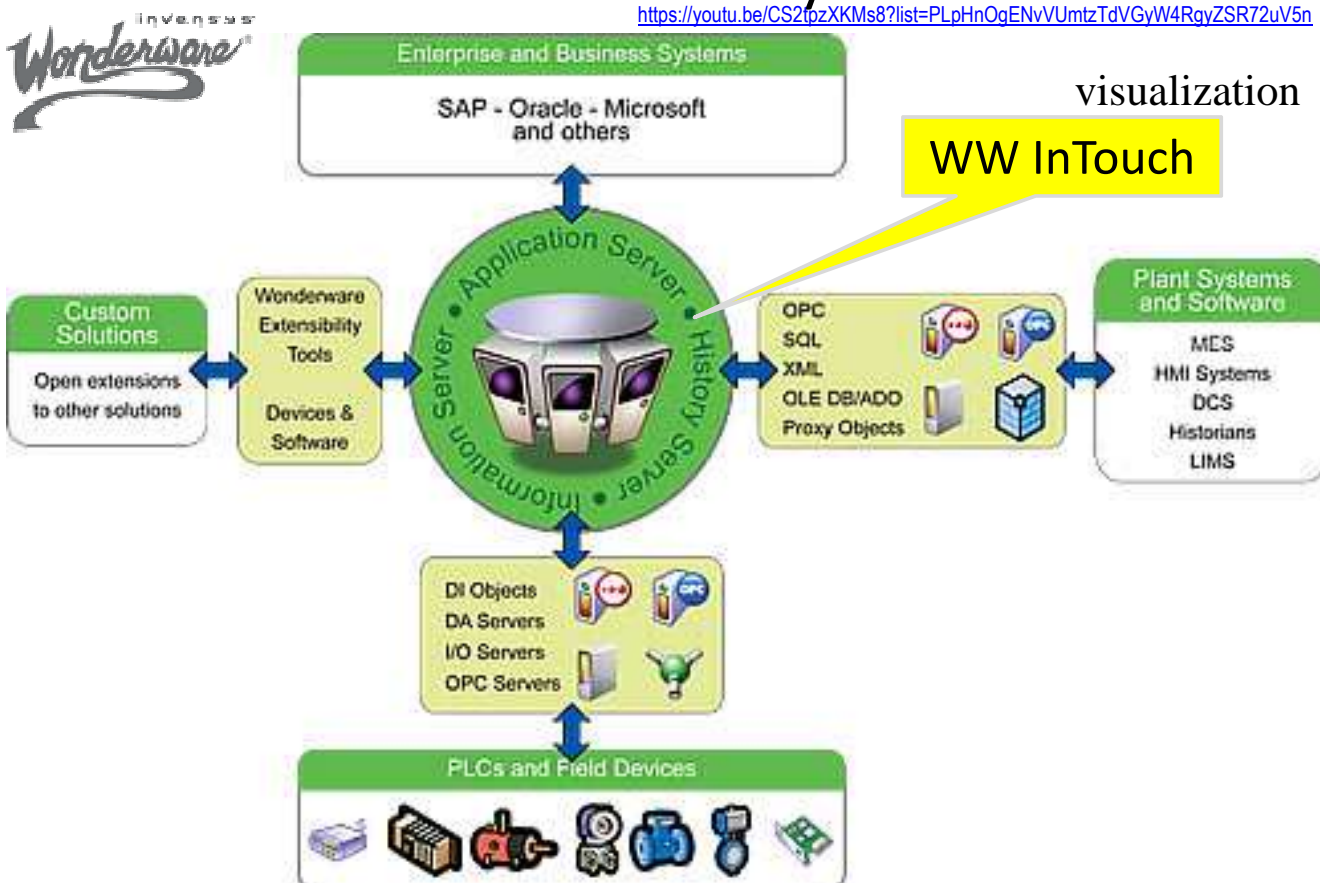
open software infrastructure
all the way up to the Enterprise and supply chain applications

standards-based networking, with a standard application layer, and then software interfaces on top of that.



Wonderware Archestra System Platform

<https://youtu.be/CS2f0zXKMs8?list=PLpHnOgENvUmtzTdVgYW4RgyZSR72uV5n>

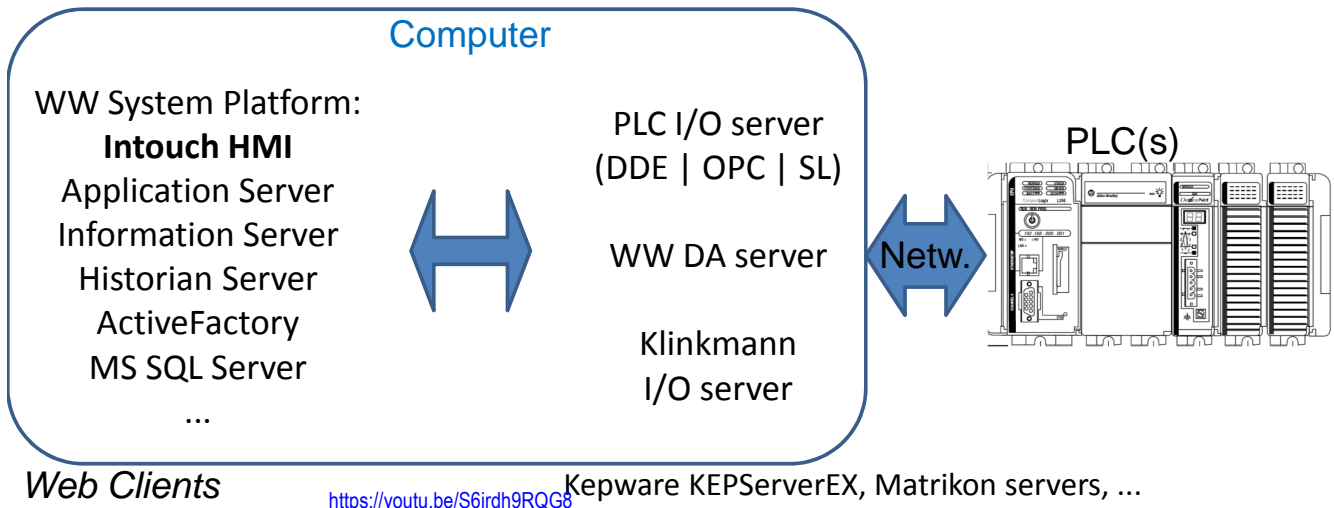


http://software.schneider-electric.com/products/wonderware/hmi-and-supervisory-control/system-platform/?trk=profile_certification_title

Getting data from PLC to HMI database

<https://youtu.be/zfHqgffY9n4>

- Variety of software interfaces available to connect to PLC
 - Client–server software that knows how controllers and Networks present data, polls the controller and forwards the information inside computer in the form of the commonly known formats (DDE, OLE, XML)
often referred to as I/O servers or DA servers



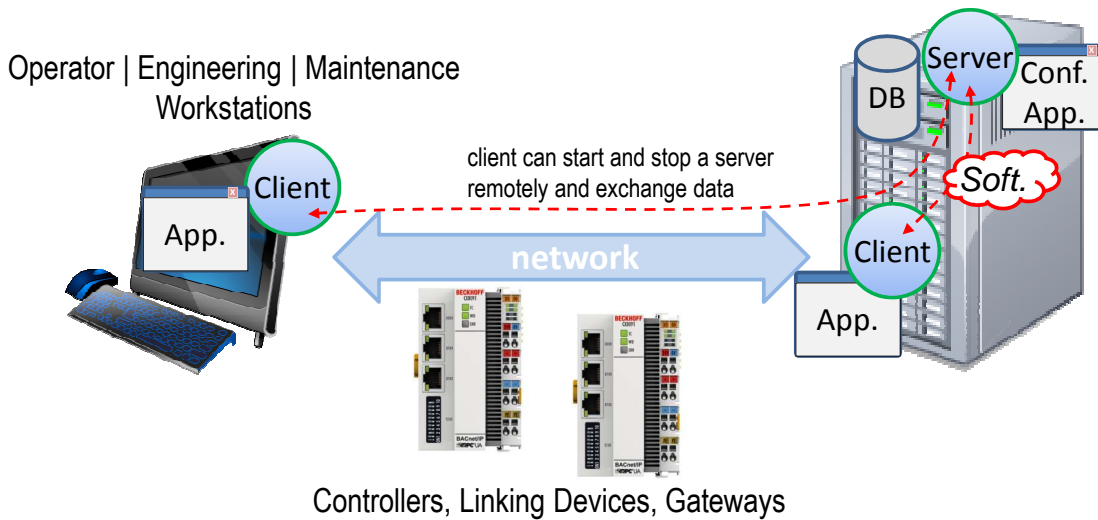
SCADA and HMI headaches

- In the past, most applications such as HMI communicated with hardware such as a PLC using custom-programmed drivers. If an HMI needed to communicate with a PLC, it required a custom driver (I/O server) written for the specific protocol used by the PLC
- Each HMI required its own set of custom drivers for each of the devices.
- Configuration of different data access servers (I/O, DA, OPC)
- Management of a set of application servers
- Proper HMI screens' design
- User authorization and remote access security issues

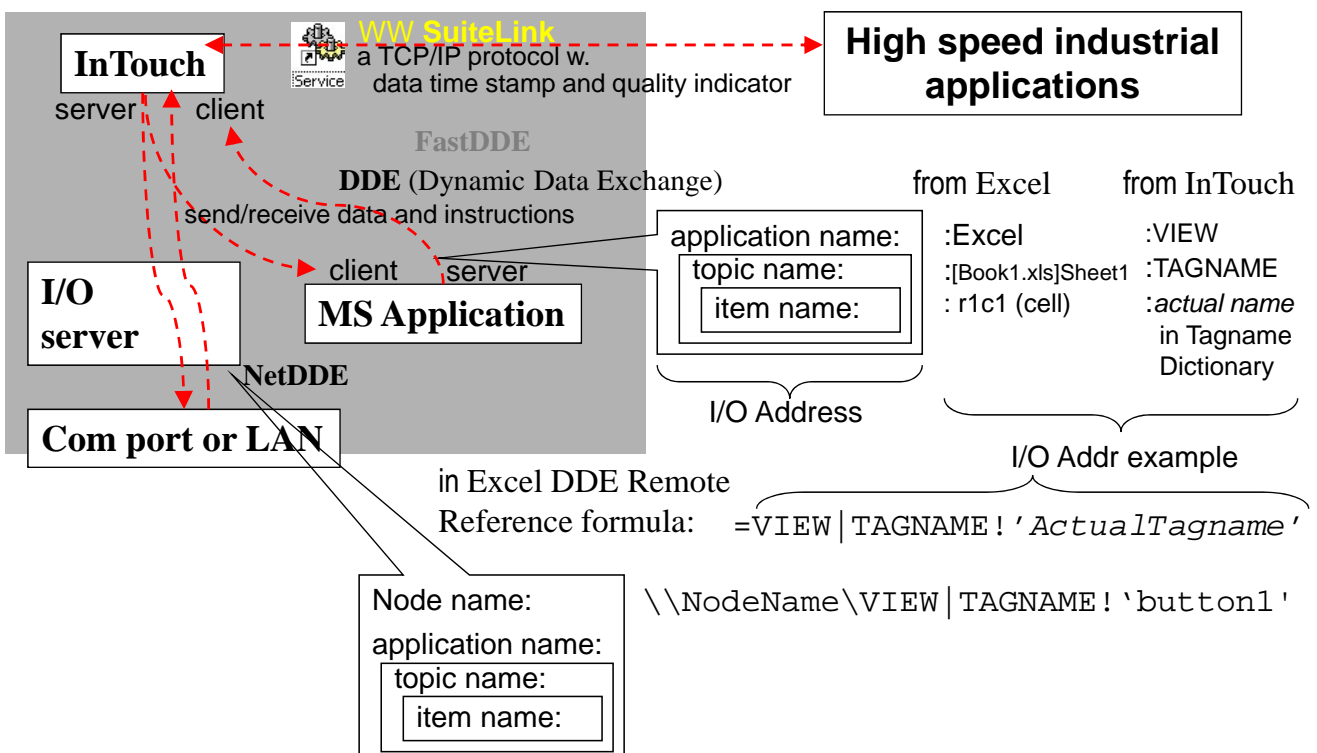
See also <http://en.wikipedia.org/wiki/SCADA>

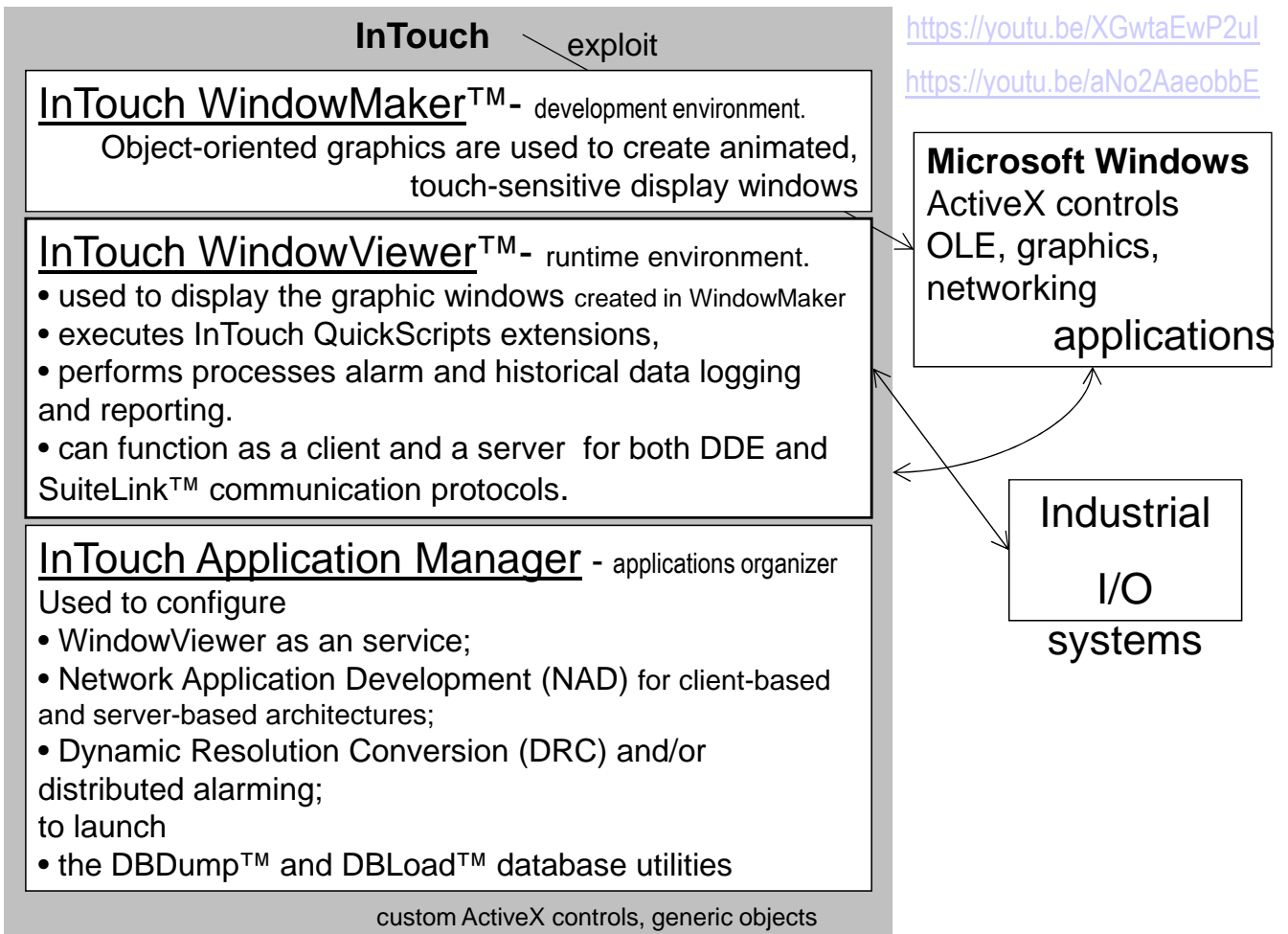
Client-Server Architecture

Most software today is based on client-server architecture. The server software typically connects to the hardware or database data source.



I/O & DDE, SuiteLink Communications



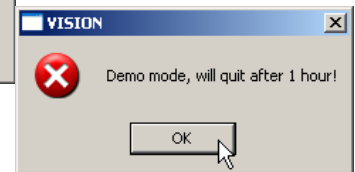
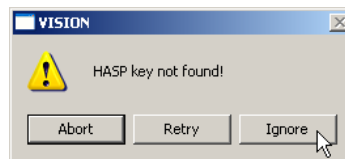


Start Wonderware InTouch in Demo mode

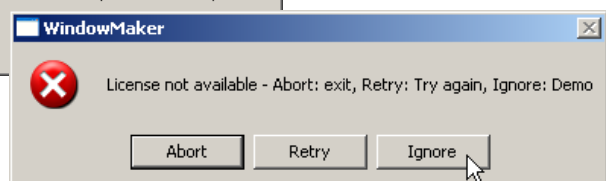
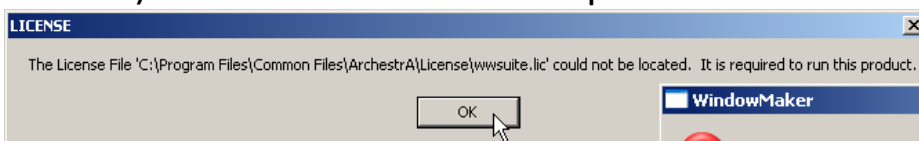
[HT run InTouch in Demo mode.mp4](#)

- Demo Application, [HT open Pumpstation Examp with VISION.mp4](#)
- Pump test (+Klinkmann -> Unitronics Vision SL&DDE server)

- Homework

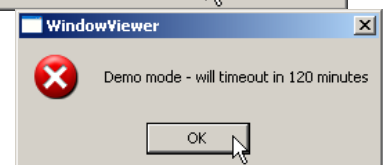


(InTouch) WindowMaker - development environment

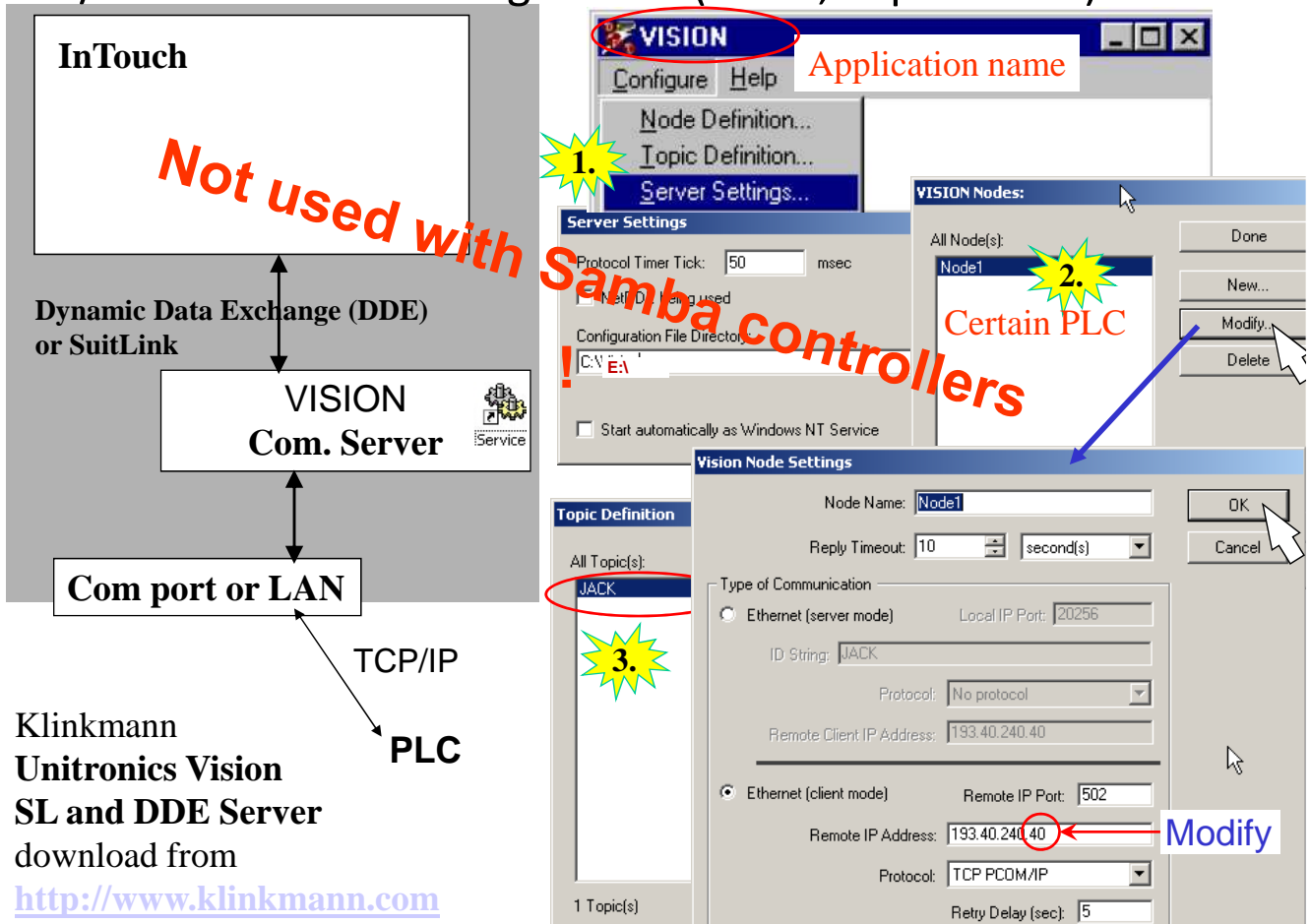


(InTouch) WindowViewer

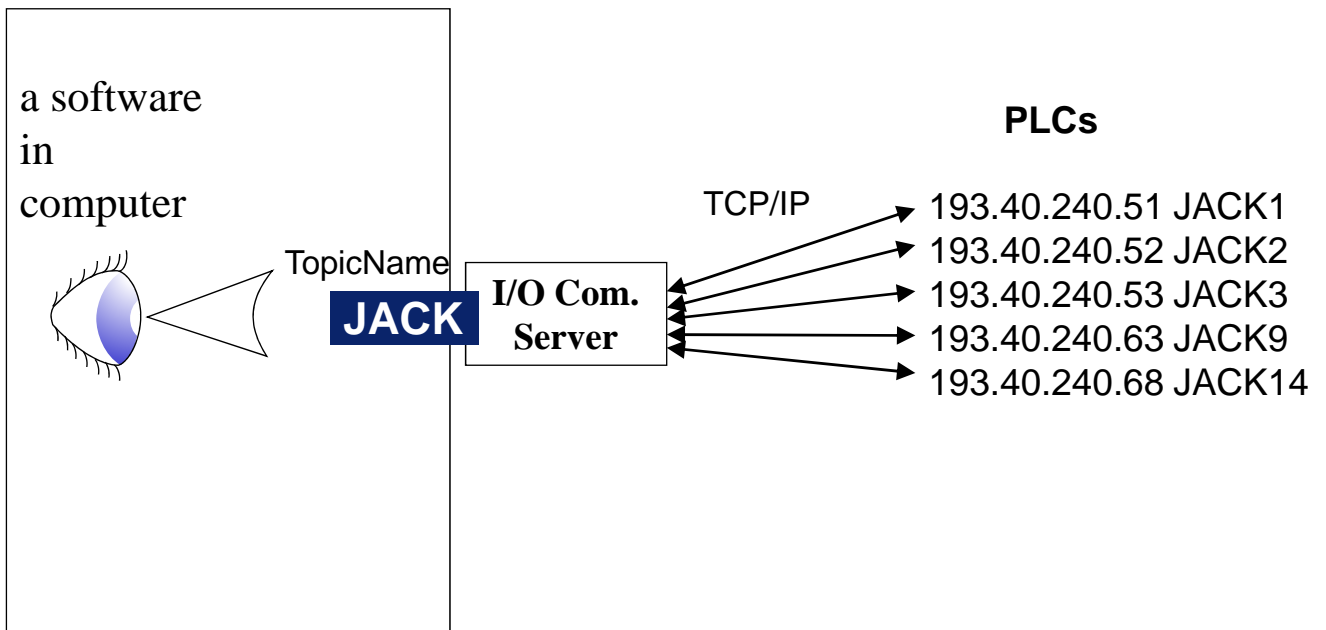
- **Runtime** environment



I/O Com. Server configuration (Node, Topic Name)



Topic Name masks communication channels



Server/Client software:
InTouch
WindowViewer

I/O server:
Unitronics Vision
SL and DDE Server

I/O Com. Server configuration (Topic Definition)

[HT open Pumpstation Examp with VISION.mp4](#)

Vision Topic Definition

Topic

Topic Name: JACK

Node: Node1

Update Interval: 1000 millisecond(s)

PLC

PLC Type: VISION 120/130/230/260/280/290BY/730

Unit Number: 1

Watchdog

Memory Integer(MI): 100

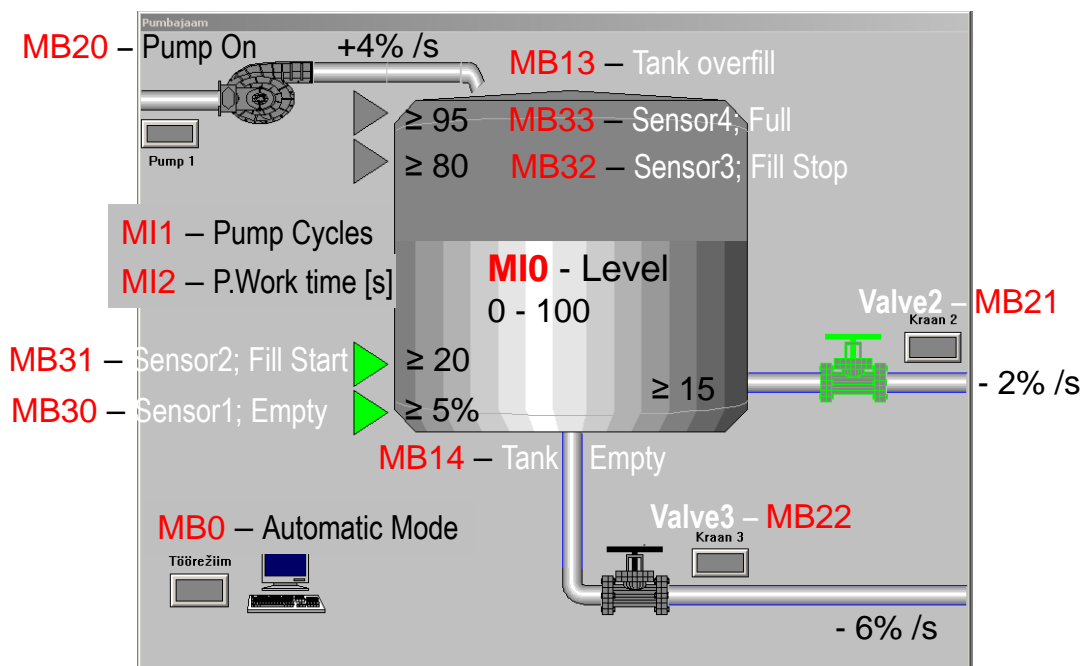
Send Interval: 0 sec

Value to write: 777

Capacity of Responses... Cancel OK

Tank On-Off Level Control HMI

& PLC Variables



WW InTouch HMI design software documentation

C:\Program Files\Wonderware\InTouch\ITAppManagement.pdf

- Creating| Finding an InTouch Application

C:\Program Files\Wonderware\InTouch\ITConcepts.pdf

- Visualization Windows and Graphics (Objects, Symbols, Wizard)

- Data Management (Tag Types, Tag Properties)

- Scripting and Logic (Script Types)

C:\Program Files\Wonderware\InTouch\ITDataManagement.pdf

- Data Management Overview (Tag Types, Tag Properties)

- Data Access with I/O (Access Names, I/O status)

- Reducing Tag Usage (Tag Usage, Deleting Unused Tags)

C:\Program Files\Wonderware\InTouch\ITVisualization.pdf

- WindowMaker (Application Explorer,)

- Application Windows (Creating, Modifying)

- WindowMaker Objects (Shapes, Text, Grouping)

- Animating Objects (Animation Links, Data Display/Entry)

- Wizards

<https://youtu.be/CS2tpzXKMs8>

C:\Program Files\Wonderware\InTouch\ITScriptsAndLogic.pdf

- (Script Types, Creating, Triggers, Syntax, ...)

Virtual
Machine

C:\ disk

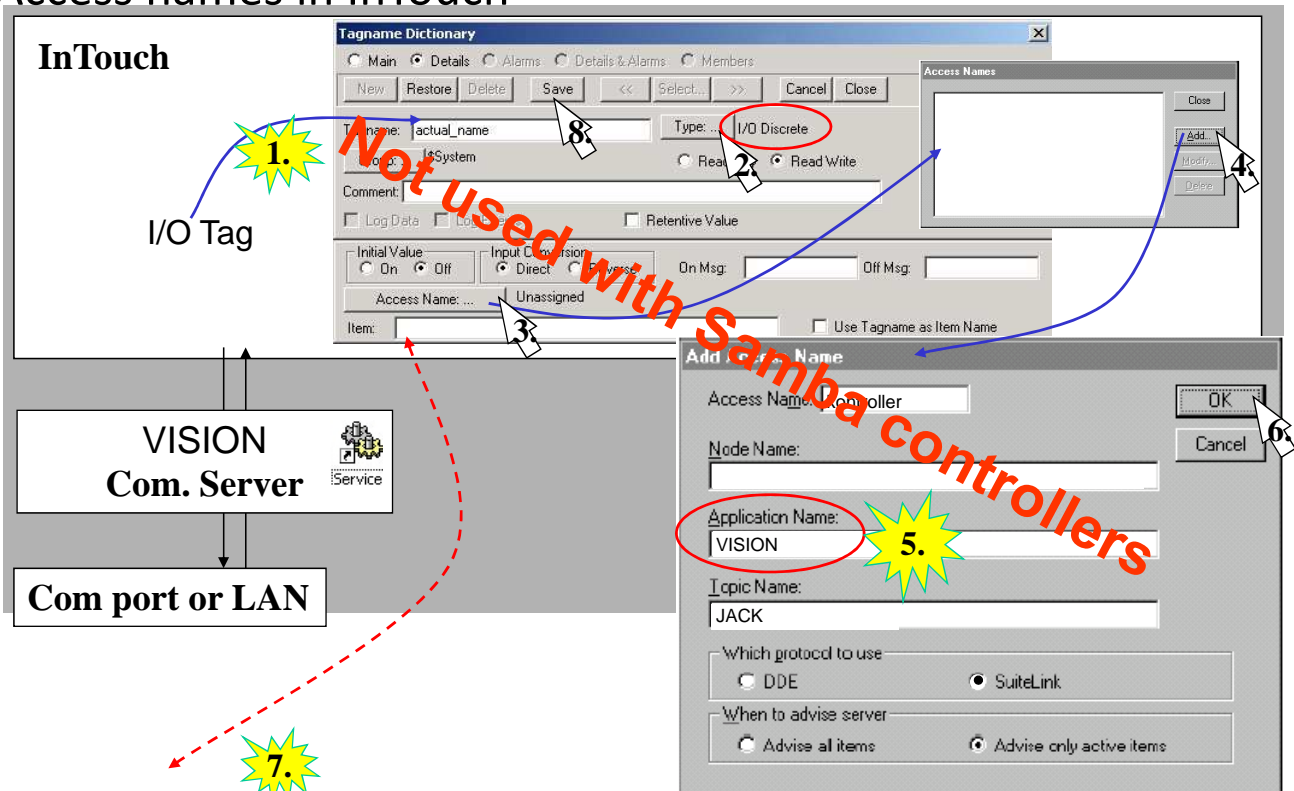


Student_

Home

E:\ disk

Access names in InTouch



Item name:

I#

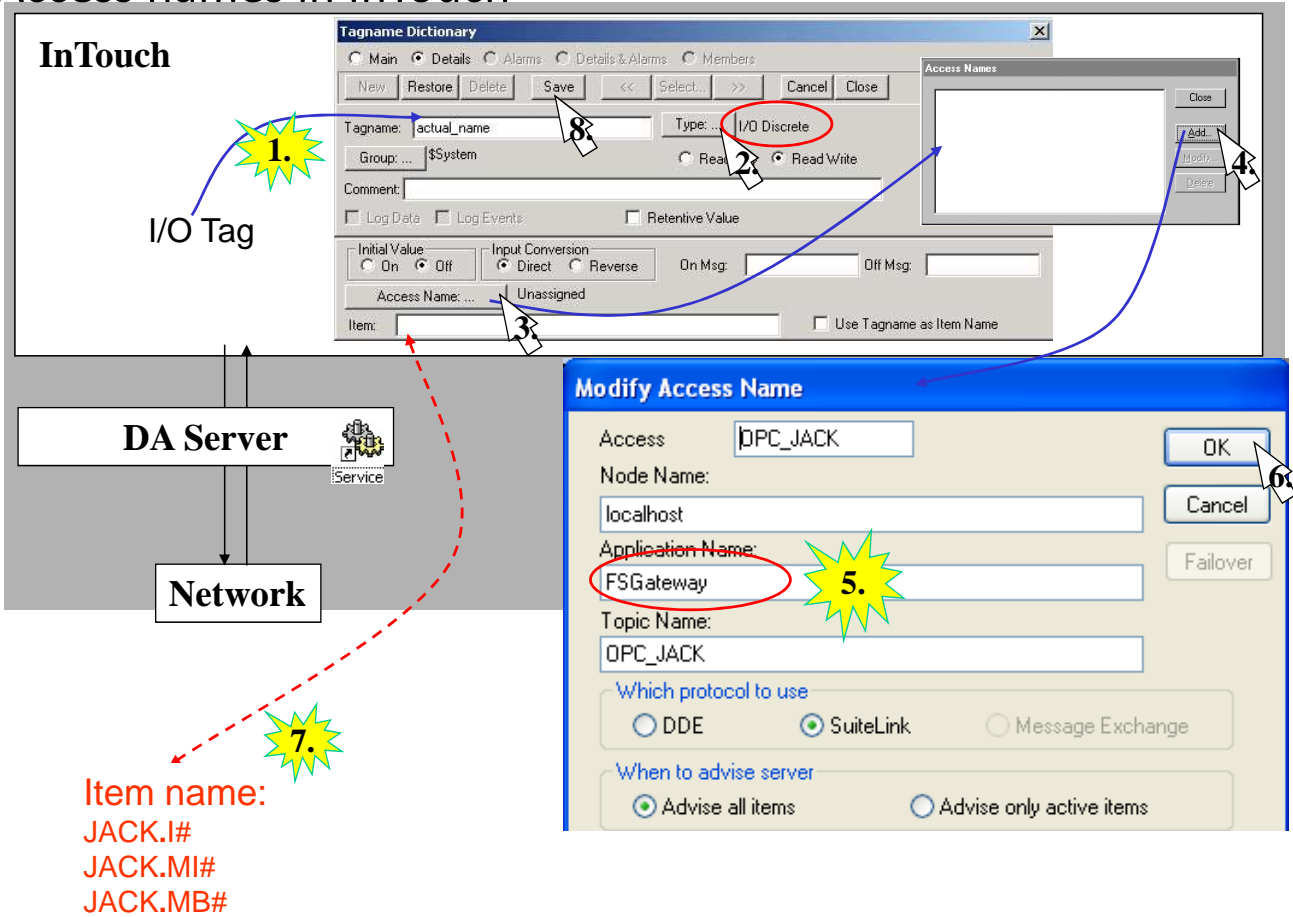
MI#

mm, ss

=VISION|topic!STATUS

[HT Animation and AccessName.mp4](#)

Access names in InTouch



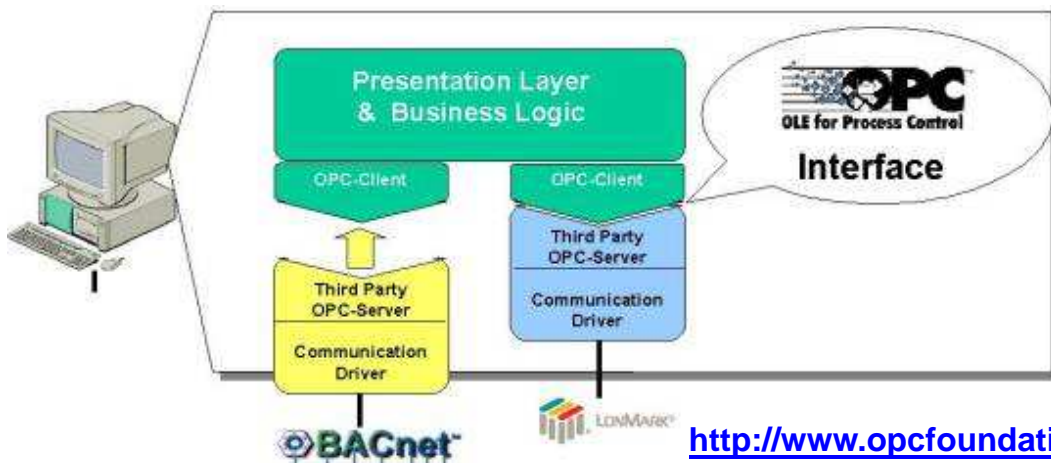
OPC

<https://youtu.be/mK-OL03LaGg>

OPC – “OLE for Process Control”

Root: Microsoft OLE/DCOM (Object Linking and Embedding /Distributed Component Object Model)
- basis for interface technologies

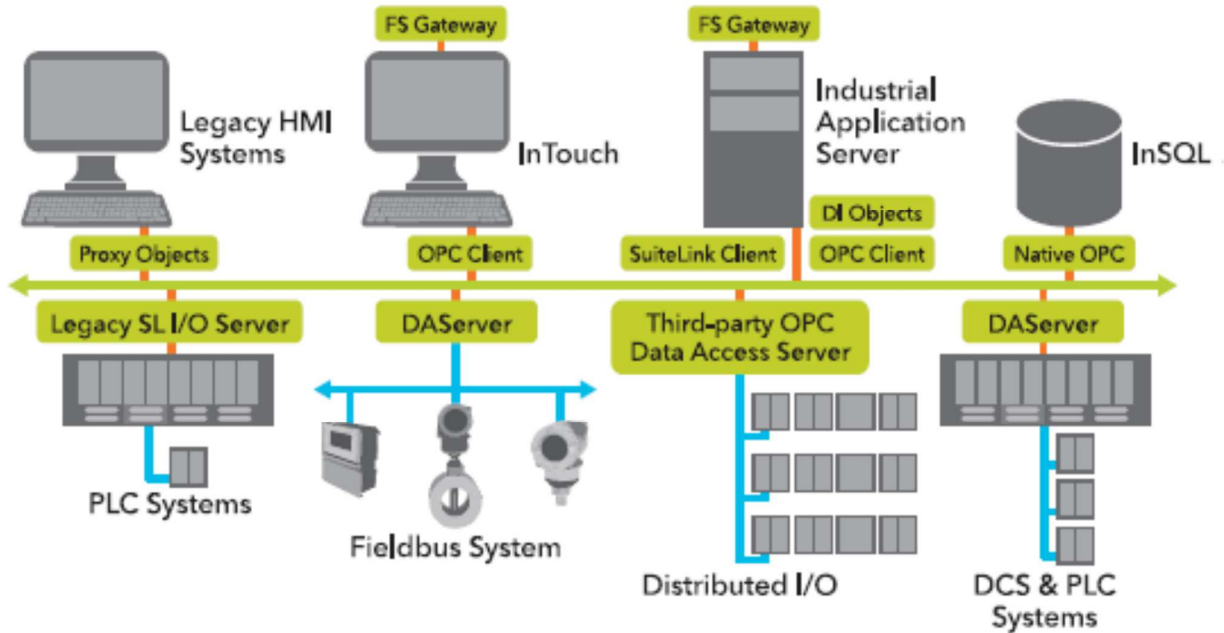
Anew (2008) **OPC UA** (Unified Architecture); XML and Service Oriented Architecture (SOA) based, w. enhanced security. IEC 62541-2011 platform independent interoperability standard for industrial and process control applications from plant-floor level to executive-floor level.



Open Connectivity standard for the secure and reliable exchange of data between devices and software's from multiple vendors

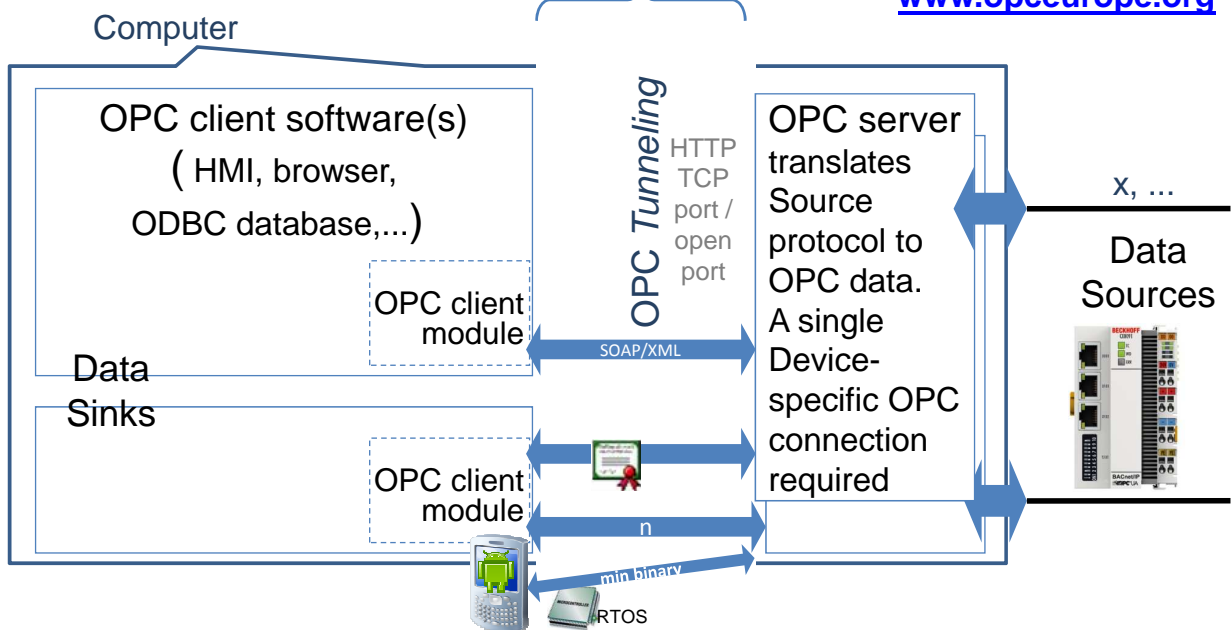
Device Integration

- DAServers, I/O Servers



OPC interface

www.opceurope.org



A lot of software is OPC compatible. With OPC it is unnecessary for the Data Sink to know anything about how the Data Source communicates or organizes its data. OPC eliminates the need for custom drivers between each new application and Data Source. There's an OPC server available for almost every modern and legacy device on the market.. Changing Source needs only the OPC server to be kept current. Software updates do not interrupt data exchange with Data Sources. Bigger freedom to choose hardware.

OPC Data types

The 3 Classic OPC specifications corresponding to the three data categories:

OPC Data Access Specification (OPC DA)
– for real-time data
w. timestamp and quality code

OPC Historical Data Access Specification (OPC HDA)
– for historical data
analysis, trending and reporting

OPC Alarms & Events Specification (OPC A&E)
– for alarming information

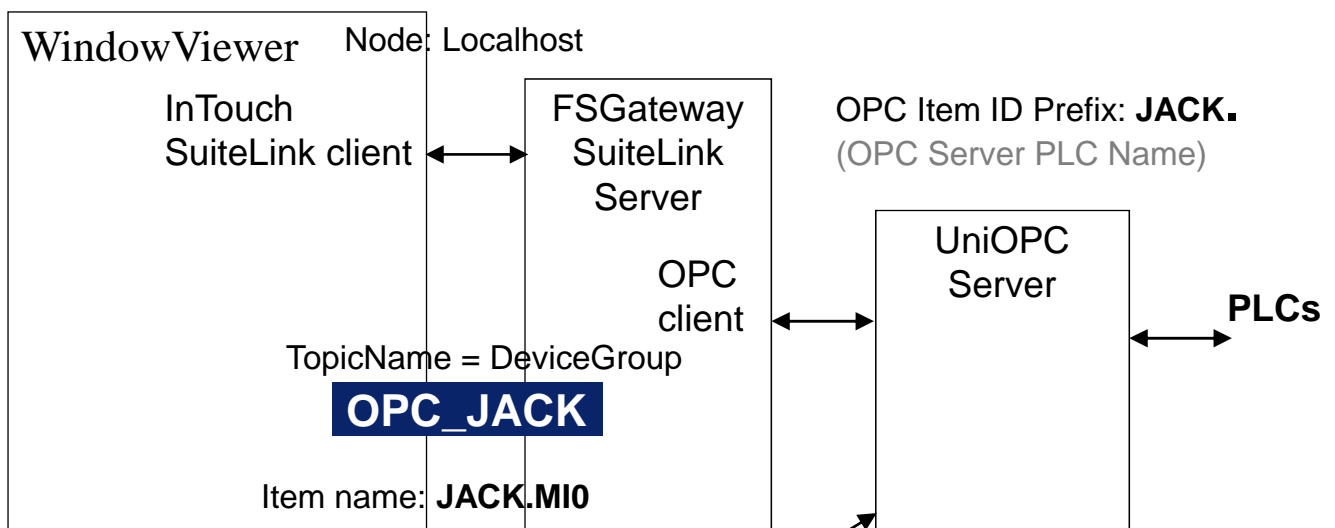
OPC Unified Architecture (OPC UA)
integrates all 3 into one
consistent framework

improved and added
+ *methods*
+ *OO information model*
"OPC UA Information Model
for IEC 61131-3"

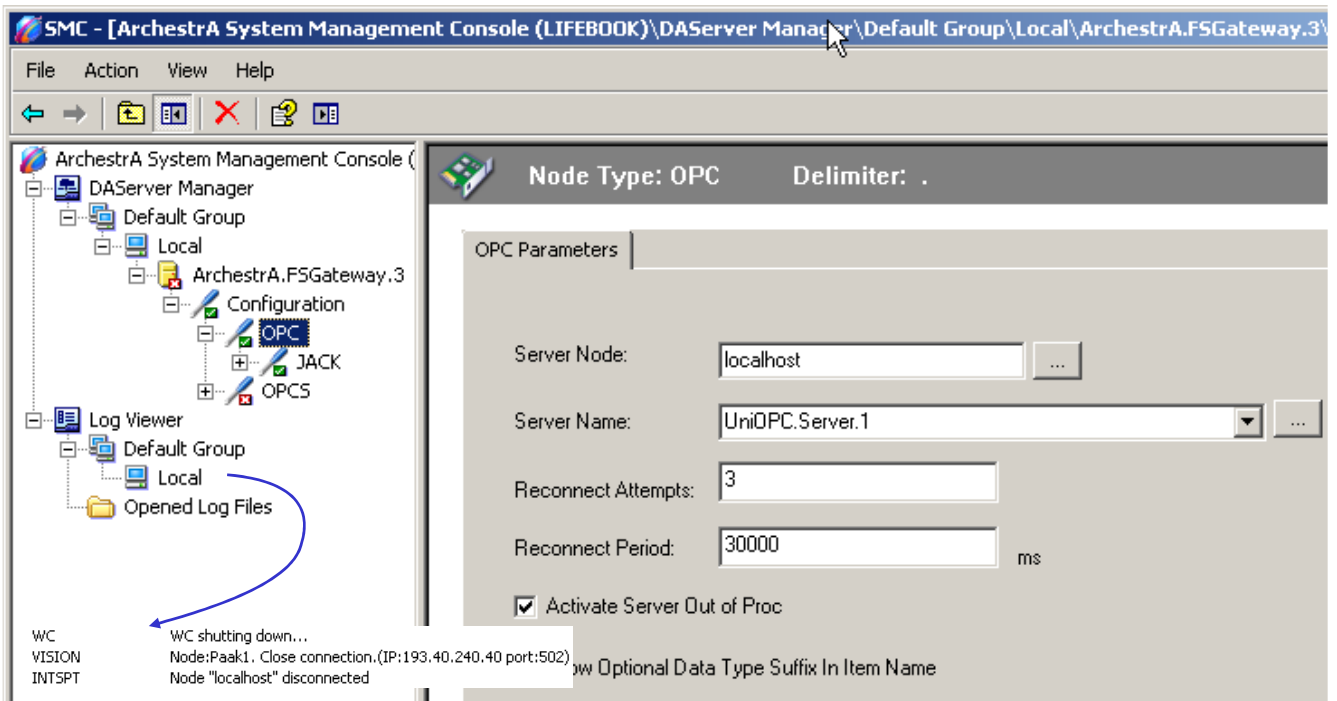
OPC connectors are not required to support all of the OPC specifications. Both the OPC Client and OPC Server must support the same OPC specification.



Archestra FactorySuite Gateway on DA server role



FS Gateway; OPC to SuiteLink Configuration, ...



FS Gateway is hosted by the DAServer Manager, a Microsoft Management Console (MMC) snap-in, which is part of the ArchestrA System Management Console (SMC) suite of utilities.

Many high-level functions and user-interface elements of the DAServer Manager are universal to numerous products created with the ArchestrA DAS Toolkit. Only the documentation for the DAServer Manager contains descriptions of those universal functions/UI elements. Therefore, reading the documentation for both the MMC and the DAServer Manager is critical to understanding user's guide. To read the documentation about the MMC and DAServer Manager, click the **Help** command on the SMC's **Action** menu.

The only correct sequence:

1. Activate FS Gateway; 2. Go to InTouch Runtime -> OPC server opens itself & click



1. Activate FS Gw

Name	Client Value	Time
JACK.MB20	TRUE	21:58:03
JACK.MB21	TRUE	21:50:21
JACK.MIO	26	21:58:07
	FALSE	21:51:46
	Communication OK	21:50:21

Device Group = application name:
topic name:
item name:

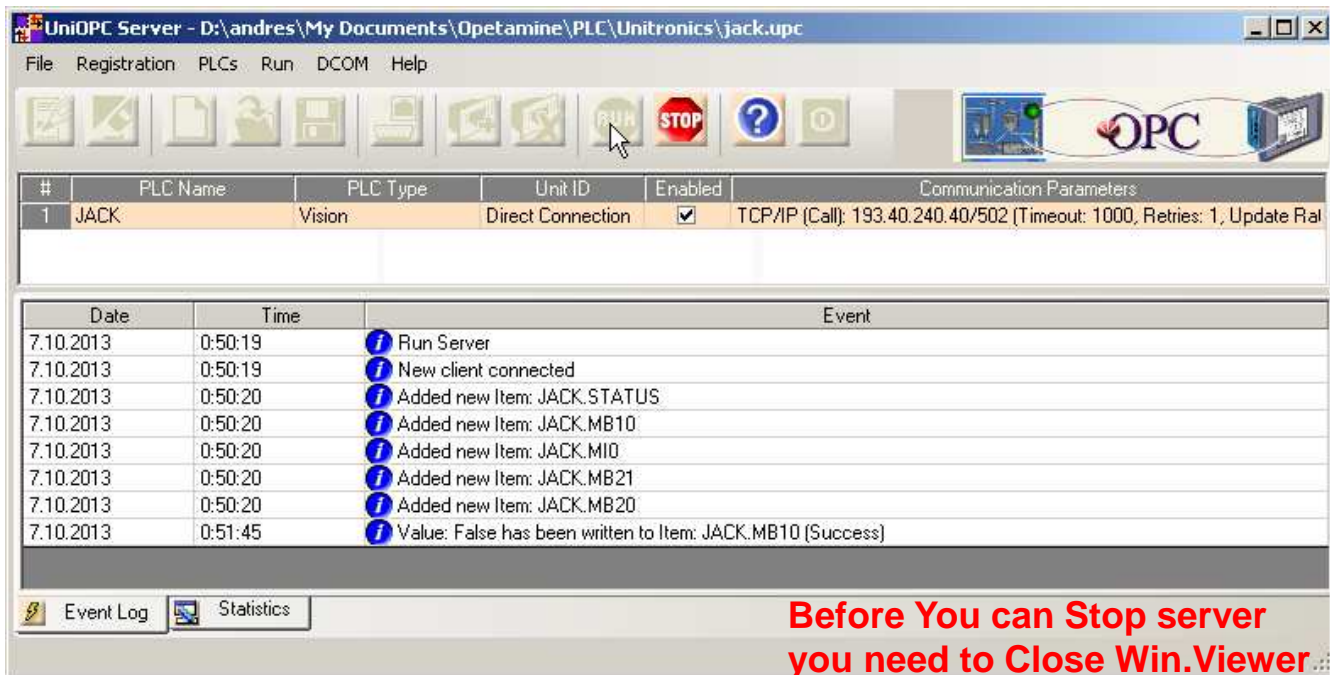
Access name conf

- FSGateway
- OPC_JACK
- JACK.MIO

[HT use UniOPC and FSGateway.mp4](#)

```
Info          PlugInDDESL      Timers: prot=50, validData=60000, Request=1000.
DACmnProtWarn FSGateway       Valid license is available
Info          FSGateway       Wonderware I/O Server Toolkit for Windows NT - Version 7,2,1,
Info          WWSL            Suitelink: OpenServer - Registered Server Name: (FSGateway)
```

UniOPC server and FSGateway events log



The screenshot shows the UniOPC Server application window. The title bar reads "UniOPC Server - D:\andres\My Documents\Opetamine\PLC\Unitronics\jack.opc". The menu bar includes "File", "Registration", "PLCs", "Run", "DCOM", and "Help". The toolbar contains icons for "Run", "Stop", "Help", and "Info". Below the toolbar is a table with the following columns: "#", "PLC Name", "PLC Type", "Unit ID", "Enabled", and "Communication Parameters". The table contains one entry for "JACK" with type "Vision", unit ID "Direct Connection", and enabled status checked. Below this is an event log table with columns "Date", "Time", and "Event". The event log shows several events from 7.10.2013, including "Run Server", "New client connected", and several "Added new Item" events for JACK.STATUS, JACK.MB10, JACK.MI0, JACK.MB21, and JACK.MB20. The final event is "Value: False has been written to Item: JACK.MB10 (Success)". At the bottom of the window, there are buttons for "Event Log" and "Statistics".

#	PLC Name	PLC Type	Unit ID	Enabled	Communication Parameters
1	JACK	Vision	Direct Connection	<input checked="" type="checkbox"/>	TCP/IP (Call): 193.40.240.40/502 (Timeout: 1000, Retries: 1, Update Pal

Date	Time	Event
7.10.2013	0:50:19	Run Server
7.10.2013	0:50:19	New client connected
7.10.2013	0:50:20	Added new Item: JACK.STATUS
7.10.2013	0:50:20	Added new Item: JACK.MB10
7.10.2013	0:50:20	Added new Item: JACK.MI0
7.10.2013	0:50:20	Added new Item: JACK.MB21
7.10.2013	0:50:20	Added new Item: JACK.MB20
7.10.2013	0:51:45	Value: False has been written to Item: JACK.MB10 (Success)

**Before You can Stop server
you need to Close Win.Viewer
and Deactivate FS Gateway**

```
VIEW          Wonderware I/O Server Toolkit for Windows NT - Version 7,2,1,14
WWSL          Suitelink: OpenServer - Registered Server Name: (VIEW )
VIEW          Setting current View window HWND = 2098562
INTSPT        Node "localhost" connected
FSGateway     Connected to Server OPC
```

ISS0089 ADVANCED PROGRAMMABLE LOGIC CONTROLLERS

autumn 2017

Homework 2 – Samba and HMI (InTouch)

Plant

Samba controller and HMI connected over Internet

Tasks:

Design an operator interface (HMI) on PC for the first homework system with InTouch or some other industrial HMI design software.

Operator interface must show all control inputs, outputs and internal variables representing current control state. To not surpass the 32 Tag limitation in InTouch demo mode you may limit visualization to only 20 variables. Controller and HMI communicate over Internet.

Interface graphical data should be understandable and interpretable without the help of a user manual.

In your report show interface window(s), control variables (tagnames) list and communication server configuration settings views.