

*How to get process data onto your desktop:
or
Connectivity for your analog devices

with a glimpse of the future:
The Industrial Internet of Things IIoT*

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Thank You for Attending Today's Webinar



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Where are we today?

- Lots of analog sensors and switches
 - Thermocouples/RTDs
 - Pressure transmitters
 - Flow meters
 - Level transmitters
 - Humidity/moisture sensors
- Rugged, conditioned industrial outputs
 - 4-20mA
 - 0-5V
 - Modbus



Where are we today?

- If you already have a DCS or a Fieldbus, you'd be looking at the data on your desktop HMI
 - Profibus
 - Foundation Fieldbus
 - Ethernet/IP



- But, you're tuned in here because you don't

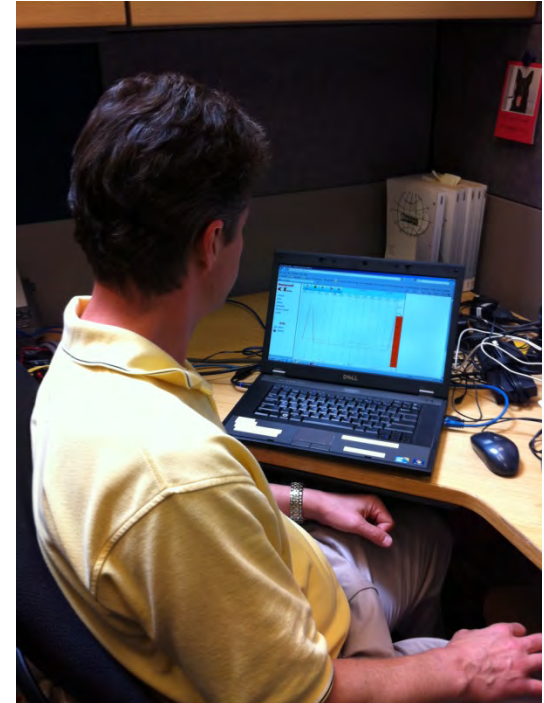
Where are we today?

- PCs are 30-35 years old now
- But PCs don't natively handle process (analog or switch) data.
- Stumbling blocks
 - It isn't USB or Ethernet
 - No universal protocol to interpret the USB or Ethernet data
 - Software package needed to interpret/display the data
 - A driver needed to let software talk to the device



Where are we today?

- You sit at your desktop and want to see what's happening in the process or to get an alarm when the switch trips
- How can you get process data onto your desktop?



What's the Internet of Things?

- From an article, *OPC UA, seen through the eyes of users*
 - by Randy Kondor, published 2009, OPC Foundation
- Since the 1990's, the industrial world benefitted from OPC DA
- OPC DA (now 'Classic OPC') revolutionized connectivity of instruments/controls-to-HMI software
 - OPC is an industrial Communications Specification (set of rules)
 - Client – Server
 - HMI Software is an OPC client
 - Instruments/devices talk to an OPC server
 - OPC server talks to OPC server
 - Uses the Windows component, DCOM – restricted to a Windows environment
 - For instance, an OPC server runs as a Windows service
 - Use of OPC tracked the spread of Windows PCs into the industrial world

What's the Internet of Things?

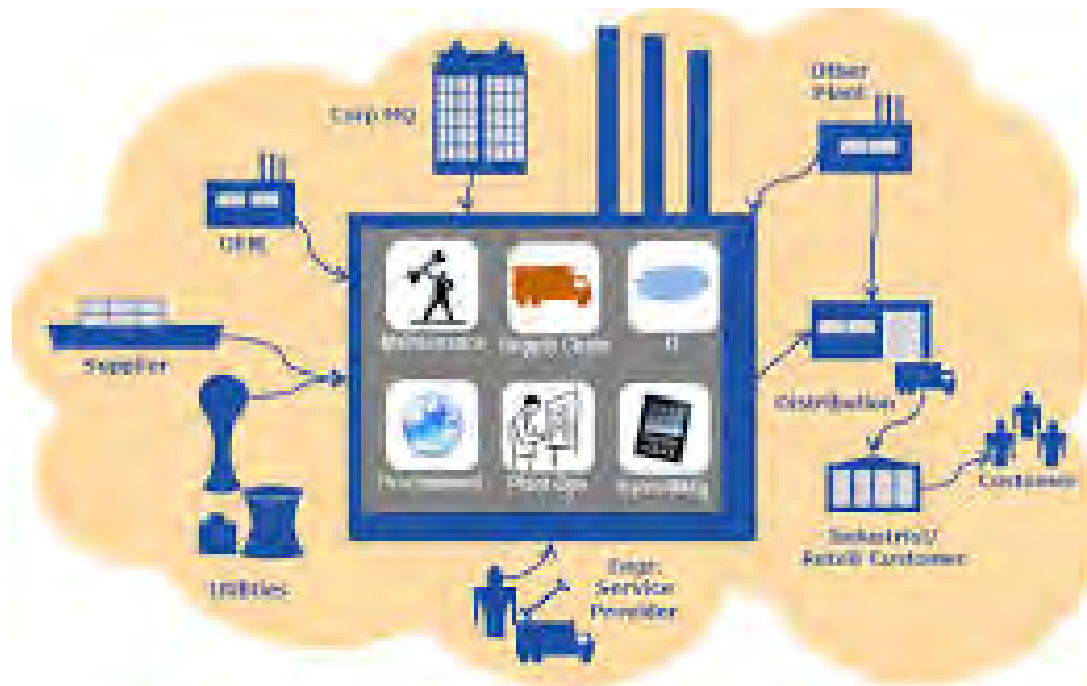
- Who uses OPC DA?
 - Anyone running an HMI software program less than 15 years old.
 - OPC Foundation estimates that 80% of OPC end-users do not even know they're using it
 - Allen Bradley's communications program, RSLinx, is based on OPC
- By any measure – extremely widespread and successful – why?
 - Visible – System integrators could talk to more devices more easily
 - Invisible - Eliminated the need for “driver development” by the HMI vendors; OPC server vendors concentrate on connectivity on the low side
 - Analogous to Windows handling printer drivers, rather than each DOS application needing a custom printer driver
- 20 years later, OPC DA seems limited given evolution of PC, the internet and wireless communications (cell phone)

What's the Internet of Things?

- 2010 or thereabouts - OPC Foundation announces the successor: OPC UA (Unified Architecture)
- OPC UA is a total restructuring of OPC connectivity, not necessarily limited to higher end instrumentation/devices
 - Includes self-recognizing, auto-populating device-to-client operation
 - Includes ‘analytics’, whatever that means
- OPC UA is the kernel of *Industrial Internet of Things*
 - Abbreviated *IIoT* or *IIot*

What's the Industrial Internet of Things ?

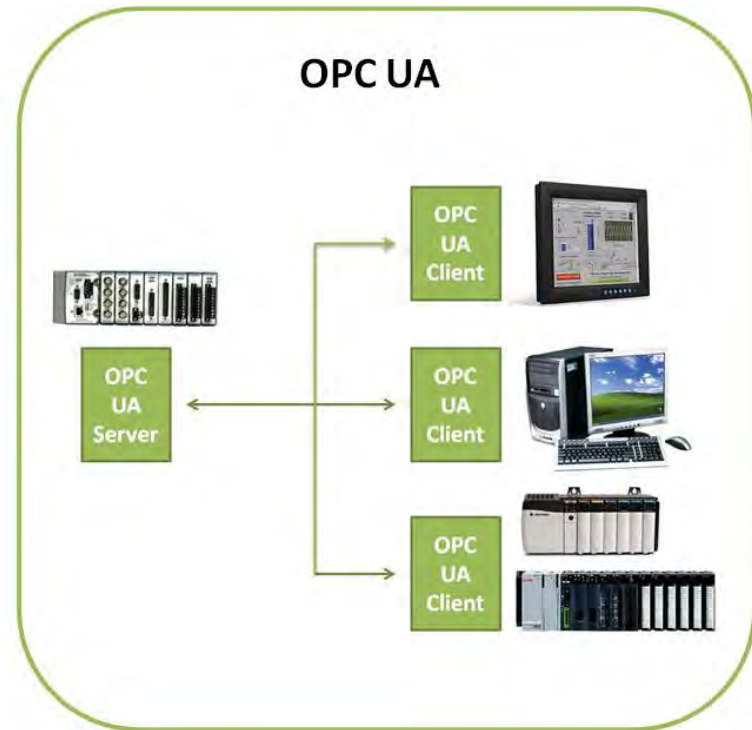
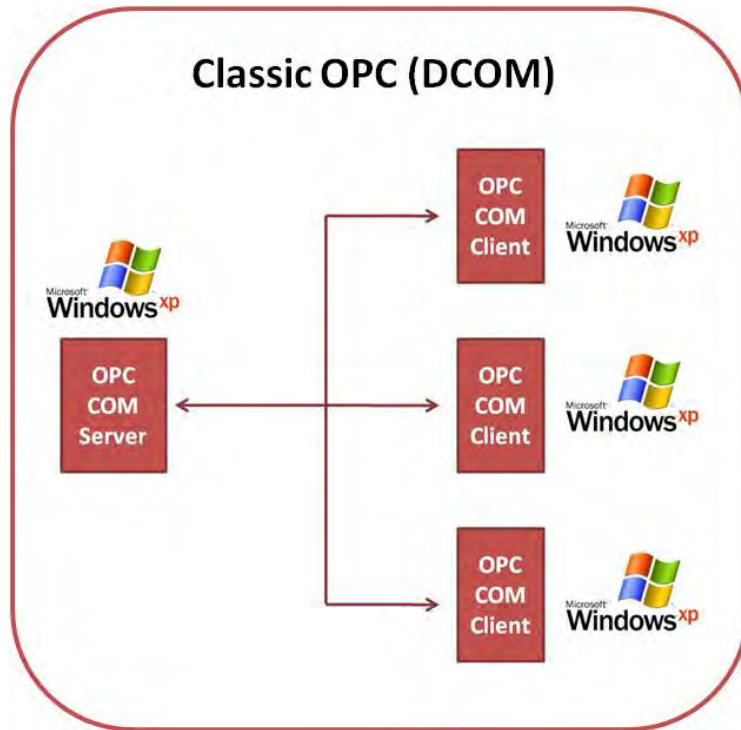
- Painted as the True Panacea - all devices will be recognized and communicate with host software



Connected Intelligent Factories Offer New Value Chain Models

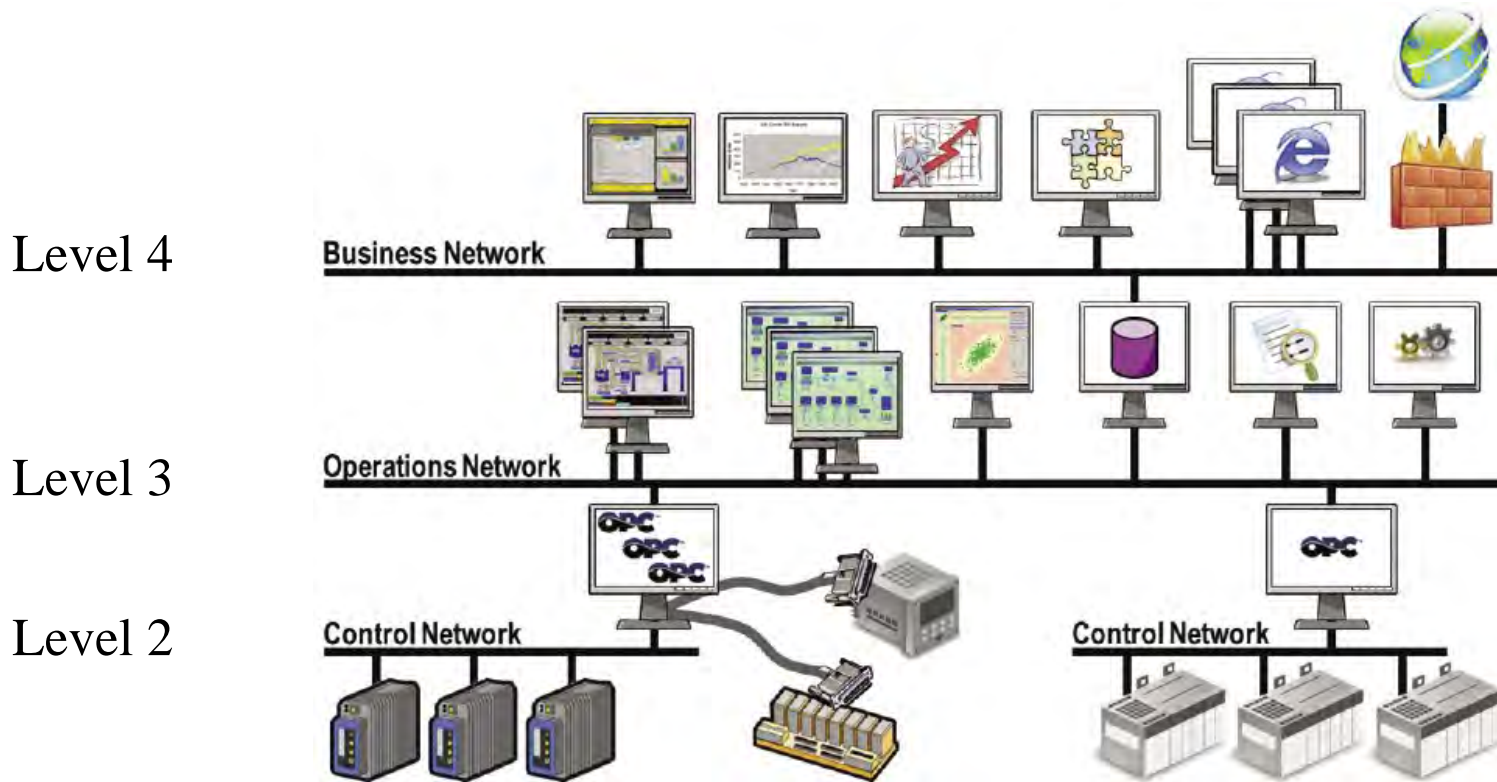
What's the Internet of Things?

- OPC UA will not be Windows dependent
 - means OPC UA will be able to be 'embedded' in non-Windows devices
 - O/S independent



What's the Internet of Things?

- OPC DA is typically found between Level 2 & Level 3.
- OPC UA promises to exchange data between the Level 2/3 and the business (Level 4) network.



What's the Internet of Things?

- OPC UA abandons Windows and is web services based
 - Upside – O/S independence
 - Downside - security
- “OPC UA is the Modbus of the new century”
 - Modbus is arguably the most widely used industrial communications protocol

What's the Internet of Things?

- Evolution of smart cell phone connectivity is pushing development of apps for remote monitoring of industrial devices
- OPC is not a replacement for low-level field device communication standards such as 4-20 mA, HART, PROFIBUS, or Foundation Fieldbus.



What's the Industrial Internet of Things ?

In summary

- Up to now, a marketing promise (trust me . . .)
- OPC UA is coming.
- Our vendors tell us it's on the way
- But, to date, Lesman has one device – wireless gateway with OPC UA
- Was it Xerox or IBM that in 1990 promised the “paperless office” by year 2000?
- Let's pause for a reality check
- Is it here yet? Not really
- Is it coming? Definitely

Until OPC UA arrives . . .

- How do you get desktop connectivity now?
- “Data on the Desktop”
- Example – Lesman’s server room
- Servers are critical for our operation
 - Email
 - VOIP phones
 - Web orders
 - Internal: accounts receivable/payable; order entry, shipping
- Servers generate a lot of heat and do not like high ambient temperatures
- Need to know when A/C is compromised and take action
- What tells us?



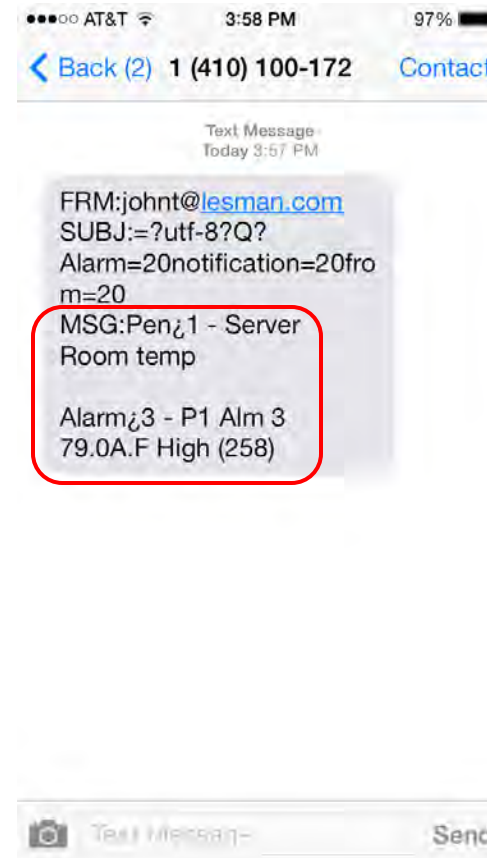
Data on the desktop

- Hang a temp sensor
- Connect sensor to a web/email/text message-enabled alarm recorder
- Configure staged alarms
 - 77 Deg F
 - 78 Deg F
 - 79 Deg F
 - 80 Deg F
 - 81 Deg F
- On alarm - sends email and text message



Data on my phone

- On alarm - sends email and text message



Data on the desktop

- From a desktop: View the temperature trend



Data on the Desktop

- Change the setpoints if need be
 - Note the log-in for making changes

Alarm Name	Setpoint
Alarm 1	Hi (77.00), P1 Alm 1
Alarm 2	Hi (78.00), P1 Alm 2
Alarm 3	Hi (79.00), P1 Alm 3
Alarm 4	Hi (80.00), P1 Alm 4
Alarm 5	Hi (81.00), P1 Alm 5
Alarm 6	Hi (82.00), P1 Alm 6

Back Finish ?

Status: Control Mode

Username

Password

Print Release Control 1.0.0.10

Data on the Desktop

- What's it like doing it 'live'?

Data on the Desktop

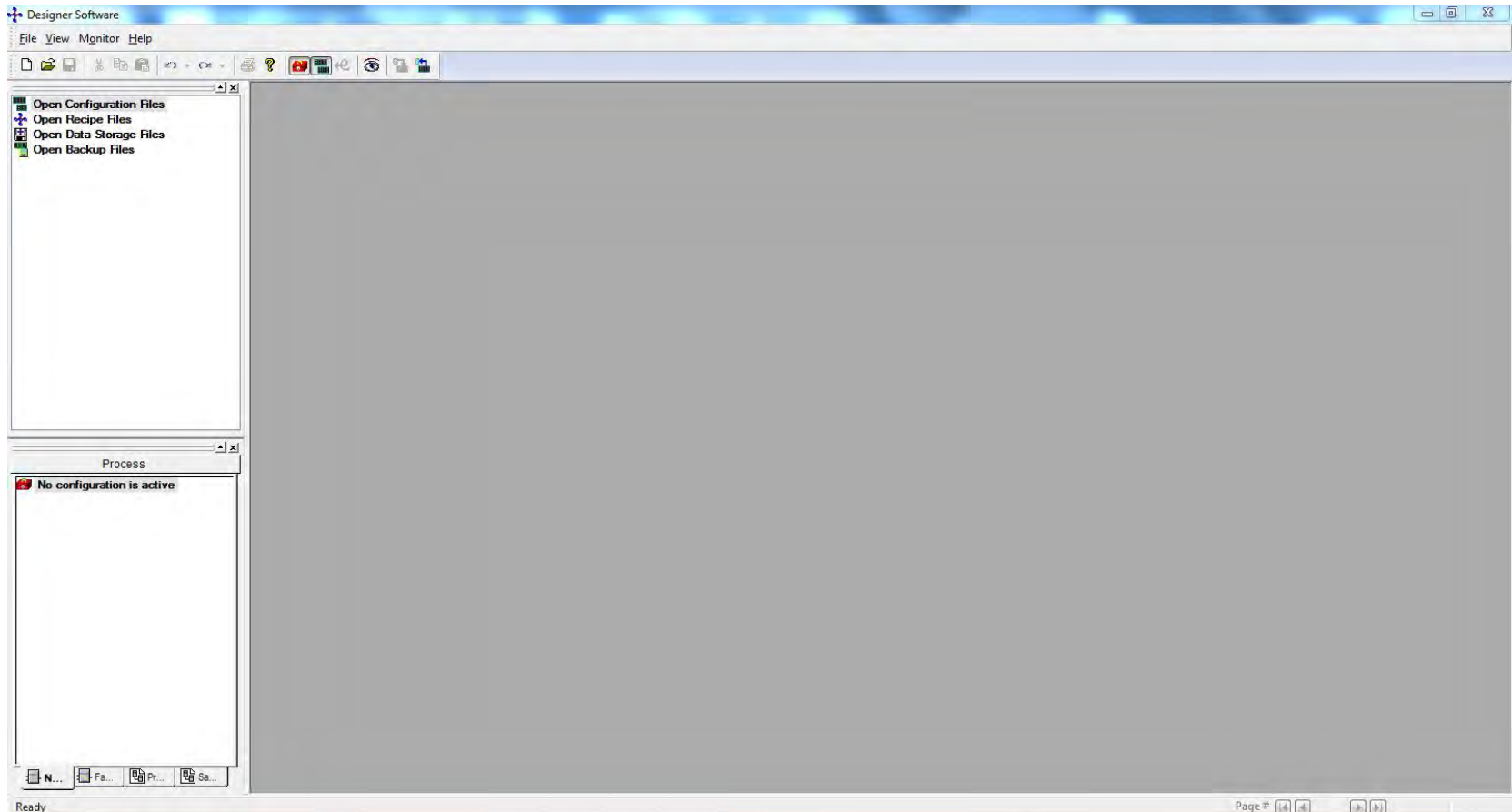
- How usable is a system like this?
- Two parts to getting it working
 - Configuration
 - Networking

Configuration

- Recorders are configured, not programmed
- Programming starts with a blank slate
 - Usually a separate Development software package
 - Programmer defines and codes everything - all sequences, all operations, etc
 - Higher skill level, testing/debugging, requires a programmer to make changes
- Configuration is menu based & selecting a parameter from a set of choices

Blank Slate programming

- Honeywell's Control Designer for HC-900 Process Automation Controller



Blank Slate programming

- Honeywell's Control Designer uses Function Blocks

The screenshot displays the Honeywell Control Designer interface. On the left, a 'Function Blocks' tree shows categories like I/O Blocks, Loop Blocks, SP Program, Logic, Counters/Timers, Math, Calculations, and Alarm/Monitor. The 'Math' category is expanded, showing blocks such as SCB, ADD, SUB, MUL, DIV, 4 Input ADD, 4 Input SUB, 4 Input MUL, and Free Form Math. The main workspace shows a 'MATH117 10' block with inputs A, B, C, D, E, F, G, and H. Inputs A, B, and C are connected to values 5.000, 10.000, and 15.000 respectively. Input H is connected to 3.000. The block has an 'OUT' output connected to a variable '[AVG_A_B_C]' and an 'ERR' output. A 'Free Form Math' dialog box is open, showing 'Block Number 117' and 'Order 10'. The 'OUT =' field contains the expression $(A+B+C)/H$. The 'Errors' field is empty. The 'Functions' list includes abs, exp, ln, log, and neg. The 'Operators' list includes + (Add), - (Subtract), * (Multiply), / (Divide), and ^ (Power). The dialog has 'OK' and 'Cancel' buttons.

Blank Slate programming

- PLCs/HMIs/Wonderware packages use Structured Text:

```
if result then functionString = "block_2";
else functionString = "block_3";
endif;

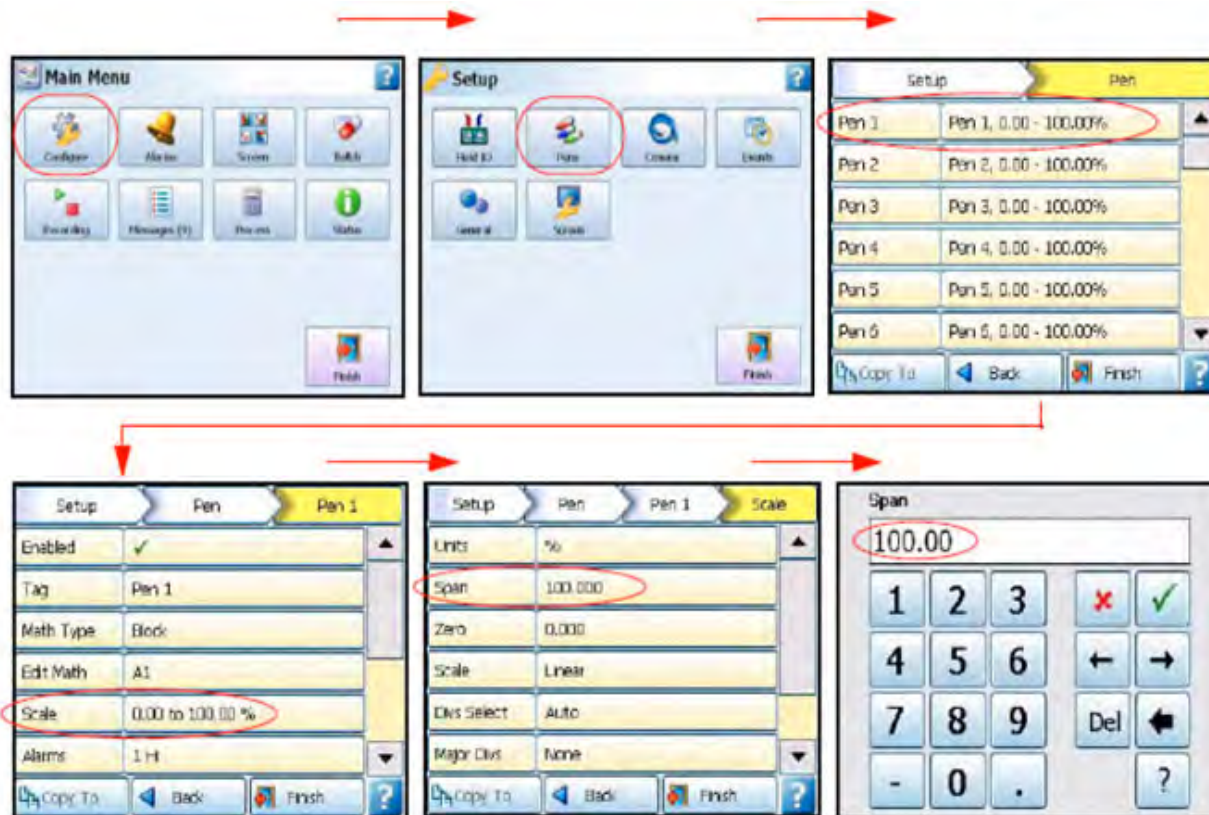
value = System.AppDomain.CurrentDomain.GetData("fResult");

'Use SortedList to pass multi-parameters
dim params as System.Collections.SortedList;
params = new System.Collections.SortedList();
'this parameter will be passed by value
params.Add("value",value);
'this parameter will be passed by reference
params.Add("myTable",myTable);
System.AppDomain.CurrentDomain.SetData("fParams",params);
```

- Whether Structured Text or Function Block programming
 - Initial and *continuing cost* of development software
 - Skill level required for blank slate programming/editing
 - Changes are billed like lawyer fees

Compare to Trendview Configuration

- Recorders are NOT programmed from a blank slate
- Recorders use Menus. Make a selection from choices, or enter a value



Example of a recorder menu path from the Main Menu to Pen Scale configuration with clear rapid navigation

Compare to Trendview Configuration

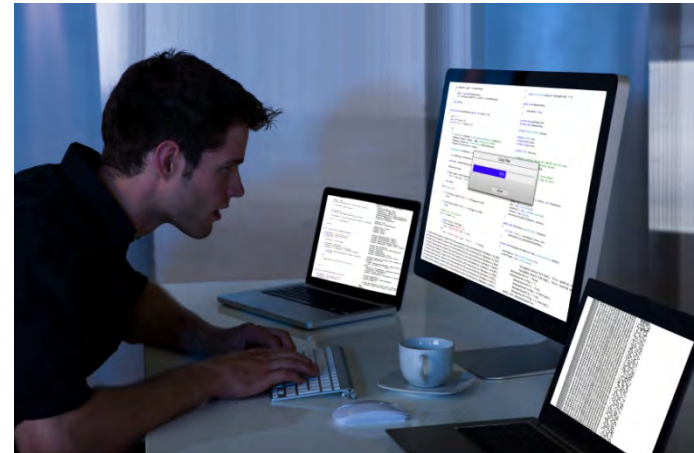
- With menu driven configuration, a technician with a moderate skill set can
 - Install
 - Commission
 - Make incremental changes over time
- Handle it ‘in-house’



Networking a recorder

Requires some assistance from your IT guy

- Install software at a admin level
- User and group entries
- IP address, Gateway IP
- Routing between subnets
- Connect from your home PC requires VPN access from outside the plant



Variety of sizes and options

- Buy only what you need
 - Screen size
 - # of inputs
 - Case style
 - Options
 - Batch
 - Modbus Master



Why a recorder?

- Super readability for charts
 - High contrast LCD
 - Rounded , even time divisions
 - Swap between three chart speeds
- Trend data AND digital data
- Alarm Annunciation and notification
- Consolidates multiple paper recorders
- Print to a USB printer
- Batch recording
- USB bar code reader
- Easy to get data out
- Archived data saved in a database, not zillions of files that are “high maintenance” file management
- Menu Configuration, not blank slate programming
- View recorder screen remotely “Data on the desktop”



Cellular visibility

- They hear you.
- It's coming
- Vendors are working on it
- Until it arrives, consider a networked recorder
- If the promises about OPC UA's universal connectivity are true, then the recorder will connect as easily as anything else; it won't be obsoleted
 - OPC does not eliminate the 'front end': the AI the sensors/transmitters connect to



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