

It's Not Enough to be Smart

A User's Perspective on Smart Process Instrumentation and Networks

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Brief Resume

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- B.S. / Ph.D. in Chemical Engineering
- 36 years with Procter & Gamble
- Focus areas
 - Process automation and control
 - Control loop performance and tuning
 - Process instrumentation
 - Community manager of the internal P&G automation and control global community.

Today's Process Instrumentation “Network”

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- **Conventional I/O dominates**
 - Highly distributed
 - Ethernet backbone
- **Discrete devices are simple ON/Off**
- **HART is broadly available for analog devices but not highly leveraged**
- **Ethernet is becoming more important**
 - Backbone of Remote I/O
 - Drives of all kinds
 - Complex / multivariable instruments
 - Coriolis flowmeters
 - pH transmitters
- **Typically on an isolated private network (192.168.1.xxx)**

Business and Technical Drivers

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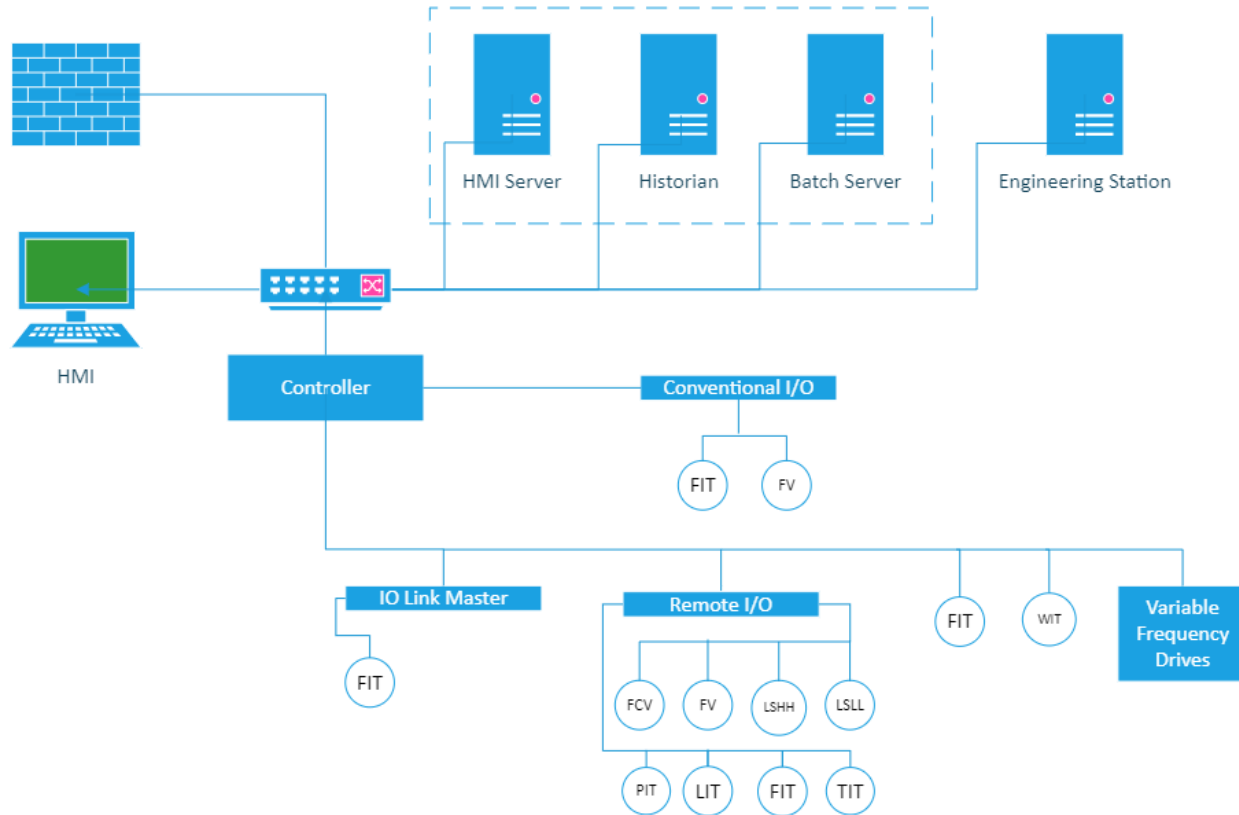
- “Smarter” devices with more data to share
- More systems want that data
 - Maintenance
 - Data Analytics
- Continued penetration of Ethernet farther down in the architecture
- Key process industry needs have not been met by mainstream IT Ethernet technologies.
 - Multi-conductor fragile wiring
 - Long distance wiring (not fiber)
 - Loop powered devices
 - Electrically classified areas
- New networking technologies
 - Advanced Physical Layer (APL)
 - IO Link

Smart Process Cell – “SPC”

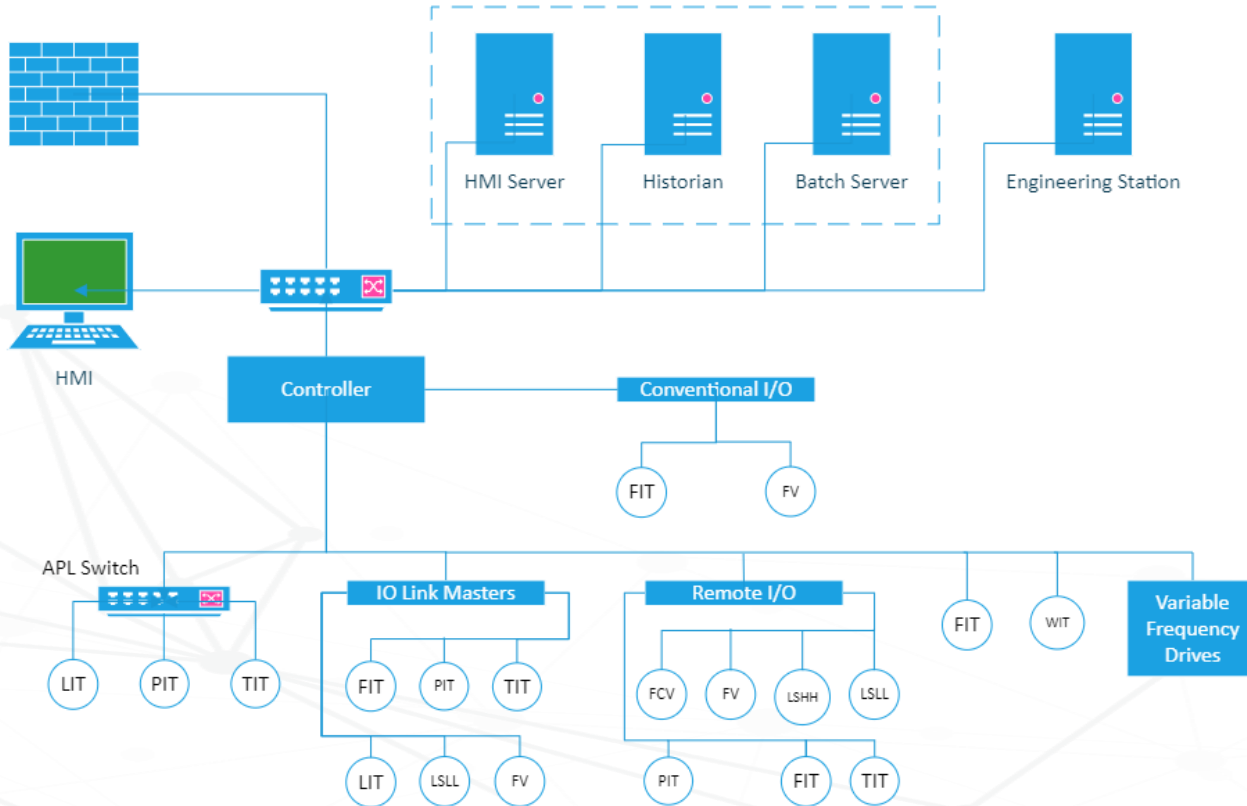


- Located at P&G Corporate Engineering Technology Lab (CETL) in West Chester, OH
- Process Equipment
 - Four tanks (500 kg and 375 kg)
 - Six pumps with flowmeters
 - Continuous and batch operations (3 units)
- Process Fluid – water
- Fully self-contained and remotely operated

The SPC Automation Network (December 2019)



The SPC Today



What Do Users Need?

Help Us Manage Complexity

Hand tools

DVM

HART Communicator

BootP

DHCP

IODD

EDS

Profiles

Firmware Rev

Data Model



The World of Logitech Mice for Windows

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Replacing a Mouse

- *The user . . .*



Removes old mouse



Connects new mouse



Wait



Uses new mouse

- *Windows . . .*

Loses connection to old device

Sees a new “pointing device”

- Finds an appropriate driver, using the network connection if it needs to.

Installs the new driver

Tells you it’s done.

Replacing a Mouse

- *The user . . .*



Removes old mouse



Connects new mouse



Wait



Uses new mouse,
but no emojis.

- *Windows . . .*

Loses connection to old device

Sees a new “pointing device”

- Finds an appropriate driver, using the network connection if it needs to.

Installs the new driver

Tells you it's done.

Replacing a Gaming Mouse

- *The user . . .*



Removes old mouse



Connects new mouse



Wait



Uses new mouse, but
lost 15 button
configurations

- *Windows . . .*

Loses connection to old device

Sees a new “pointing device”

- Finds an appropriate driver, using the network connection if it needs to.

Installs the new driver

Tells you it's done.

Replacing a 4-20mA HART Pressure Transmitter

- In the field*



Remove old transmitter



Connect new transmitter



Configure the range in the new transmitter



It probably works.

- In the application / controller . . .*

Loses connection to old device

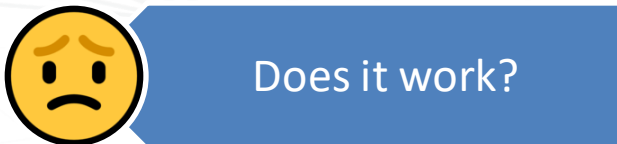
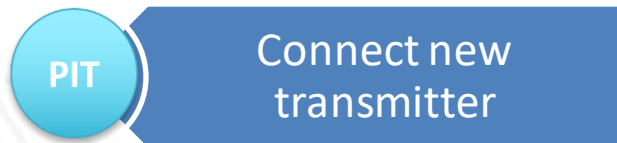
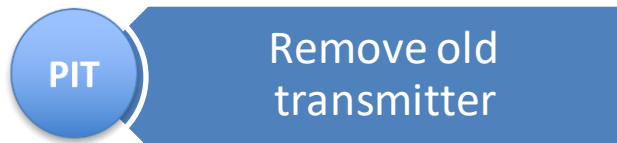
Valid connection to a new device

Check scaling

Valid signal

Replacing A Smart Device (EtherNet/IP, IO-Link, etc)

• *In the field*



• *In the application / controller . . .*

Loses connection to old device

Does the new device communicate?

- New configuration file?
- Do I have to restart/reload the controller?

Is the data structure the same?

- Do I have to change the application code?

How long will it take to get back up?

Where Do Users Need Help With Smart Devices?

Communications

- IP Address Assignment
- DHCP, BootP
- Local displays
- Dip switches
- Selector wheels
- Switch port based DHCP ?
- Watch out for assumptions
- 192.168.1.x
- 10.10.x.x
- ????



Where Do Users Need Help With Smart Devices?

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- Integration and Compatibility
- Configuration Files / Drivers
- EDS files
- IODD files
- Easy replacement of “like for like” devices
- Temperature
- Pressure
- Switches

***What skills
will be
needed to
troubleshoot
and repair our
smart
systems?***

Where Do Users Need Help With Smart Devices?

• Configuration Confusion

How many ways are there to change the configuration of a smart process transmitter?

- Local display
- Field communicator
- Controller programming software
- Asset management system
- Web interface

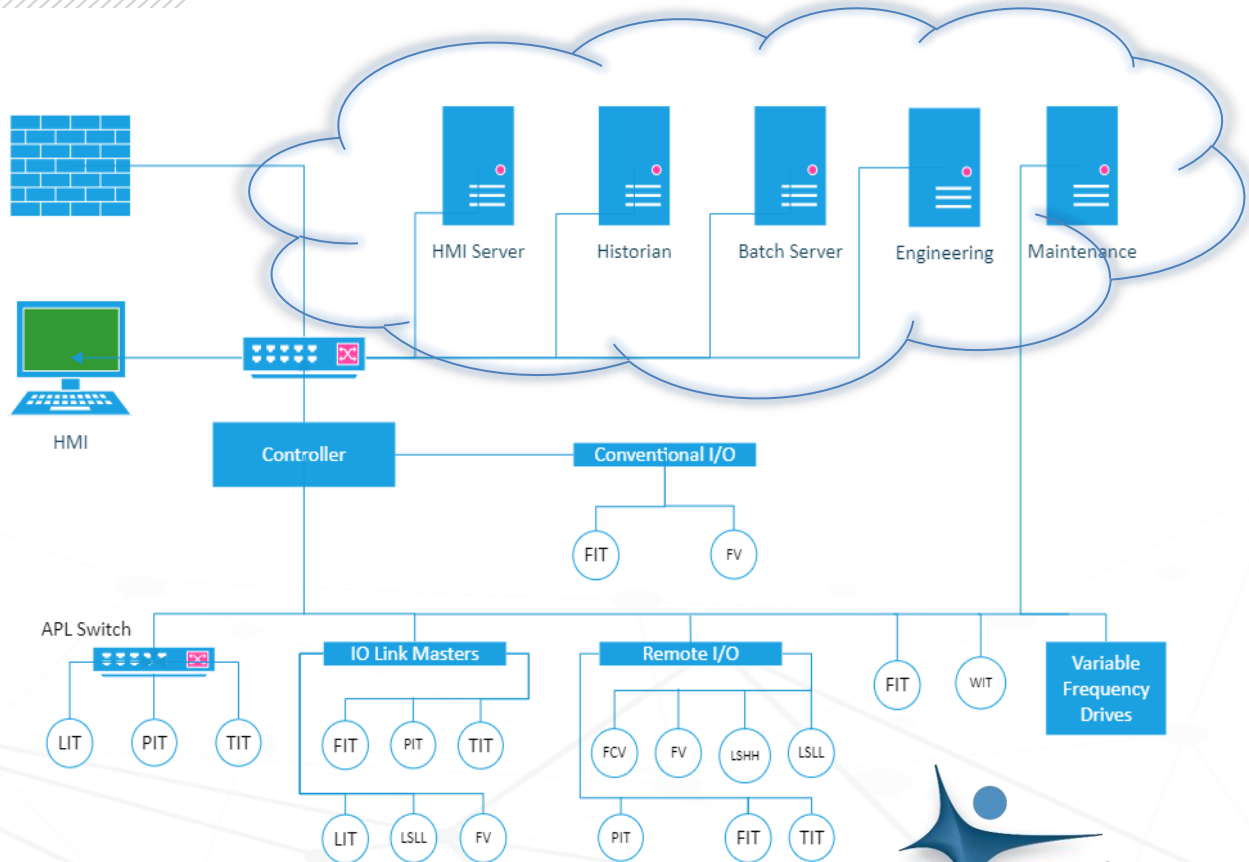
Do they all show the same information?

Who has the “Master Copy”?



Future Networks and Architectures?

- Cloud
- Less controller-centric?
- Different protocols
- Users will need standards



Conclusions

- New technologies need to deliver functionality and simplicity.
- Standards are great!
- Please put the end-users front and center when creating and managing standards.

Thank You for Your Attention

