

# It's Not Enough to be Smart

A User's Perspective on Smart Process Instrumentation and Networks

**Paul R. Maurath**

The Procter and Gamble Company



# Brief Resume



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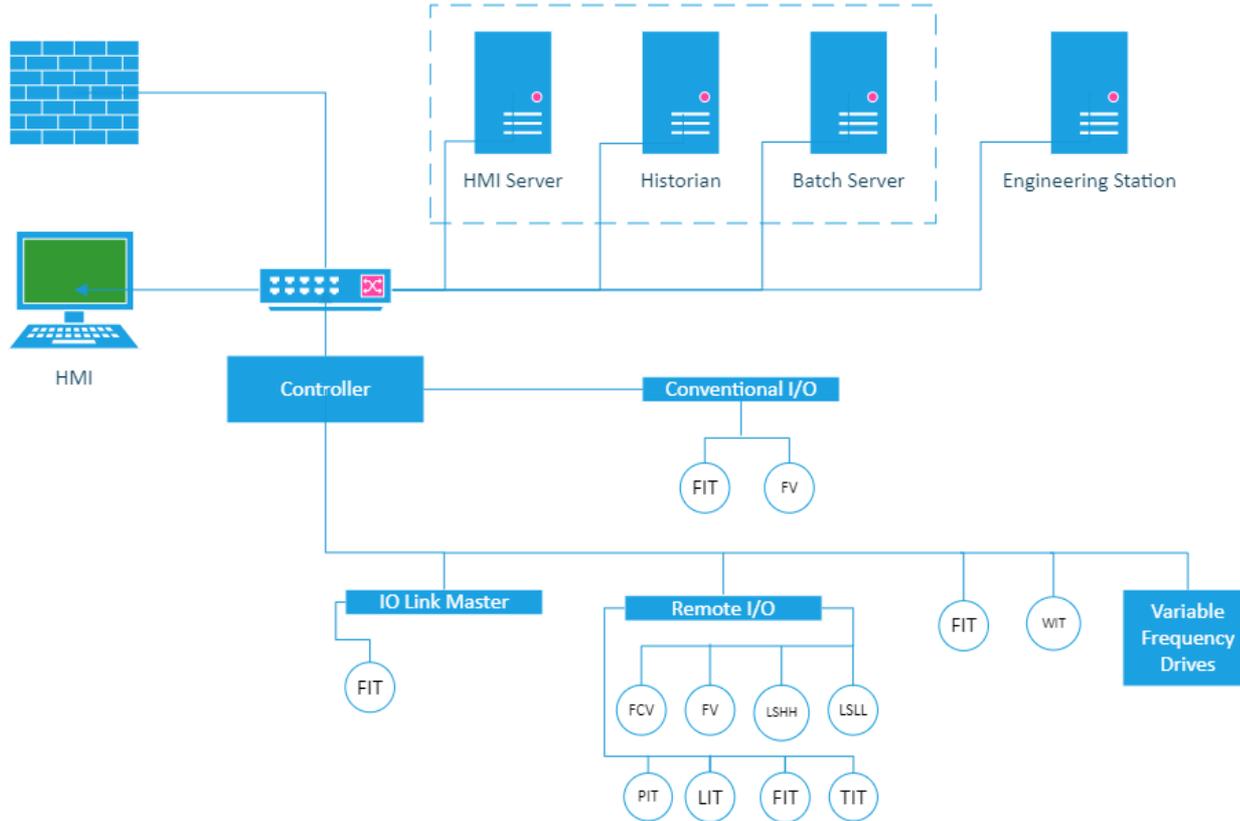
- “Smarter” devices with more data to share
- More systems want that data
  - Maintenance
  - Data Analytics
- Continued penetration of Ethernet farther down in the architecture
- Key process industry needs have not been met by mainstream IT Ethernet technologies.
  - Multi-conductor fragile wiring
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

# Smart Process Cell – “SPC”

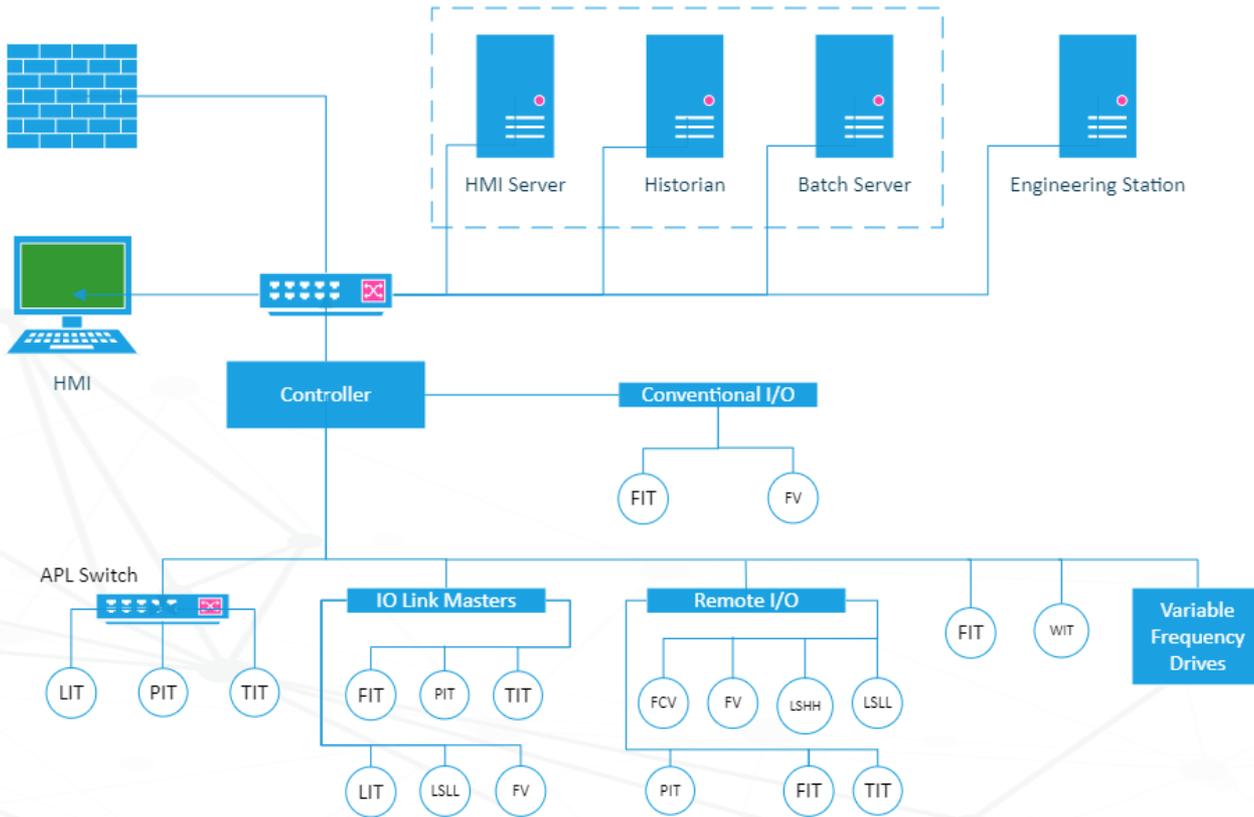


- Located at P&G Corporate Engineering Technology Lab (CETL) in West Chester, OH
- Process Equipment
  - Four tanks (500 kg and 375 kg)
  - Six pumps with flowmeters
  - Continuous and batch operations (3 units)
- Process Fluid – water
- Fully self-contained and remotely operated

# 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



# 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*

 Remove old transmitter

 Connect new transmitter

 Configure communications

 Does it work?

- *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?

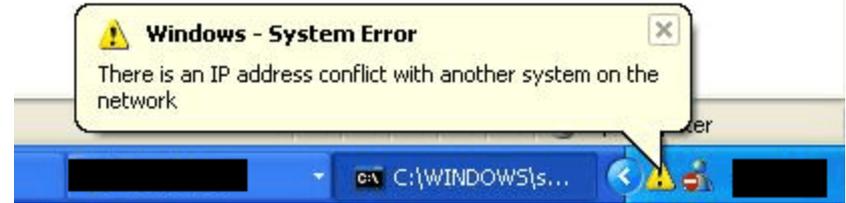
- Do I have to change the application code?

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

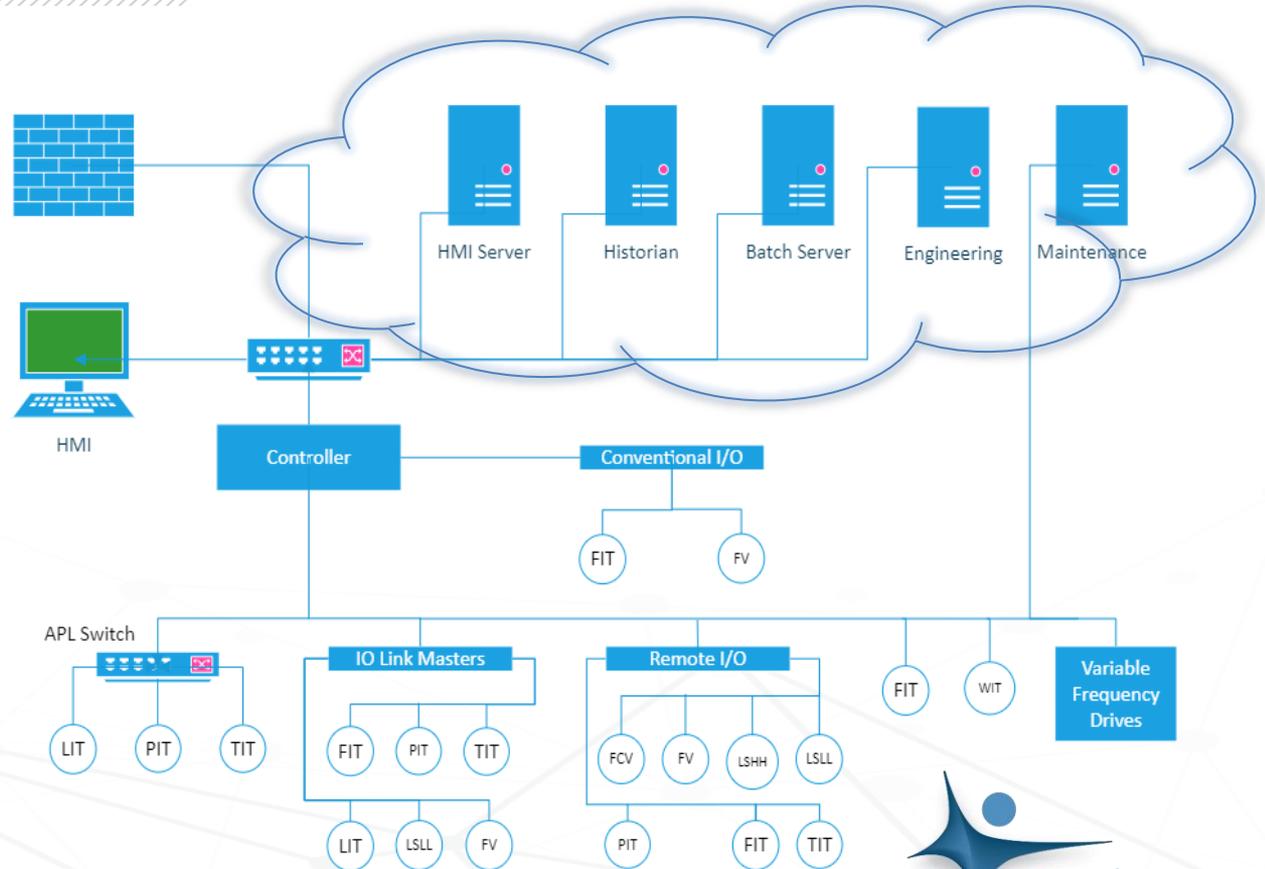
Do they all show the same information?

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

