
Top 10 Design & Security Tips
to Elevate Your SCADA System

Presenters

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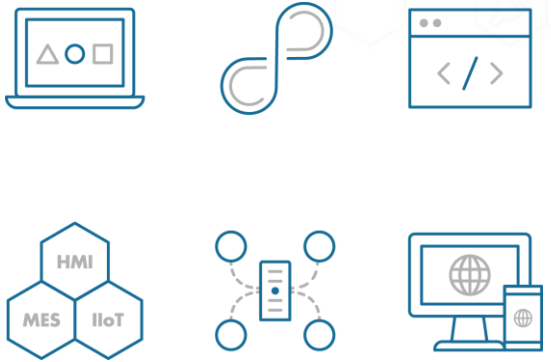
Today's Agenda

- Introduction
- Why UI/UX & Security are Critical for Control Systems
- Top 10 Design & Security Tips
- Q&A

Ignition: Industrial Application Platform

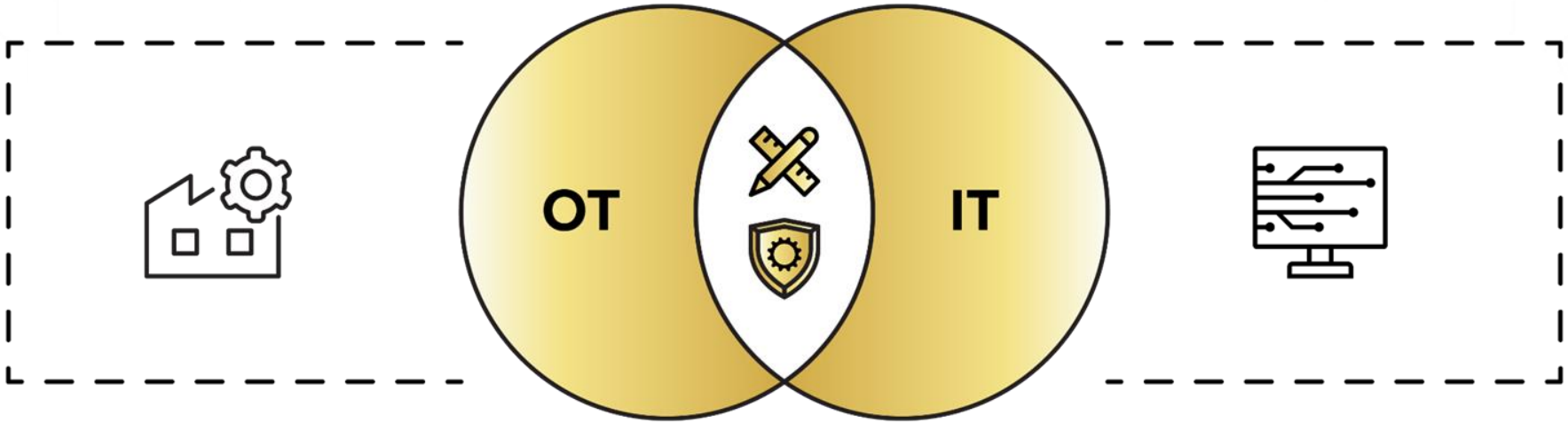
One Universal Platform for HMI/SCADA, MES & IIoT:

- Unlimited licensing model
- Cross-platform compatibility
- Based on IT-standard technologies
- Scalable server-client architecture
- Web-based & web-managed
- Web-deployed designer & clients
- Modular configurability
- Rapid development & deployment



Why UI/UX & Security are Critical

As the worlds of OT and IT continue to blend together, the issue of who has access to data becomes more vital.



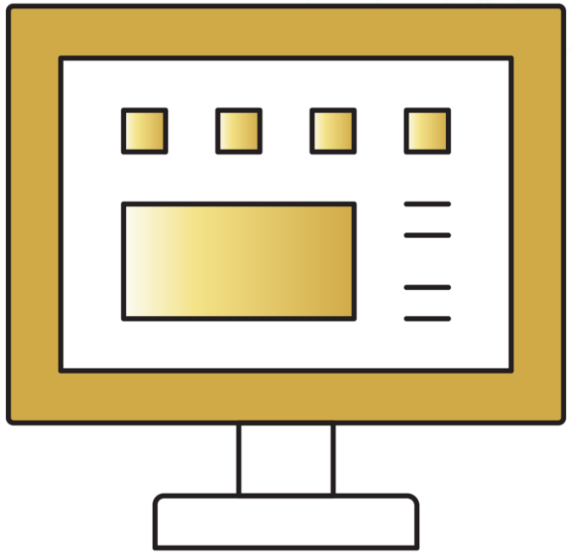
Top 10 SCADA UI/UX & Security Tips

1. Determine Your Navigation Structure
2. Cognitive Load
3. Visual Hierarchy
4. High-Performance HMI Techniques
5. Leverage Mobility
6. Understand and Secure All Connections
7. Employ Two-Factor Authorization (2FA) and Single Sign-on (SSO)
8. Leverage a DMZ
9. Decouple Devices from Applications
10. Leverage New Smart Sensors

Determine Your Navigation Structure

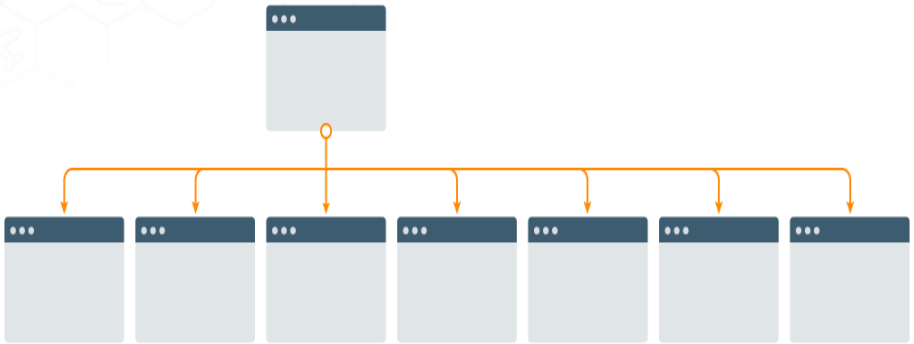
Tip #1: Determine Your Navigation Structure

- Navigation is vital in any application.
- Organization structure
  - Broad and Shallow
  - Narrow and Deep
- Screen layout

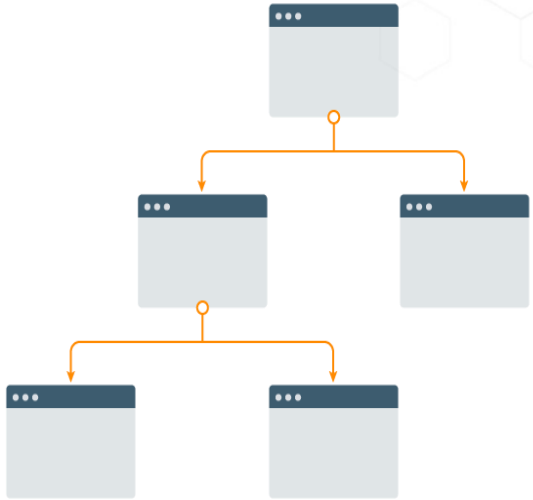


Determine Your Navigation Structure

Broad and Shallow



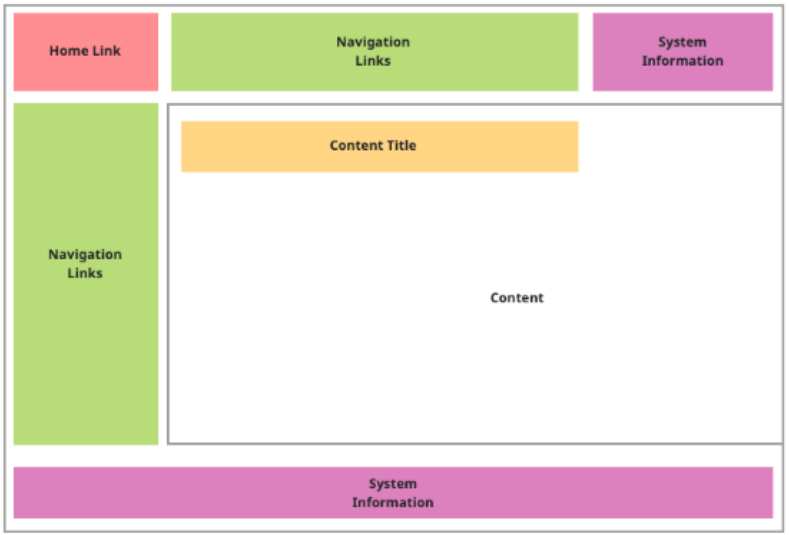
Narrow and Deep



Determine Your Navigation Structure

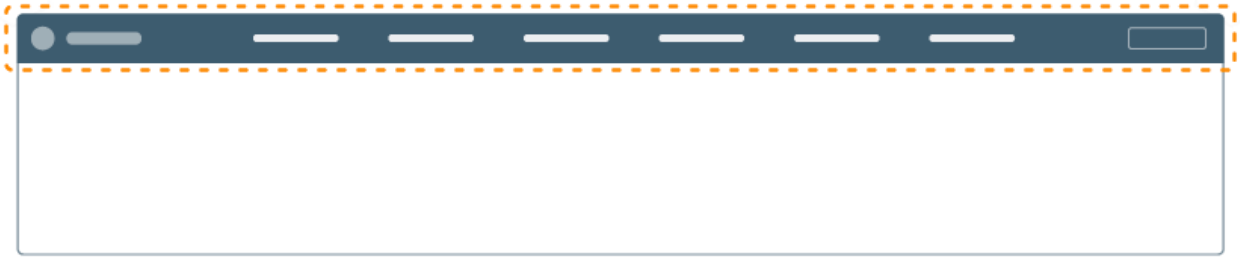
Screen layout

- Primary Top Header
- Secondary Top Header
- Side Navigation
- Tabs



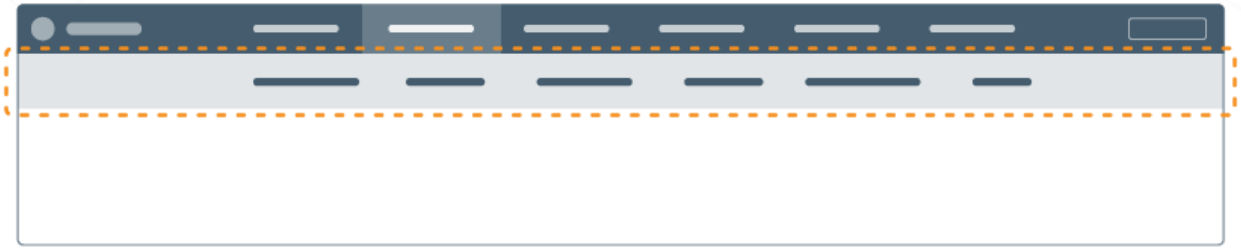
Determine Your Navigation Structure

Primary Top Header



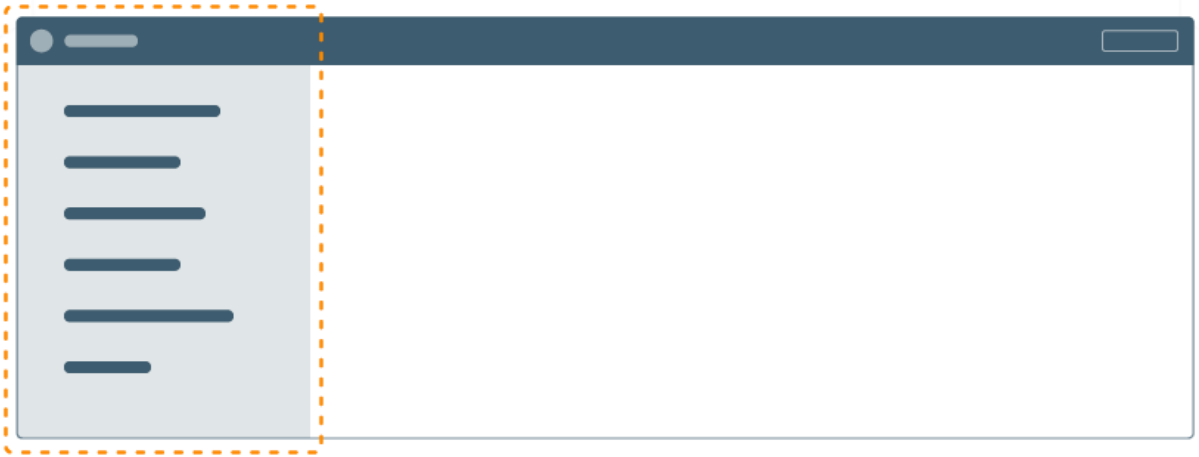
Determine Your Navigation Structure

Secondary Top Header



Determine Your Navigation Structure

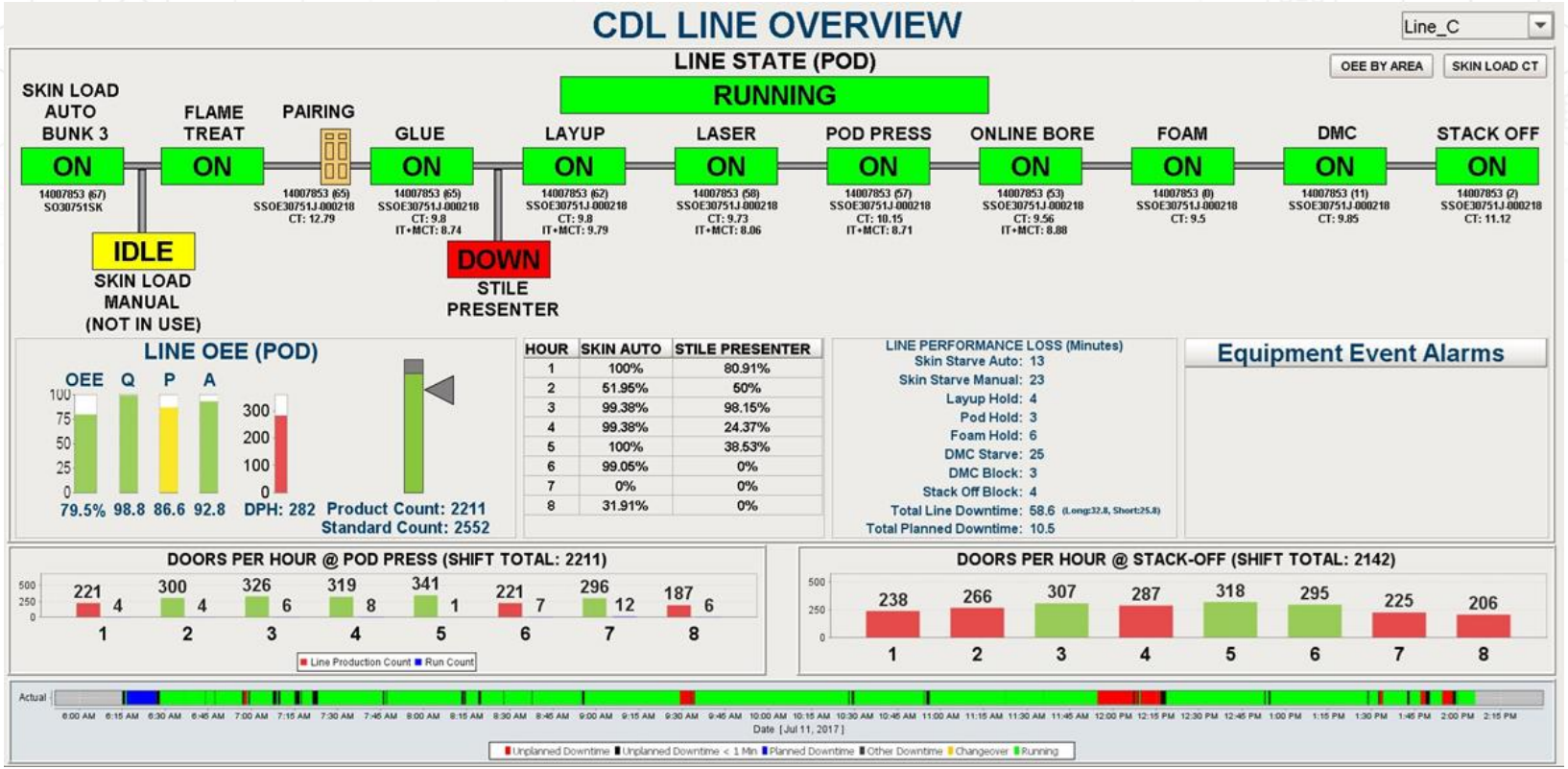
Side Navigation



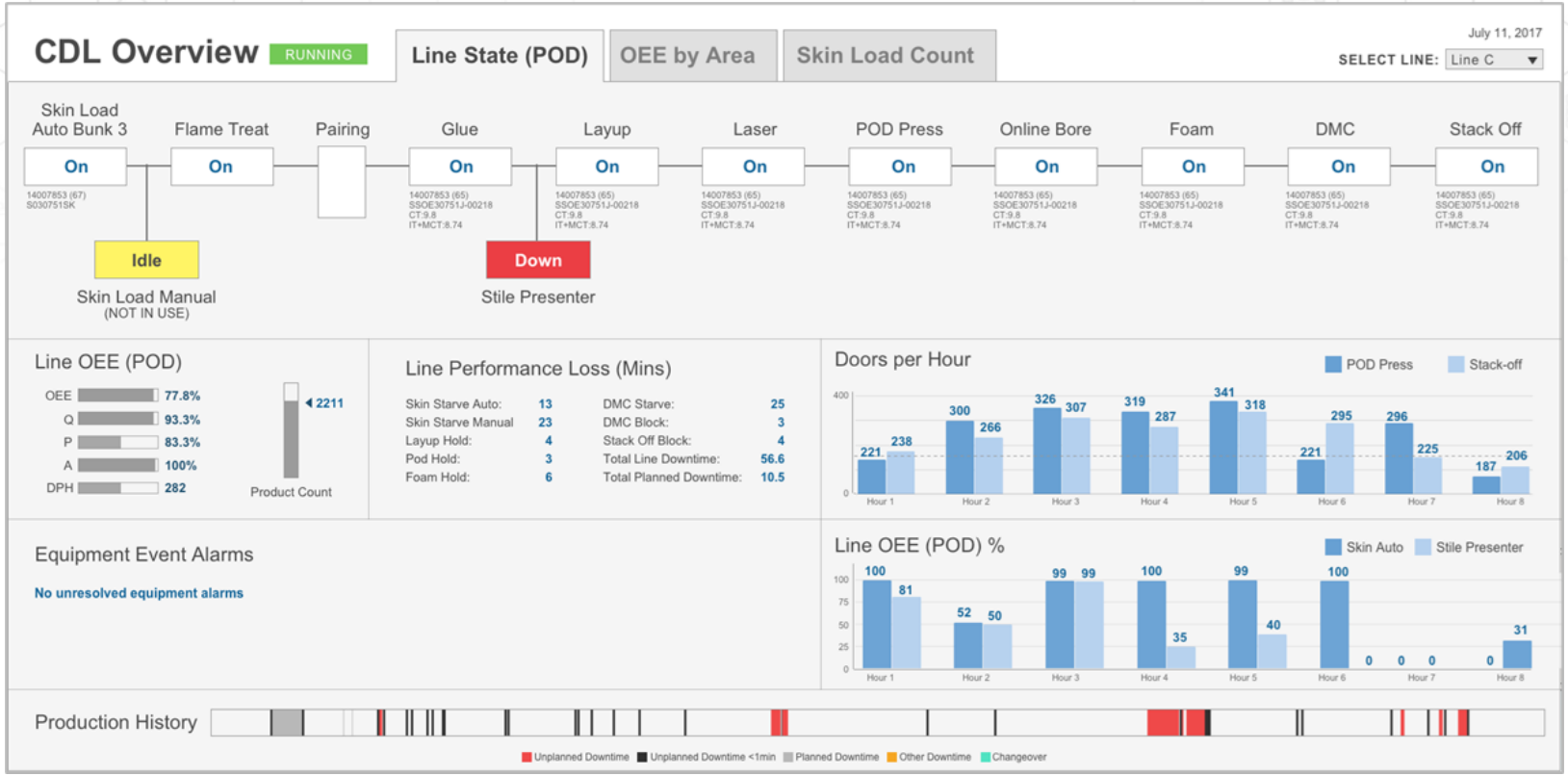
Determine Your Navigation Structure

Tabs

Example: Navigation (Before)



Example: Navigation (After)



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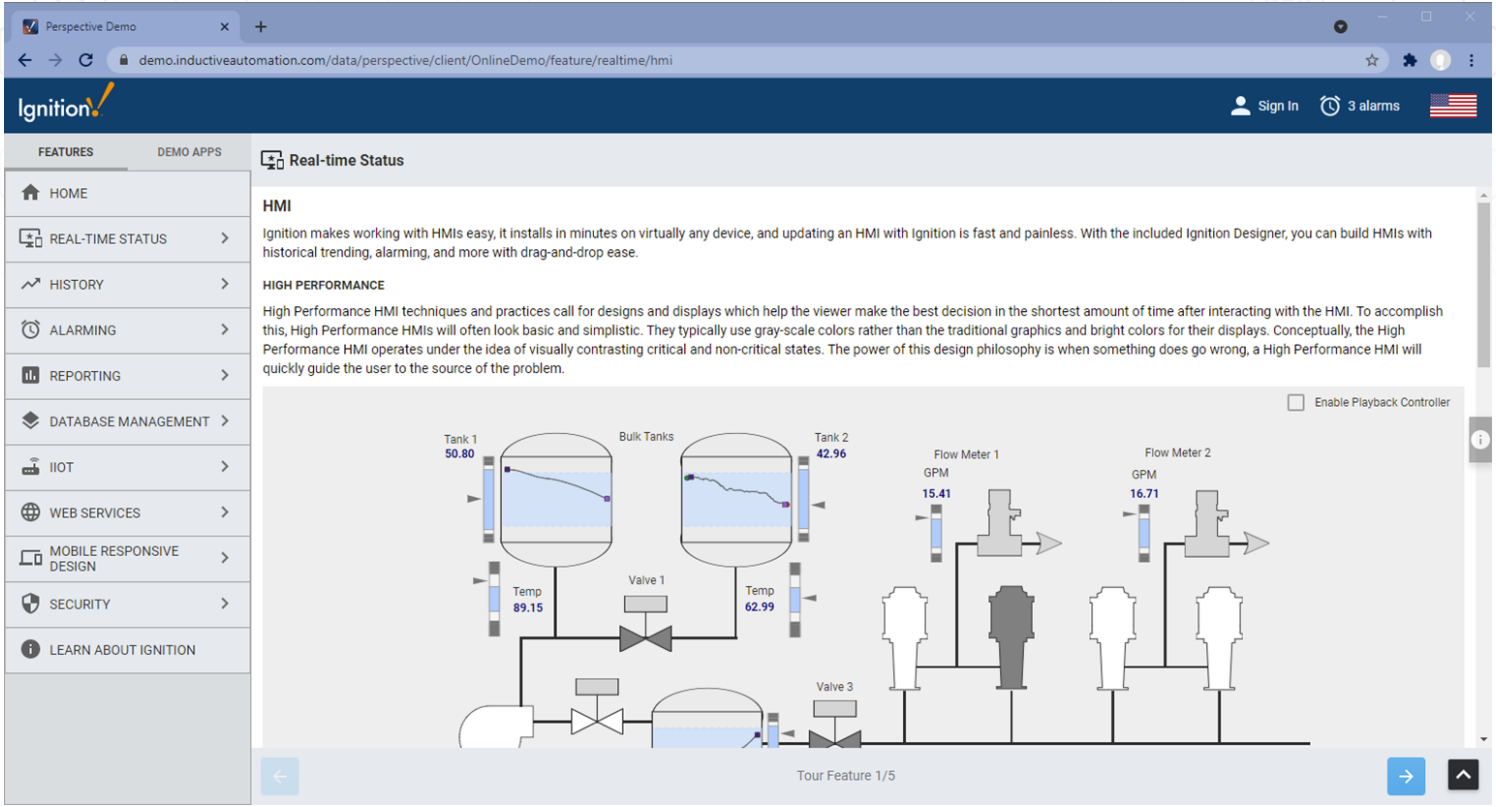
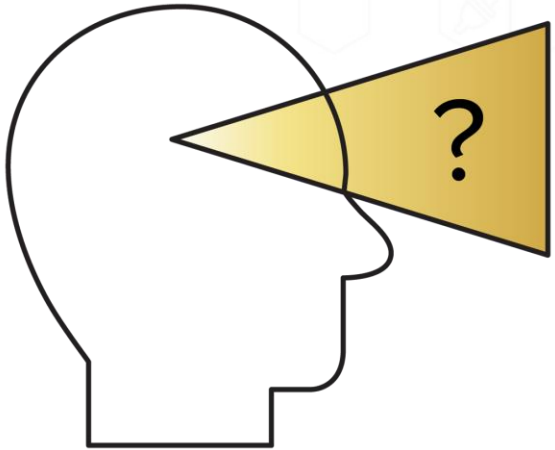
Example: Side Navigation



Cognitive Load

Tip #2: Cognitive Load

- The human eye can only handle so much at once
- Remove distractions
- Use cleaner lines
- Fewer unnecessary details



Cognitive Load

Remove visual clutter

Cognitive Load

Alignment & Grids

- Creates a set of visual rules
- Assists with navigation

Cognitive Load

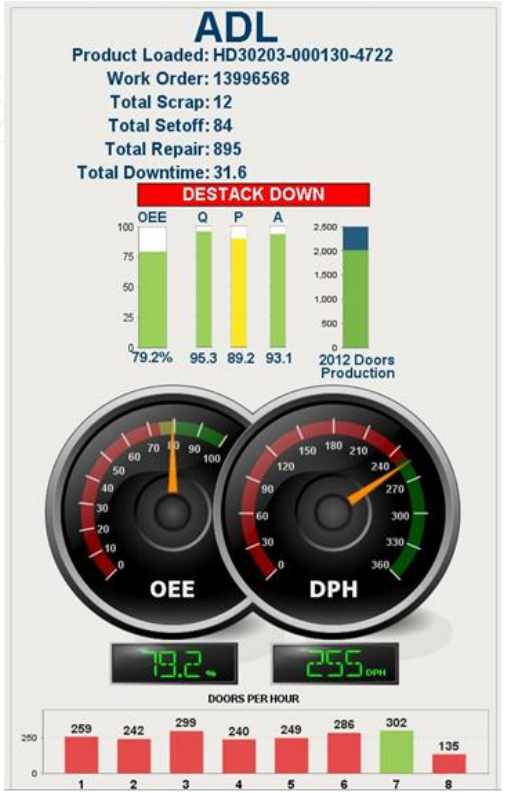
Using Text

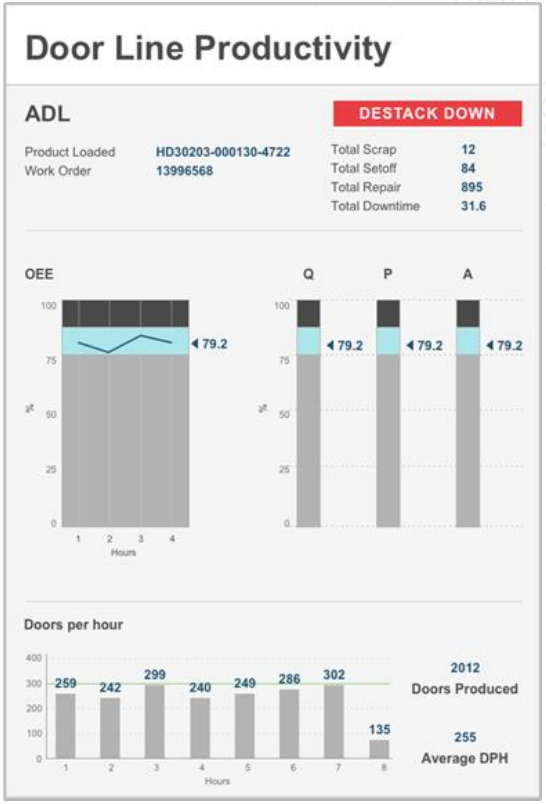
- 2-3 fonts/font variations
- Pair icons with text
- Descriptive errors where possible
- Left alignment

Cognitive Load

Consistency
- Styling
- Terms

Example #1: Before & After





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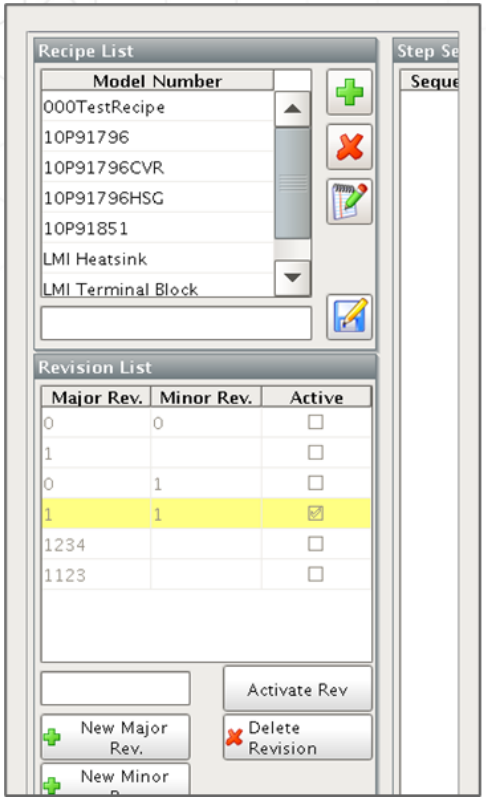
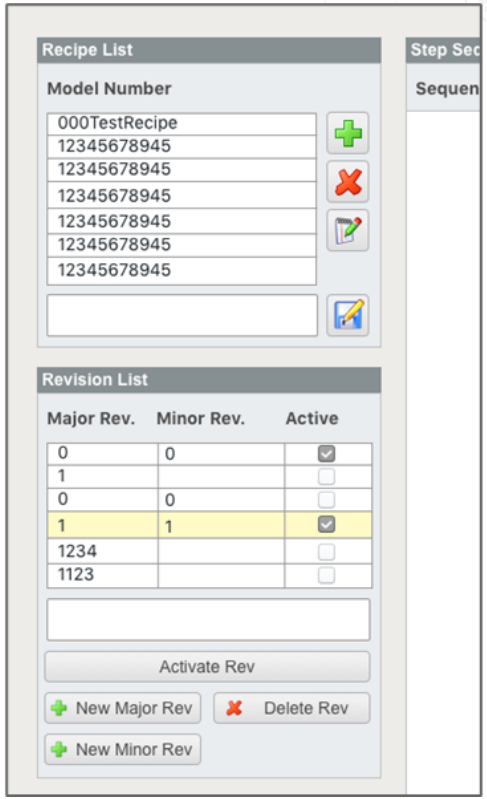


Original

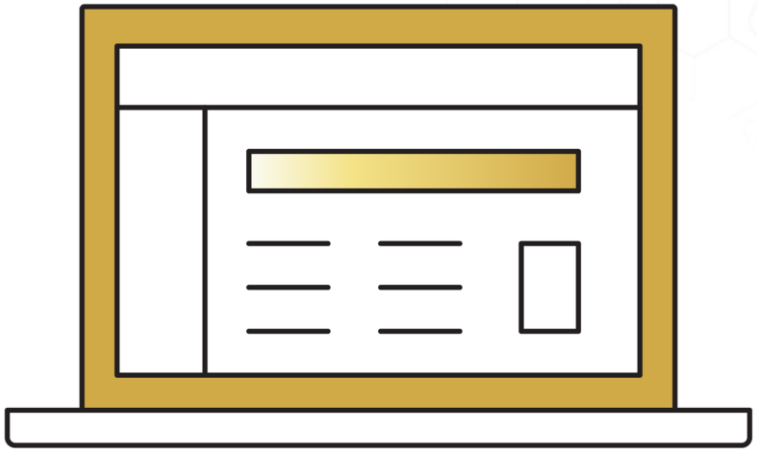


Redesign

Visual Hierarchy

Tip #3: Visual Hierarchy

- Create emphasis through:
  - Size
  - Position
  - Color
  - Isolation



Visual Hierarchy

Size

Which square stands out?

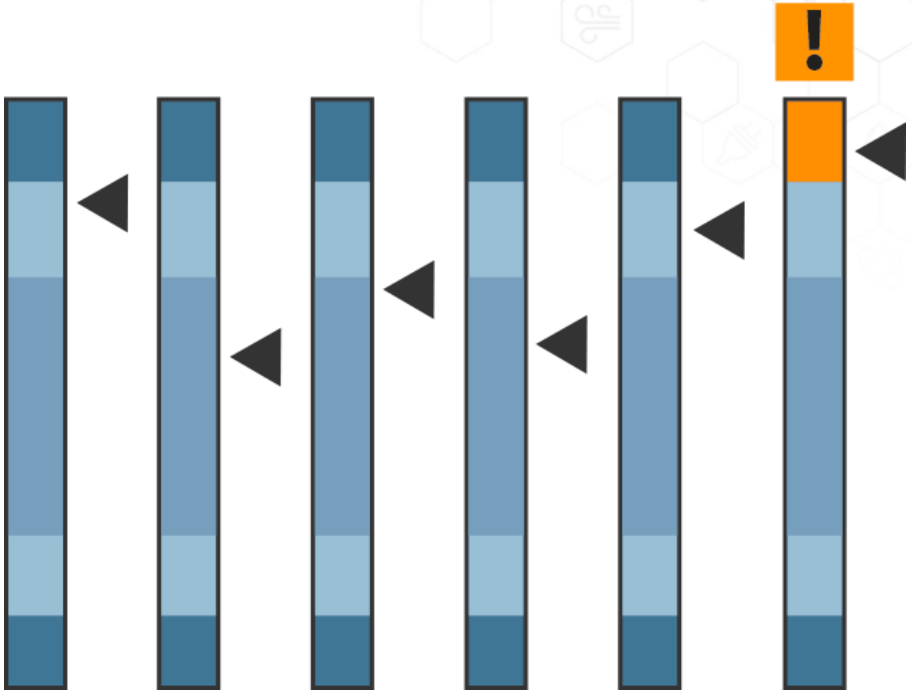
Visual Hierarchy

Color

Which square stands out?

Visual Hierarchy

Color in action



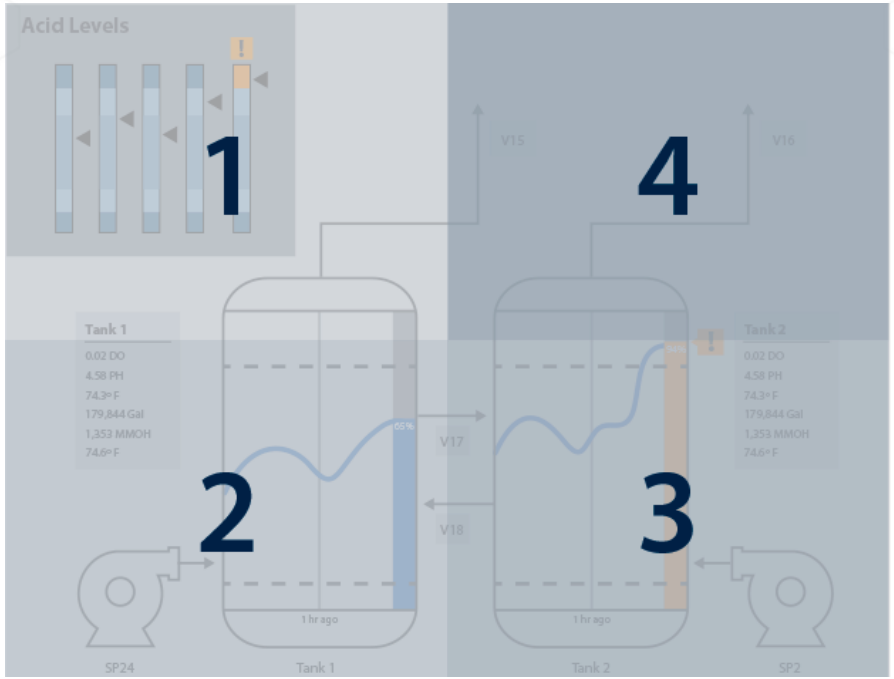
Visual Hierarchy

Position

Which square stands out?

Visual Hierarchy

Position



Visual Hierarchy

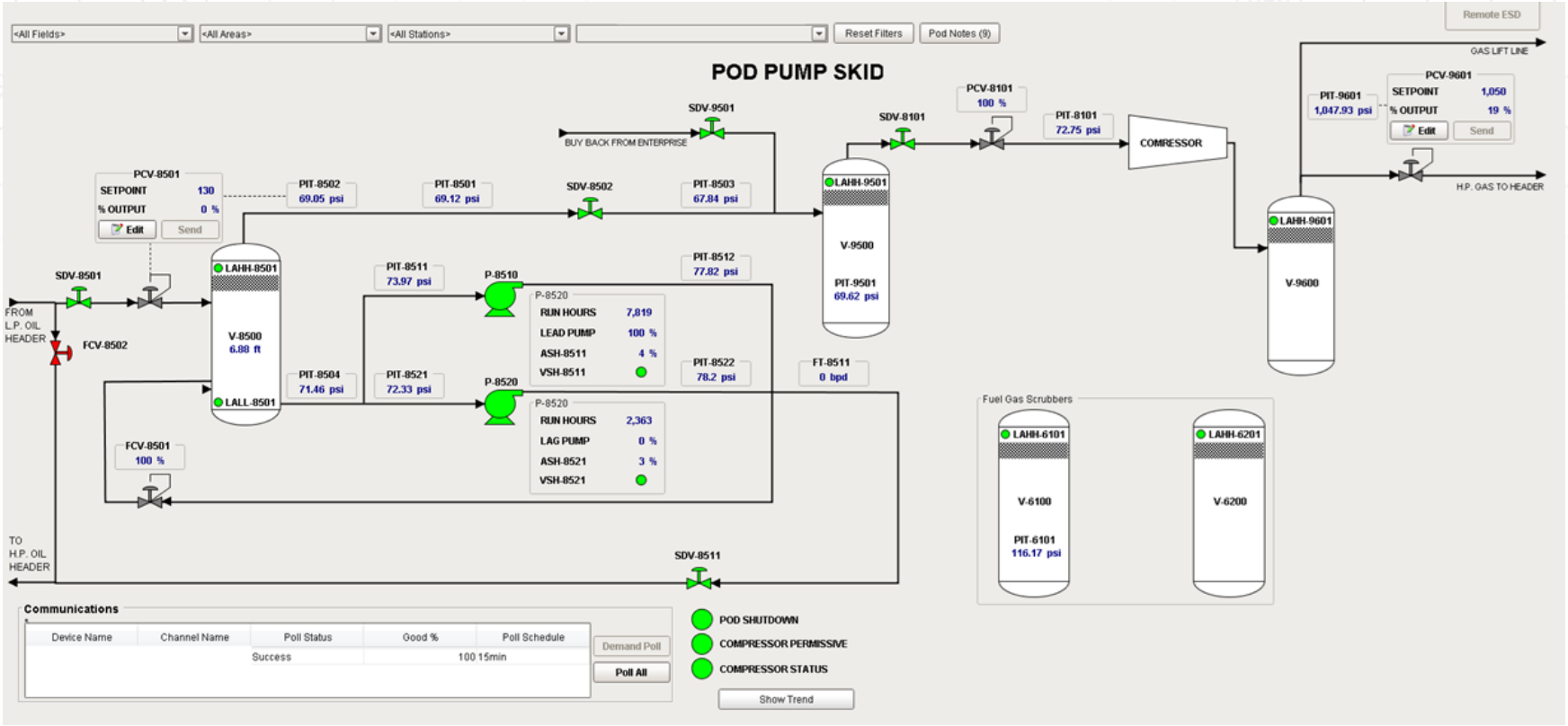
Isolation

Which square stands out?

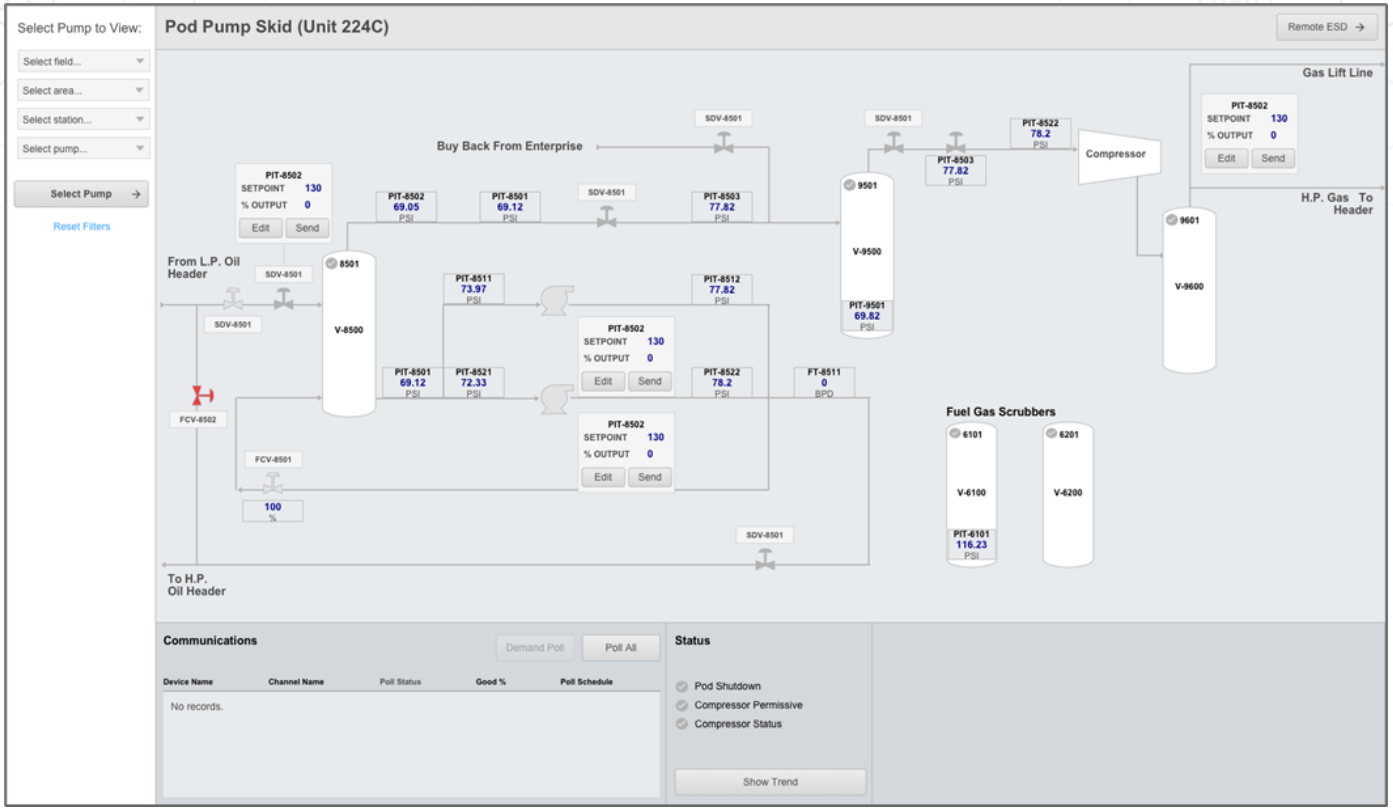
Visual Hierarchy

By combining emphasis techniques, you can achieve an even greater effect and create a hierarchy of importance for each element on the screen.

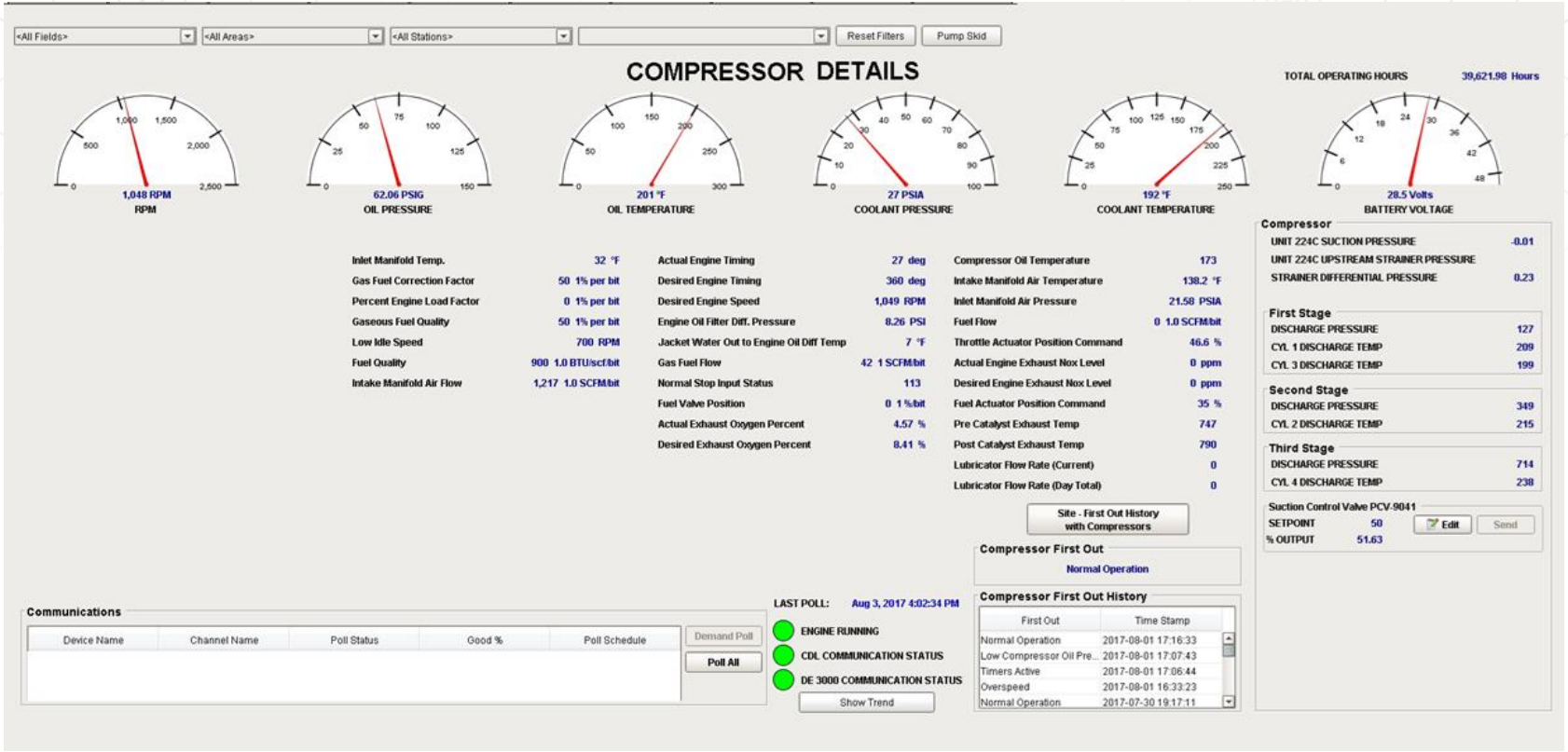
Example #1: Before



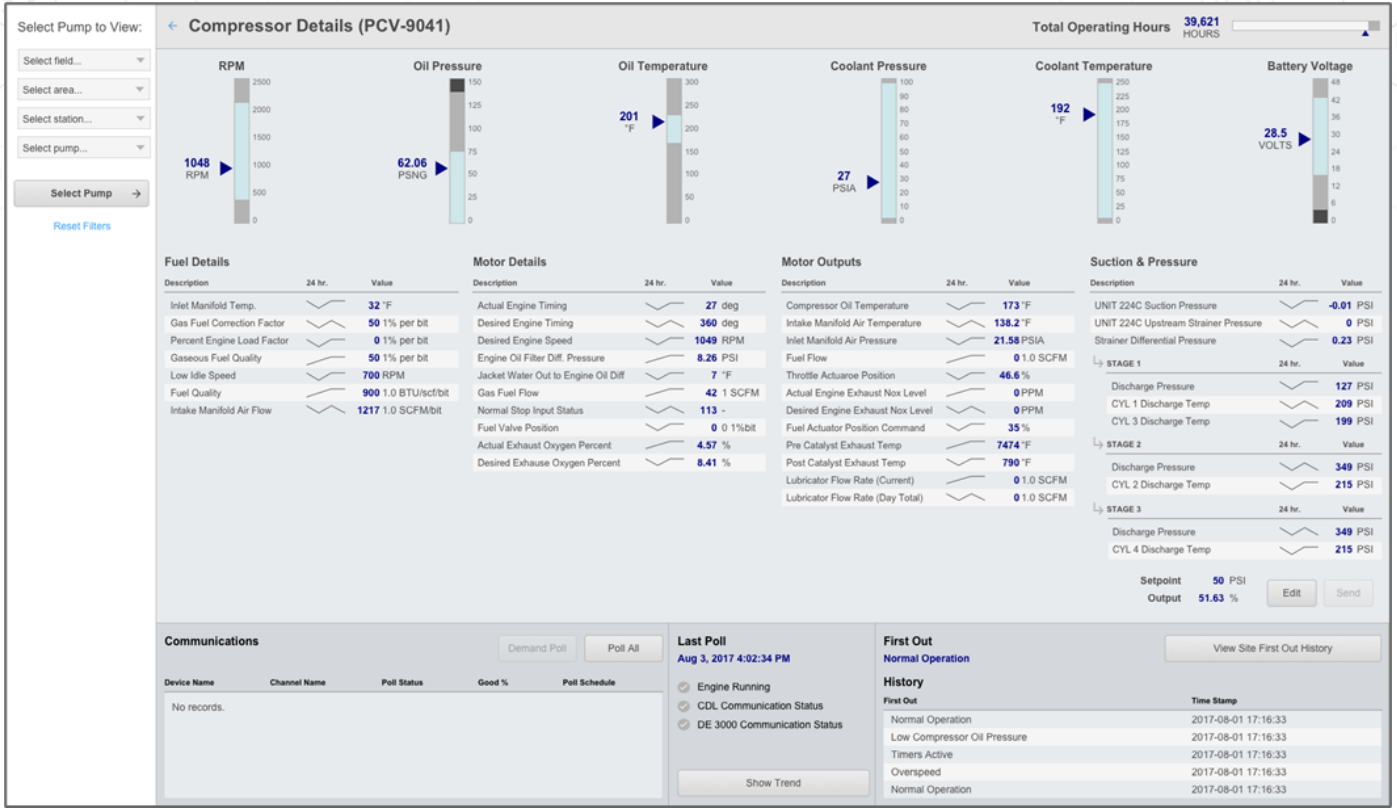
Example #1: After



Example #2: Before



Example #1: After



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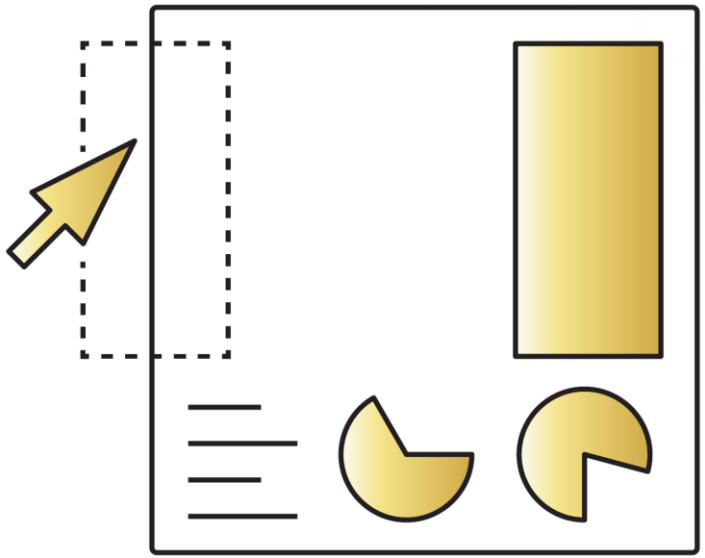
High-Performance HMI

Tip #4: High-Performance HMI Techniques

- Designs and displays that help the viewer make the best decision in the shortest amount of time



High-Performance HMI Focus

Example: Analog vs. Digital Watches

High-Performance HMI Focus

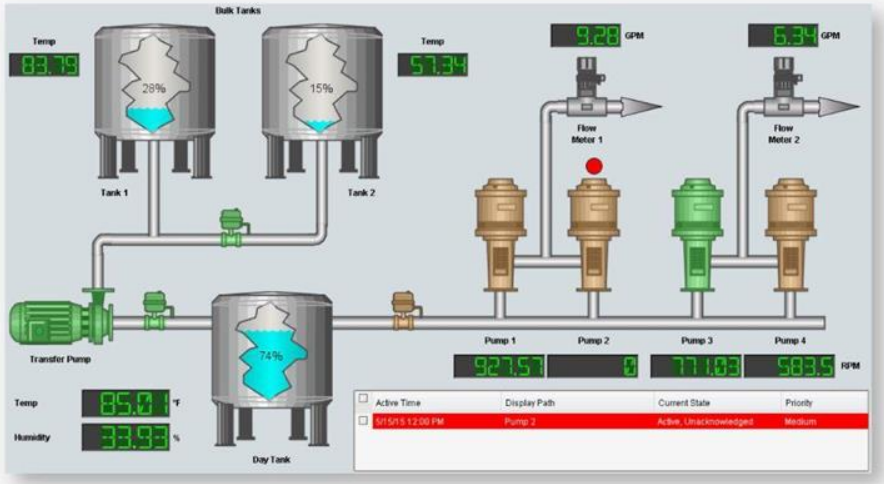
Example: Blood Pressure Reading

Blood Pressure: 122/93

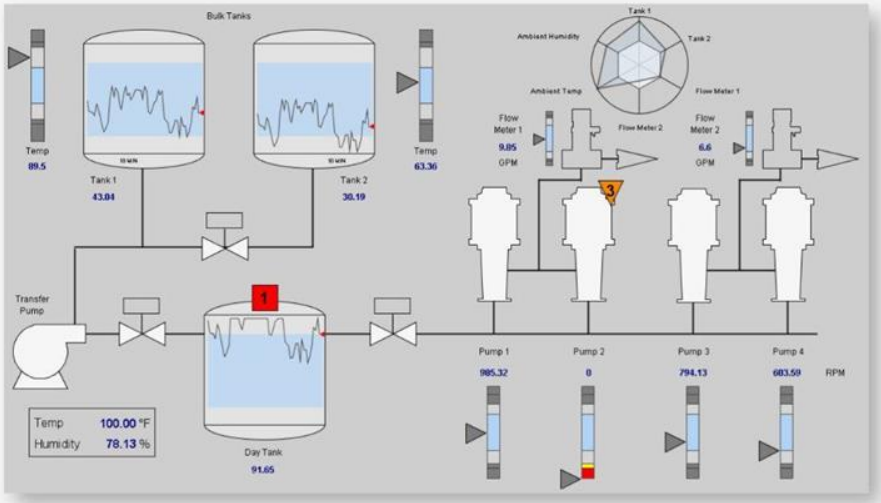
	Systolic	Diastolic
Normal		
Pre-Hypertension	122	
High Blood Pressure Stage 1		93
High Blood Pressure Stage 2		
Hypertensive Crisis		

High-Performance HMI

Traditional HMI



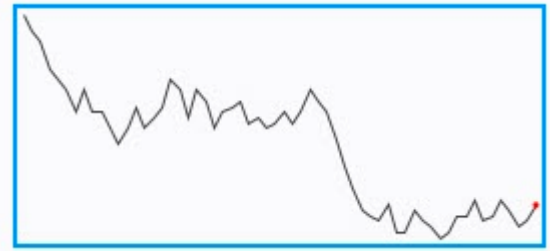
High Performance HMI



High-Performance HMI

Sparklines

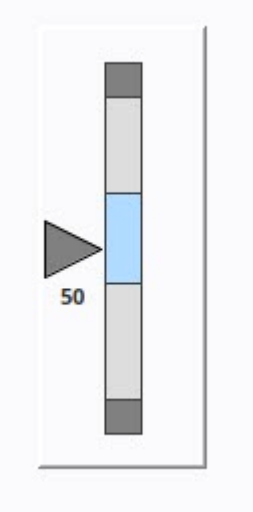
- Minimalistic chart component that displays a line-chart history for a single datapoint
- Show contextual information in a very small amount of space
- Typically used to display the recent history to quickly discern the recent trend



High-Performance HMI

Moving analog indicators

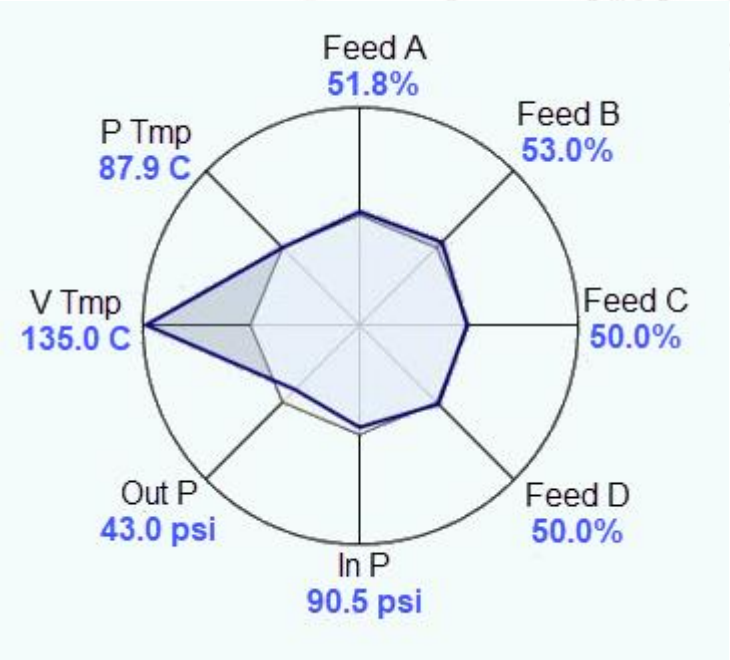
- Displays an analog value as an arrow pointing at a bar with segments showing the desired operating range



High-Performance HMI

Radar chart

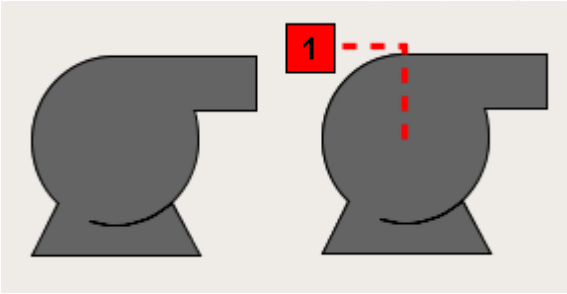
- Display real-time information in such a way that outliers can be quickly identified
- Efficient way to convey if a process is running on-spec or off-spec at a glance



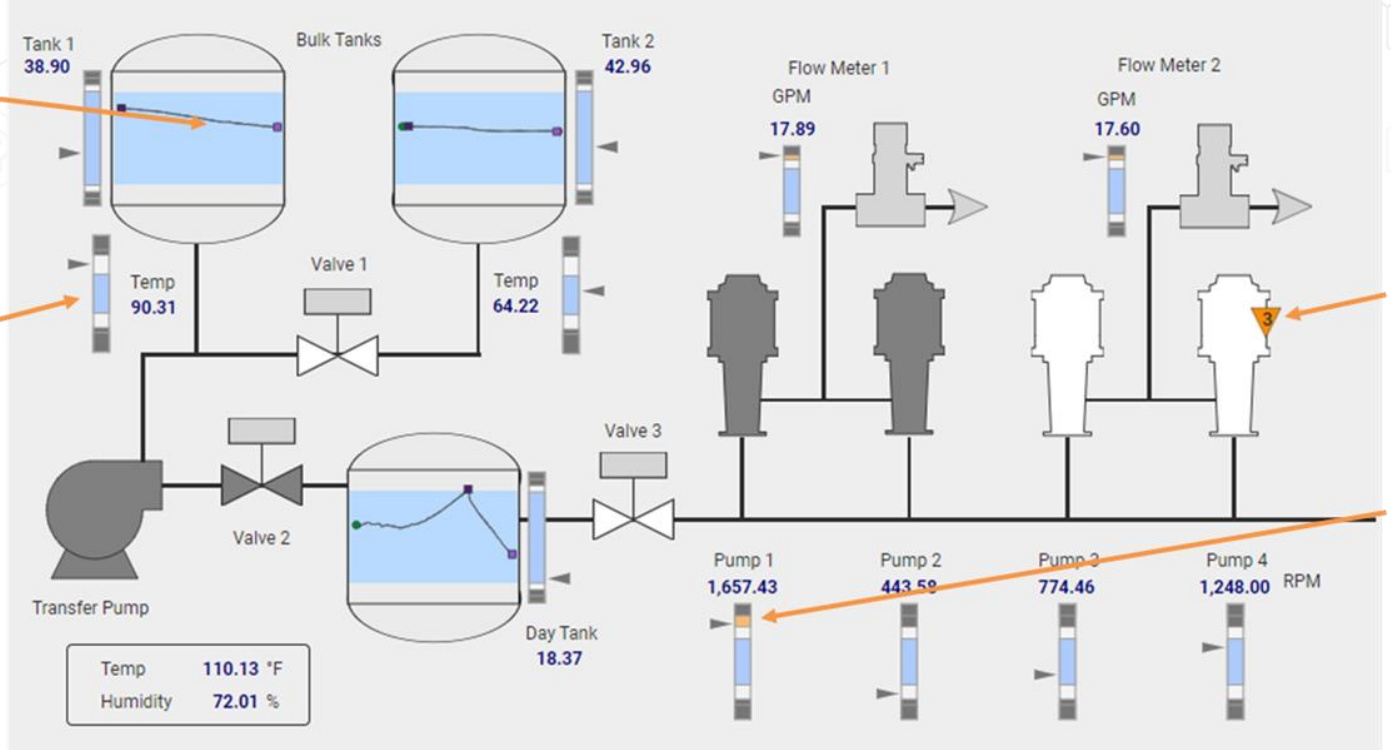
High-Performance HMI

Color Palette

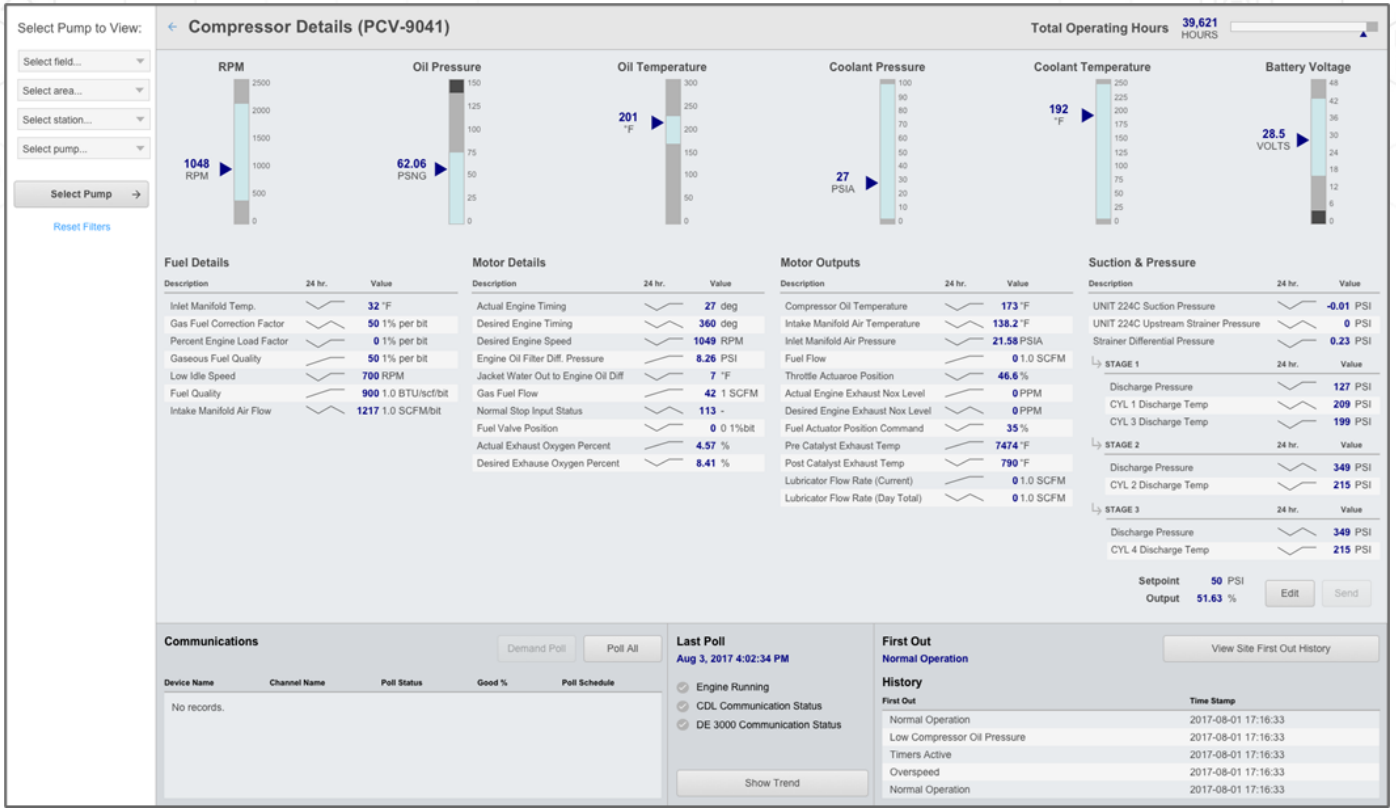
- Grayscale is used instead of traditional bright colors
- Allows use of color to ‘pop’
- Reduces ambiguity



High-Performance HMI



High-Performance HMI Example



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Leverage Mobility

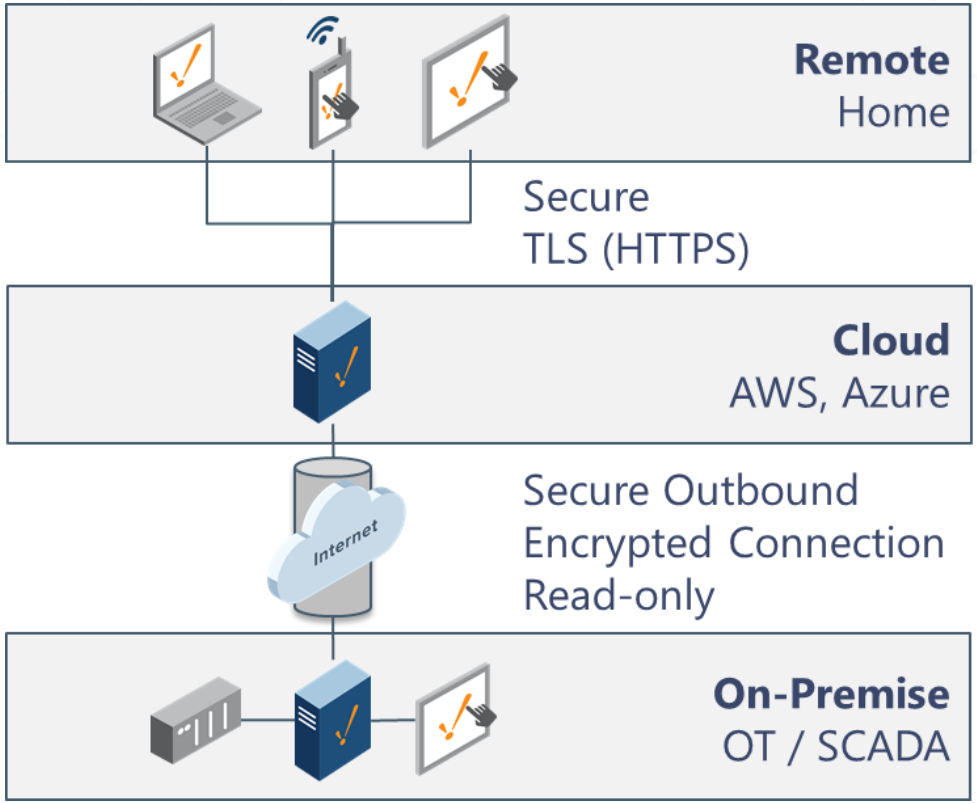
Tip #5: Leverage Mobility

- Bring in the power and magic of mobile devices
- Access data everywhere and tap into GPS, camera, Bluetooth LE, NFC, and more
- Use the cloud to deploy read-only applications

The Magic of Mobile

- Use a camera to take photos of a faulty machine or oil leak
- Easily scan barcodes including QR codes that give your SCADA system instructions
- Take readings or photos in the field and tag them with GPS and other sensor data
- Connect to Bluetooth
- And many other practical applications

Provide Access Everywhere



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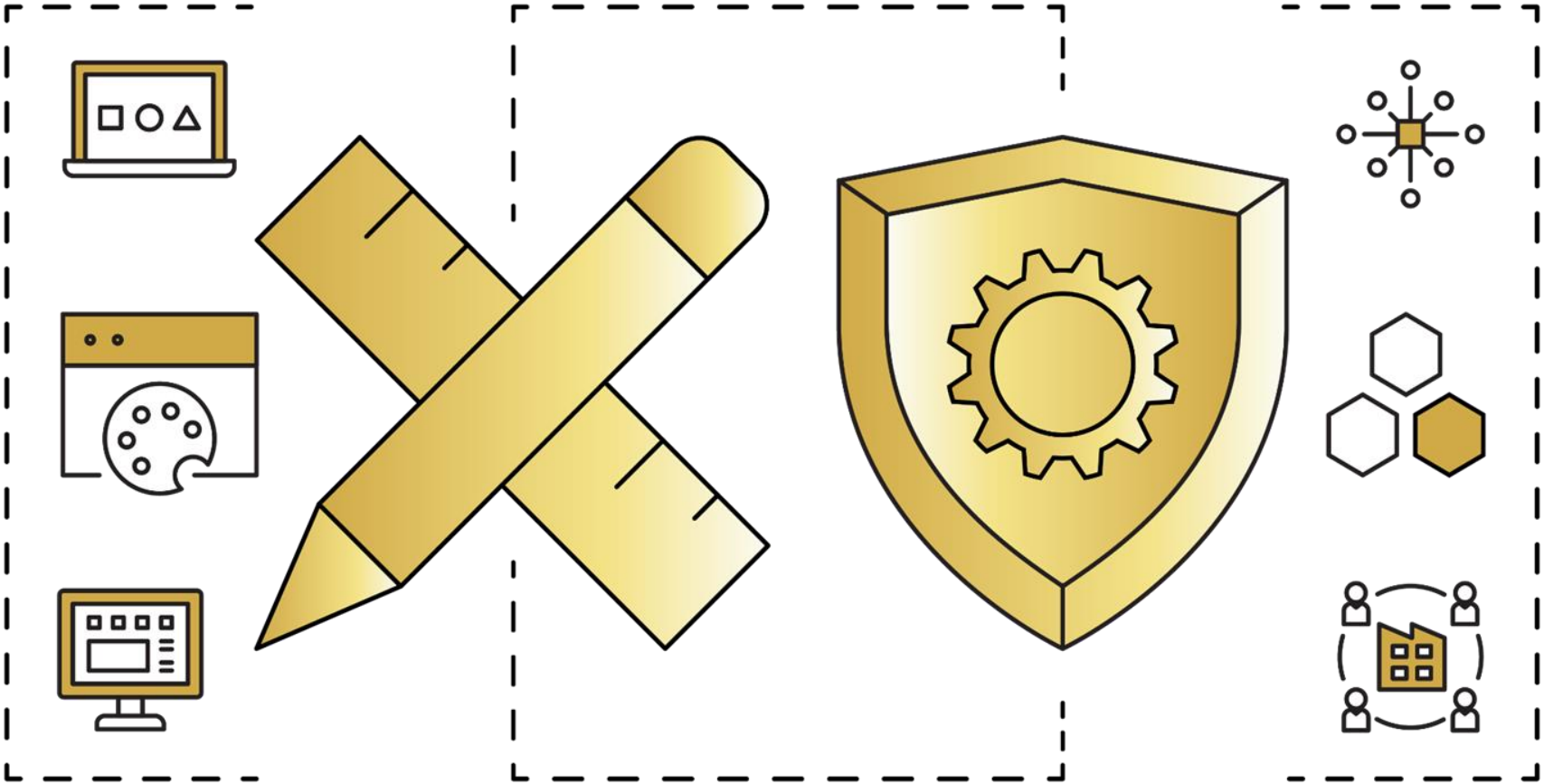
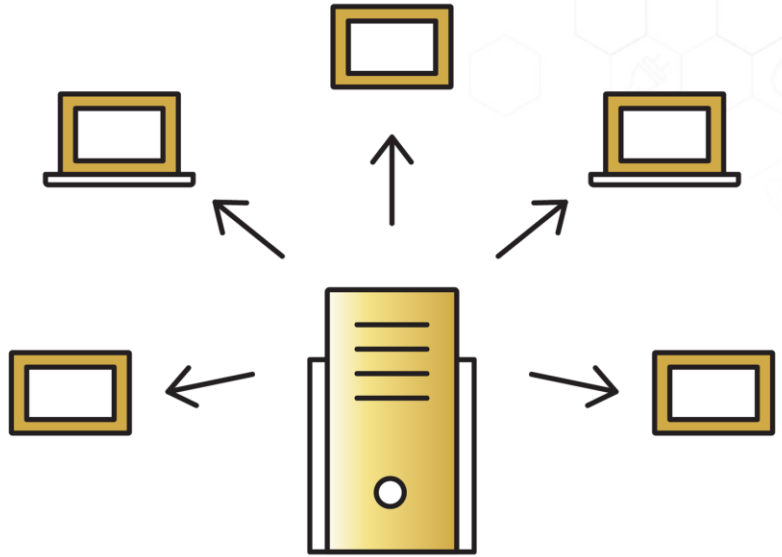


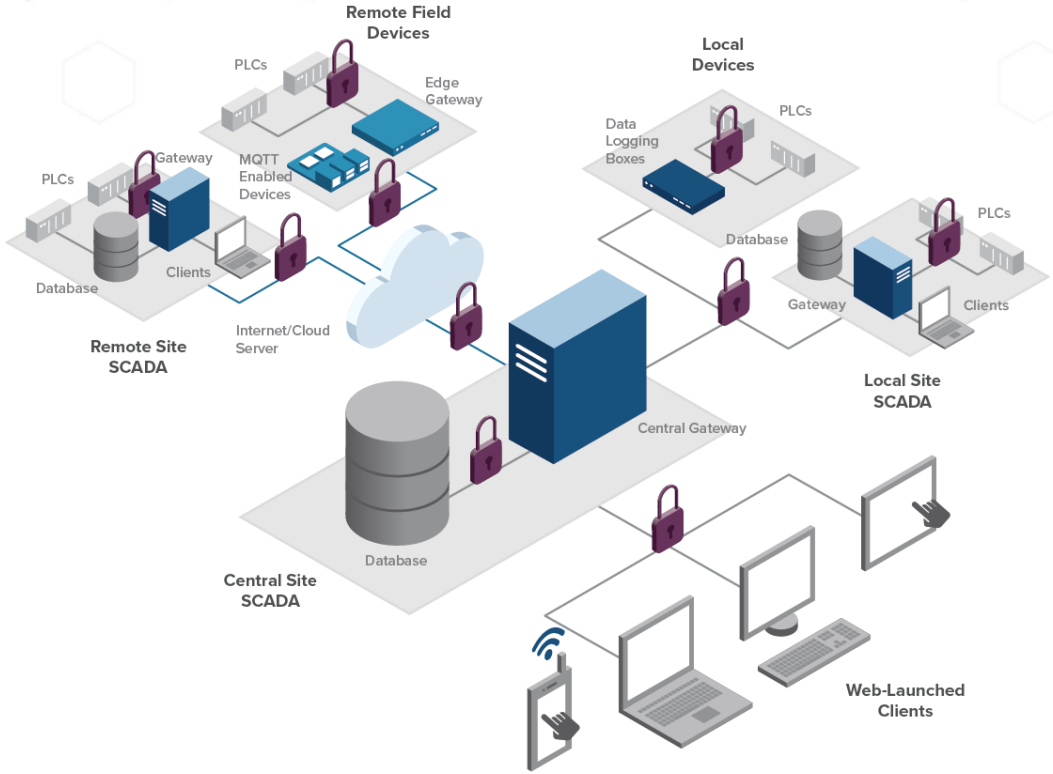
Understand and Secure All Connections

Tip #6: Understand and Secure All Connections

- HTTPS
- Encrypted connections
- Firewalls
- Limit ports
- Auditing



Understand and Secure All Connections



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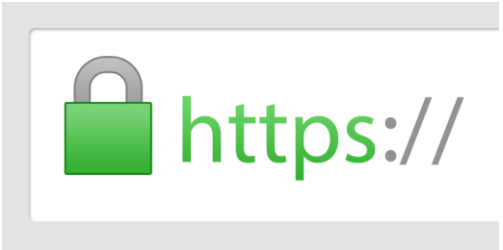
Understand and Secure All Connections

HTTPS

- ‘S’ means encrypted with SSL/TLS
- Protects against snooping and session hijacking



Understand and Secure All Connections

Encrypted connections

- OPC UA and MQTT have communication encryption built in

Understand and Secure All Connections

Ways to protect your operating system

- Enable firewalls for all traffic
- Remove unnecessary programs
- Keep patches and services up to date

Understand and Secure All Connections

Limit ports

- Only use needed ports
- Unnecessary ports leave you open to attack

Understand and Secure All Connections

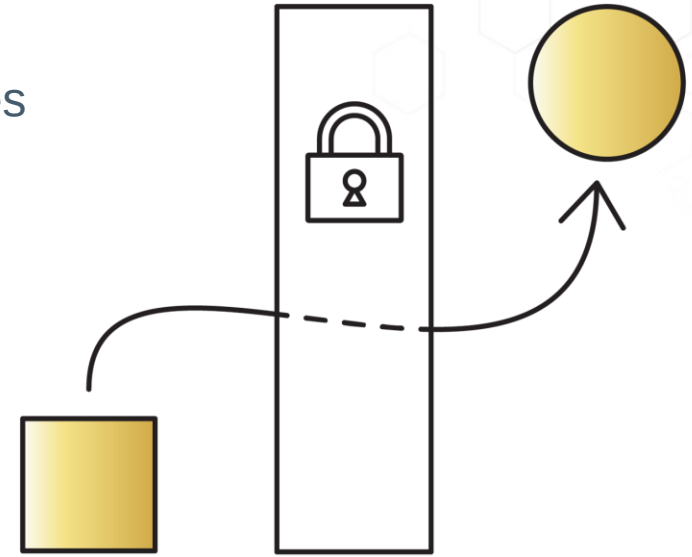
Auditing

- Keep track of *who* is doing *what* and *where*
- Gives an overview of system so that suspicious activity can be quickly recognized

2FA & SSO

Tip #7: Employ Two-Factor Authorization (2FA) and Single Sign-On (SSO)

- Corporate identity system streamlines and secures the login process



2FA & SSO

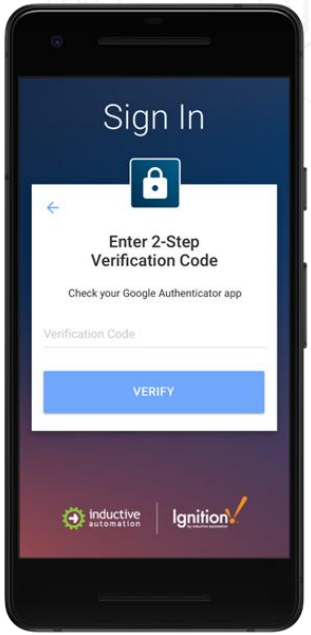
Centralized Identity Management

- Industry-leading encryption protocols
  - SAML
  - OpenID Connect
- Integration with 2FA systems
  - Extra layer of protection
  - Protects from hackers
- Verify identity of users
- Use existing corporate credentials
- Supported & managed by IT
- Used everywhere!

PingID

okta DUO

ADFS



2FA & SSO

Single sign-on

- One set of credentials allows access to more than one application
- Streamlines the login process and makes it easier to monitor user activity

Leverage a DMZ

Tip #8: Leverage a DMZ

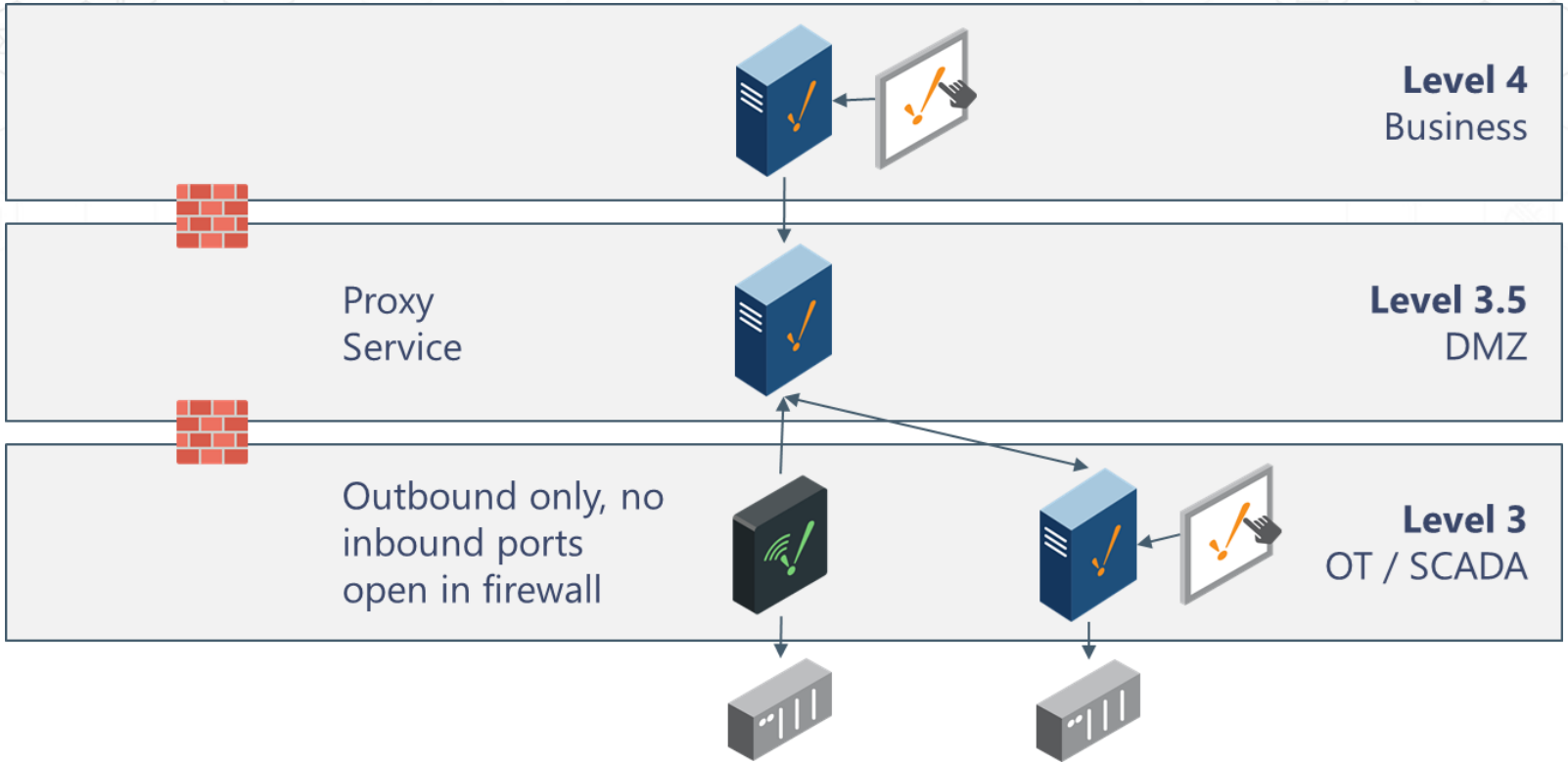
- Protects by adding an extra layer of security to internal local-area network from untrusted traffic
- Allows an organization to access untrusted networks, such as the internet, while ensuring its private network or LAN remains secure

Leverage a DMZ

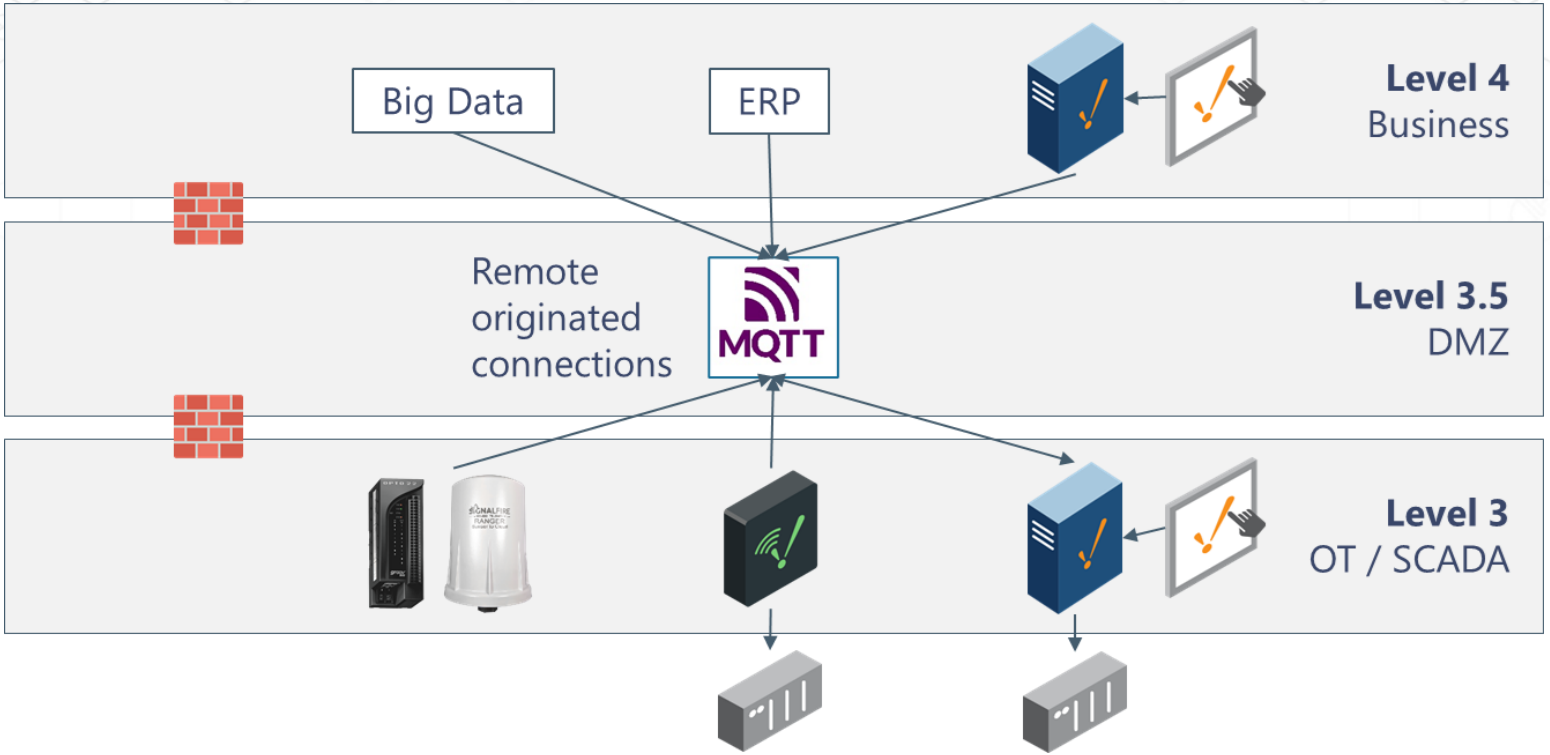
Benefits of a DMZ

- **Improved Security** - Isolate and/or filter network traffic to limit and/or prevent access between network segments.
- **Better Access Control** - Allow users to only access specific network resources.
- **Improved Monitoring** - Log events, monitor allowed and denied internal connections, and detect suspicious behavior.
- **Improved Performance** - With fewer hosts per subnet, local traffic is minimized. Broadcast traffic can be isolated to the local subnet.
- **Better Containment** - When a network issue occurs, its effect is limited to the local subnet.

Leverage a DMZ: Ignition Proxy Node



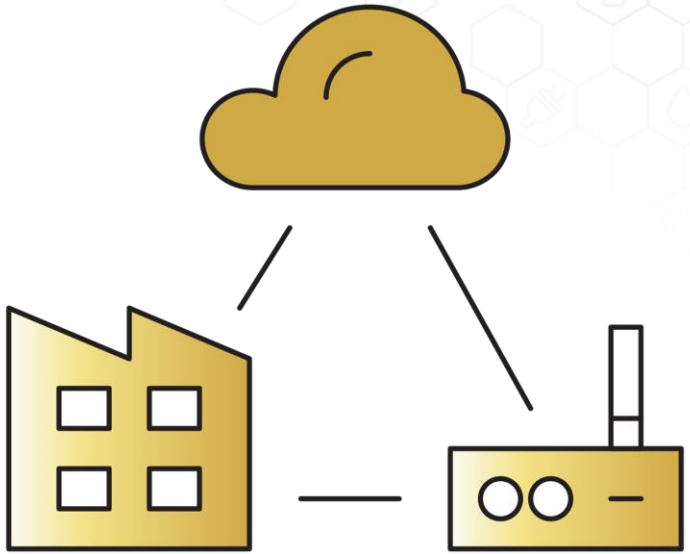
Leverage a DMZ: MQTT Server/Broker



Decouple Devices from Applications

Tip #9: Decouple Devices from Applications

- Leverage open standards
- Allows you to use the best-in-breed
- Easier to maintain
- Greater scalability and redundancy
- Access more of your data

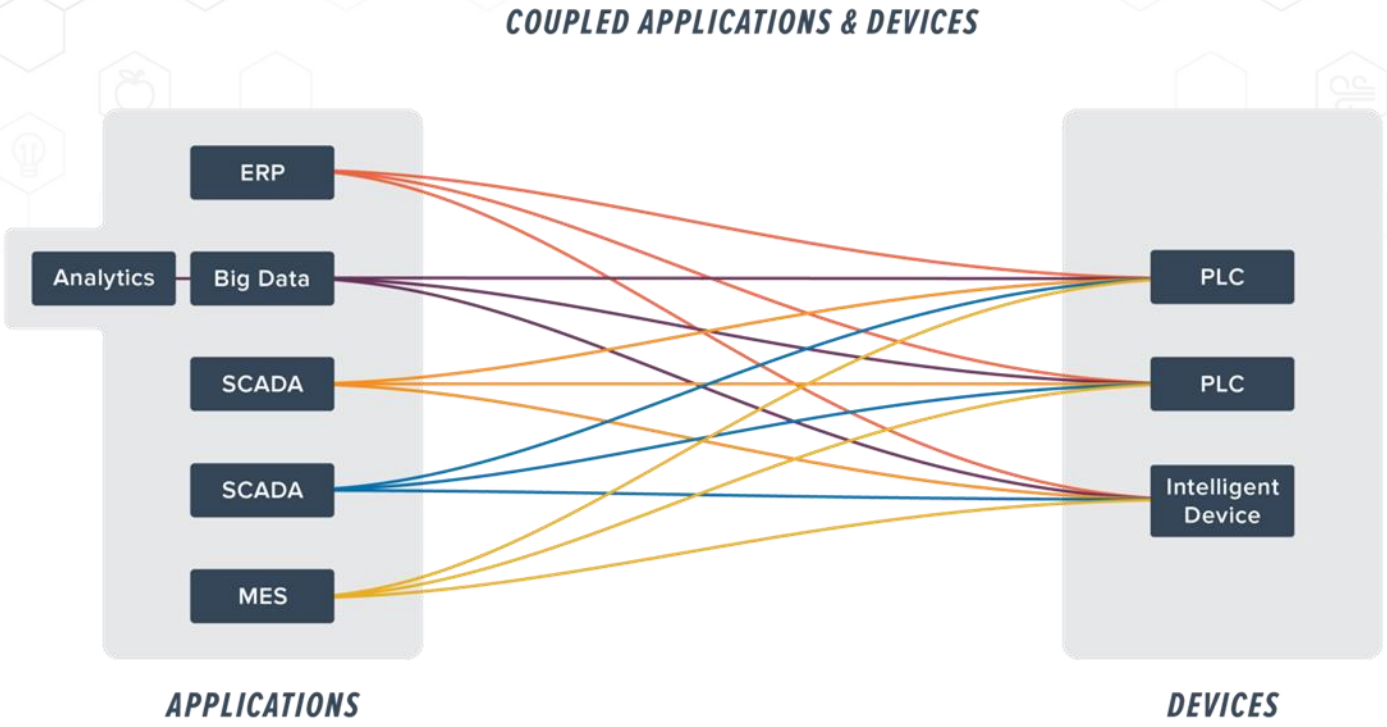


Decouple Devices from Applications

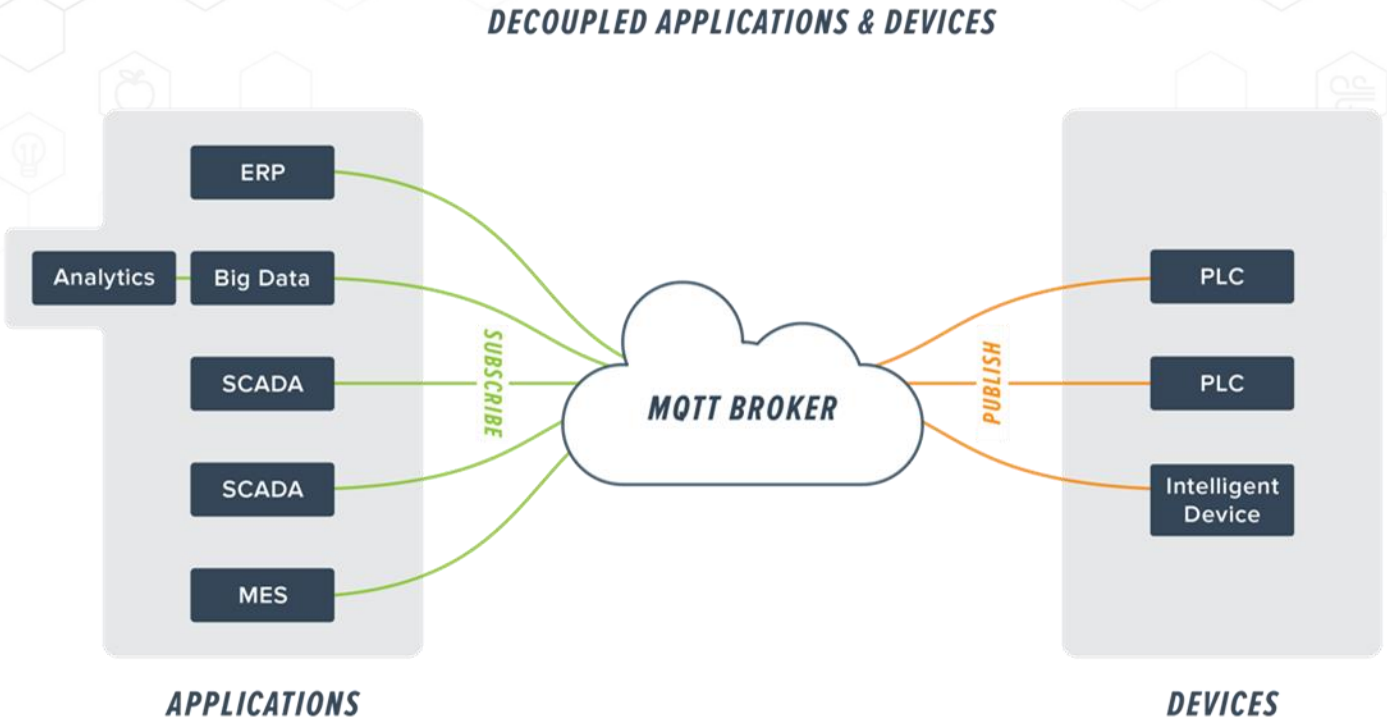
MQTT & Edge

- Leverage the lightweight MQTT protocol to build a robust architecture for delivering data to line-of-business applications
- Take advantage of edge computing to poll data at the source, poll at faster rates, get access to more data and deliver it more efficiently to the business

Decouple Devices from Applications



Decouple Devices from Applications



Decouple Devices from Applications

MQTT Benefits:

- Decouples devices from applications
- Low bandwidth
- Report by exception (RBE)
- TLS
- Outbound connection only (no inbound firewall rules)
- Stateful awareness
- Quality of service (QOS) data delivery
- Single source of truth
- Plug-and-play functionality
- Eliminates cutovers (parallel applications)

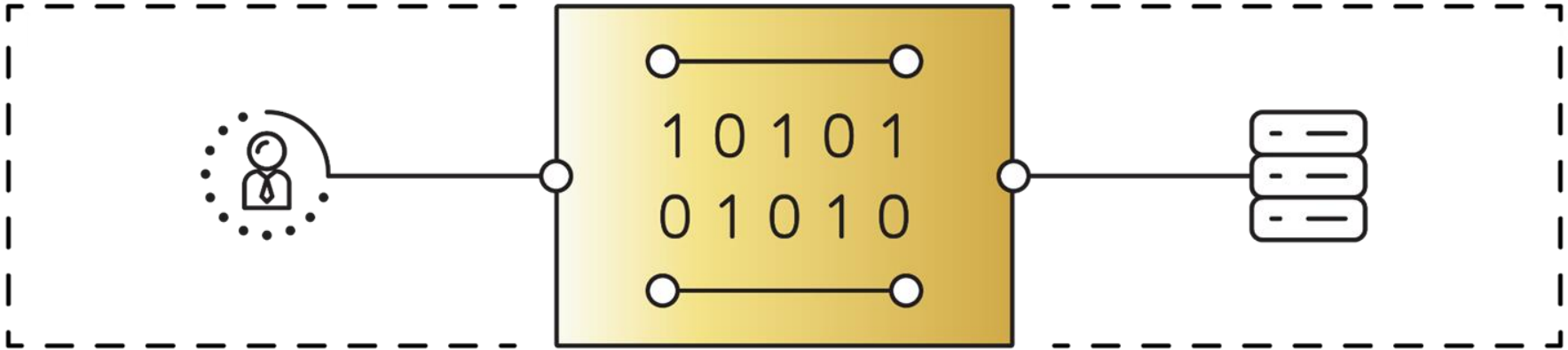
Smart Sensors

Tip #10: Leverage New Smart Sensors

- Capture more I/O data
- Overlay onto existing network
- Wireless technology
- Cost-effective
- No PLCs or running conduit or power
- Plug-and-play
- Examples:
  - Vibration monitoring
  - Temperature sensors
  - Pressure sensors
  - Leak detection
  - Flow sensors

Conclusion

Increase data accessibility for users while securing data access from everyone else.



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Questions & Comments

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